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Application Design Manual 5.4.6

APPX 5.4.6

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APPX Software, Inc.

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CHAPTER 1-1

Overview of Application Design

Cover Page

Introduction to Application Design

The application design component of APPX enables a designer to develop and modify an application system quickly and effectively. This chapter briefly describes the APPX facilities that make this possible.

Application Design is accessed by selecting the design an application option from the Main APPX Menu shown below.

Main APPX Menu

How to Reach Appx

APPX Software, Inc.

11363 San Jose Blvd., Suite 301

Jacksonville, FL 32223 USA

http://www.appx.com

email: info@appx.com

phone: 1-800-TRY-APPX or 1-904-880-5560

Terminology

There are some terms often applied to the people and systems associated with the APPX environment. The following definitions will help clarify how these terms are used as you read this manual.

An ***application system***, or application, is a set of interrelated computer processes, data structures, and procedures designed to perform one or more business-related tasks (for instance, to produce a payroll or maintain accounts payable information).

An ***application designer***, or designer, is a person who uses APPX to develop or modify applications that are run by end users.

An ***Appx Database administrator*** is responsible for performing filemanagement functions for the databases defined in an installation. This person may also be responsible for the integrity of the defined data dictionaries in each application. Larger companies will have a separate database administrator to control the data dictionary, while in smaller companies this responsibility might be given to the applicationdesigner of the application. The Appx Database Administrator is not to be confused with an RDBMS administrator. The Appx DB Administrator only works with AppxIO files.

An ***Appx System administrator*** is responsible for installing APPX on your computer and for defining in APPX the configuration. In addition this person establishes any security controls for your applications. Therefor the system administrator requires complete access rights throughout the APPX environment.

Documentation Rights. All system administrators and application designers have the ability to change documentation, but this ability can be extended to authorized users to change the online documentation or access the Documentation Management facility.

An ***end user***, or user, is a person who runs or executes an application written in APPX to perform a business-related task, such as preparing payroll.

The target audience for this manual is the application designer; in general, when directions or instructions are provided, they are addressed to a designer. The terms *designer* or *end user* are used only when such a distinction is essential to convey precise meaning.

A Specification Approach

APPX allows you to develop applications using a specification approach. Using this method, you supply responses to a number of pre-established questions or choices, and APPX produces the desired application products (menus, input screens, reports, etc.). The specification method to system design differs from the more traditional technique of using a procedural language (such as COBOL) to develop applications. APPX actually incorporates both techniques because it has its own Integrated Language Facility (ILF).

that supplements the specification tools. You can develop complete applications using only the specification method. Or, in complex situations, ILF routines can supplement the specifications to perform more sophisticated operations or to provide explicit instructions to APPX. These ILF routines become an integrated part of application design.

Prototyping an Application

One method of system design involves the development of a preliminary specification-driven application to use as a prototype during the definition stage of an application project. Prototyping is an iterative design method by which you develop sample screens and reports, review them with the intended end users, modify the samples, and repeat the review process until the samples are satisfactory. APPX is an excellent prototyping tool because you can specify and modify screen images and reports very quickly. After you and the end users reach a mutual understanding about the basic structural and operational requirements of an application, you can supplement the basic specifications with ILF routines to address the more complex processing requirements.

There are several advantages of using a prototyping approach:

With APPX, you can continue to enhance the prototype application you develop until it is complete enough to use as the real application in production. You do not have to discard the prototype and start over after all the requirements are defined.

Prototyping allows you to minimize the coding and testing cycle because you actually begin testing as soon as you review the prototype application with the end users

There is less need to freeze the design requirements before you can begin productive work and demonstrate some of the capabilities of the proposed application. Users always find it easier to critique examples rather than concepts (i.e., written specifications).

APPX's facilities provide ease of modification and enhancement; you do not have to discourage users from proposing changes and additional features.

Prototyping encourages earlier and more productive involvement of end users, reducing the chances of finding design flaws in the latter stages of development.

Integrated Documentation

APPX allows you to generate a comprehensive set of documentation for an application without having to leave the normal development environment. In many application design environments, documentation is written after the application is complete using facilities separate from the primary design tool. With APPX, documentation is written concurrently; therefore, when the application is complete, so is the documentation.

There is another way to use the documentation facility if your environment calls for producing a specification of formalized requirements. You can use the documentation screens as a tool to specify all the requirements that the application must meet, without actually developing the entire application during the first pass. At the end of this definitional phase, you are able to generate a comprehensive requirements document suitable for review and approval by designers or end users.

Components of the Application Design Facility

The application design facility is an APPX application and, as such, operates like any other APPX application. This approach may prove instructive for designers because they can choose to pattern their own development after application design.

To enter application design, you select the design an application option from the Main APPX Menu. Once you have selected an application from the Application Chooser, the primary Application Design screen is displayed, as shown below below, which contains the Application Design Specifications Menu.

Application Design Specifications Menu

Application Design is divided into five general categories, as indicated by the folder tabs: **Specifications, Tools, Language, Documentation**, and **Utilities**.

As you can see, the Specifications tab is selected by default since this screen contains the heart of application design, the Application Design Specifications Menu. The menu options are grouped by function. **Application Specifications** include basic application properties and named resources, which link graphics files for use throughout the application. **Data Elements and Structures** encompass domains, file structures, and work fields, which together constitute the Data Dictionary. **Form Based Objects** include menus, inputs, inquiries, and outputs. These objects or processes all involve designing images. **Processing Objects** include queries, updates, subroutines, job streams, and status checks. These objects or processes do not involve designing images.

Each of these options, along with those found on the other folder tabs, will be described in detail later in this manual. The remainder of this chapter provides an overview of the primary application design tools that you will use most frequently.

The Data Dictionary (Data Elements and Structures)

The *Data Dictionary* component of APPX allows you to specify information about the data and files that are used in an application. Data dictionary options, shown in the figure below, are available from the Application Design Specifications Menu under the heading "Data Elements and Structures".

Data Elements and Structures

- Domains
- File Structures
- Work Fields

Data Dictionary Options

The dictionary specifications provide a central location for all data and file attributes that the processes (menus, inputs, outputs, etc.) reference as they are developed. The APPX dictionary is active, or integrated, meaning that all the information a designer specifies in the dictionary is used by, and places restrictions on, all other parts of an application. For example, if you specify in the dictionary that the value of a field called AMOUNT cannot exceed 100, an end user could not enter a value of 105 on any input screen where this field appears. In addition, if you expand the length of a field from seven to eight characters in the dictionary, after the dictionary is processed the field appears as eight characters wherever it is referenced in the application. As a designer, you do not need to make any other modifications to accommodate this change in field length, unless the change would cause fields to overlap on a screen or in a report.

A preliminary discussion of the dictionary can be found in Data Dictionary .

Objects or Processes

The process definition component allows you to specify all types of objects or processes that, when integrated with the Data Dictionary and other application specifications, form the basic building blocks of an application. Options for objects or processes, shown in the figure below, are available from the Application Design Specifications Menu under the headings 'Form Based Objects' and 'Processing Objects'.

Form Based Objects
- Menus
- Inputs
- Inquiries
- Outputs

Processing Objects
- Queries
- Updates
- Subroutines
- Job Streams
- Status Checks

Objects or Processes Options

Form Based Objects utilize the Image Editor to define or edit images and include the following process types:

Menus, which provide a list of options available for selection by the user. Because an option on a menu may invoke another menu, an application can include many related menus.

Inputs, which allow a user to enter, modify, view, and delete data.

Inquiries, which allow a user quick access to viewing and optionally printing a specific record in a pre-defined format.

Outputs, which allow a user to produce reports or lists in a specified format that can be viewed on a screen or printed on hard copy.

Processing Objects do not involve designing images and include the following process types:

Queries, which permit a user to select a subset of records from a file and sort the records.

Updates, which allow data to be modified programmatically.

Subroutines, by which the designer can develop 'stand-alone' procedural routines that can be invoked during the execution of any other type of process.

Job Streams, which controls the execution of a series of related processes.

Status Checks, which provides the capability to perform various kinds of error checking.

Together they comprise the nine different types of objects or processes within APPX. You provide the structure for an application by connecting the various processes that you define.

A preliminary discussion of APPX processes can be found in Understanding Process Design.

The Image Editor

The Image Editor is a 'screen painting' facility within processes that support images. It allows you to specify exactly how an image should appear on a screen display or in a printed report. A key step in the definition of a menu, input, output, or inquiry process is painting the image(s) that specify the format the user will see on the screen or report. There is no separate menu option to select the Image Editor directly. Instead, you automatically enter the Image Editor directly from within process definition when defining an image for a menu, input, output or inquiry process.

The standard features of the Image Editor can be employed in character mode using only a keyboard. However, you need a mouse to take advantage of the GUI features within the Image Editor. GUI tools provide designers with the ability to create screen images complete with pictures, buttons, icons, wallpapers, and other graphical features. Another GUI tool is a data palette offering drag and drop selection and placement of data fields.

Basic functionality of the Image Editor is fully explored in Using the Image Editor and a complete discussion of its GUI features is presented in Using GUI Features of the Image Editor.

Integrated Language Facility (ILF)

As a part of APPX's application design component, the *Integrated Language Facility (ILF)* allows you to develop procedural routines within an application. Each ILF routine consists of one or more *statements*. APPX's language includes many statement *keywords* that allow you to perform a wide variety of functions. ILF routines provide you with three primary capabilities:

Explicit control over certain operations, such as file opening and closing. Based on the information you have specified in the data dictionary, APPX provides automatic control of many operations. In some instances, however, you may choose to override a standard operation by defining and executing an ILF routine.

Advanced file processing that provides you with precise control over record access, selection, and update. For example, you can perform complex cross-file updating.

More complex processing functions than the specification method supports. An application may require a complex logic operation in which a number of conditions must be checked before a certain action occurs. For example, you may want to specify that for out-of-state customers only, if their outstanding balance exceeds their credit limit by more than $1,000, a warning message is to be issued. The ILF supports such sophisticated logic and truth table operations.

The Integrated Language Facility is explored in depth in Using ILF Routines.

The ILF Editor

The ILF includes an ILF editor that allows you to develop and modify statements in routines. The editor is fully integrated with the data dictionary and processes, and provides automatic edit checking to help eliminate errors. The editor includes a number of facilities (such as move, copy, and search) that allow you to enter and edit statements efficiently. You enter the editor automatically by selecting the desired event point option while designing a process.

For more comprehensive descriptions of the editor, refer to The ILF Editor section of *ILF Integration* as well as *The ILF Editor*.

The Debugging Facility

APPX provides a debugging and testing tool, called the *statement debugger*, that allows you to step through the execution of any ILF routine and analyze how specific field values are affected by each statement. This tool is very helpful in resolving logic errors within an application. You control when and where the debugger operates by setting and clearing traps to examine sections of an ILF routine that you suspect may contain logic errors. The debugger also allows you to modify field values and monitor the effect of such changes on subsequent processing.

A complete description of the features of the debugger can be found in The Debugger

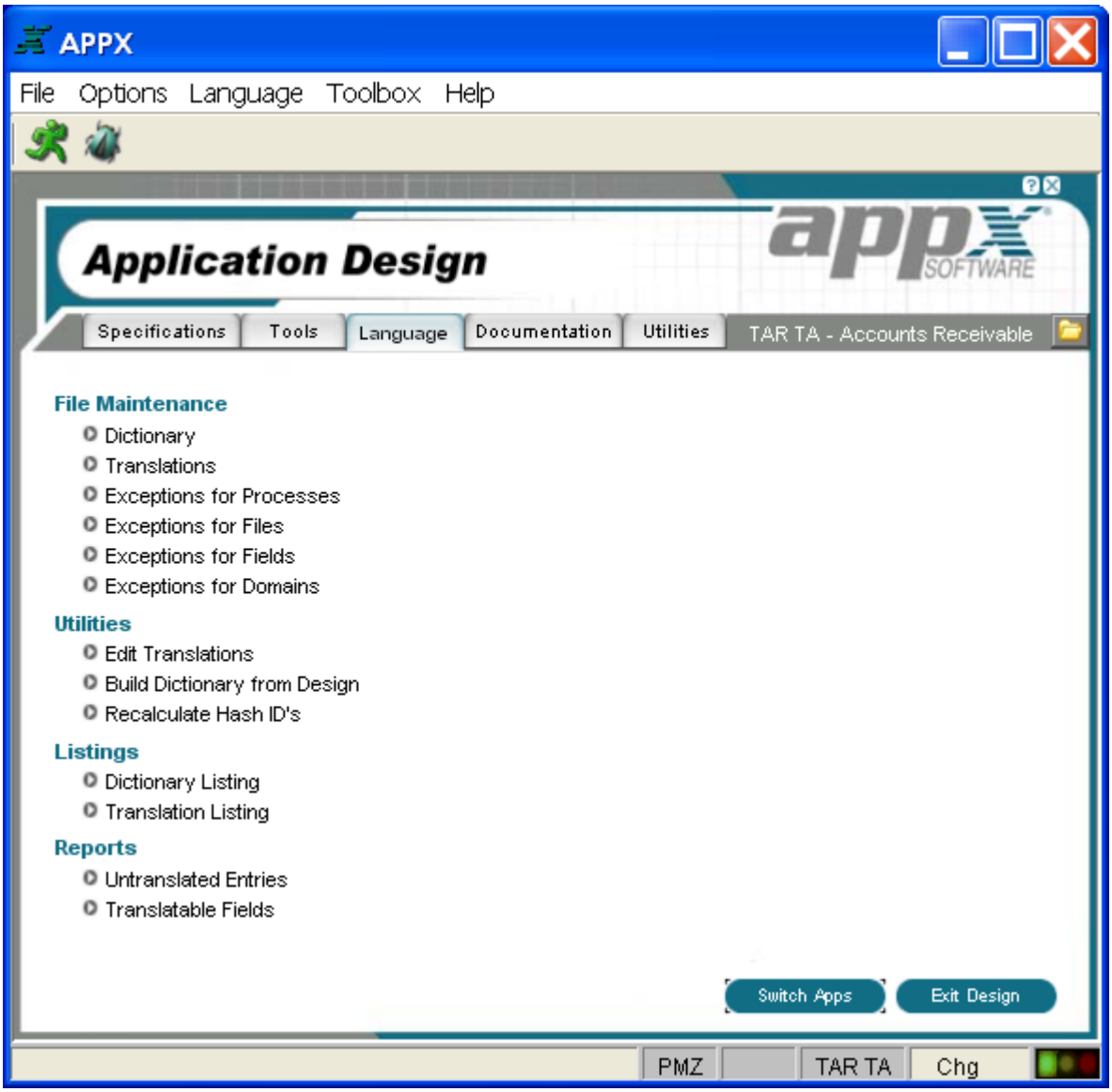
Design Tools

APPX also provides a number of tools that are designed to increase your efficiency in developing applications. One tool, called design transfer, allows you to copy existing processes as a starting point for developing other new ones. For example, you may want to 'borrow' a report layout to serve as a pattern for a similar report. Another tool allows you to quickly change all existing references in an application to a new name.

A complete description of these tools can be found in *Application Design Tools*.

Language Facility

When you select the Language tab from the primary Application Design screen, the Application Design Language Menu is displayed, as shown in the figure below.

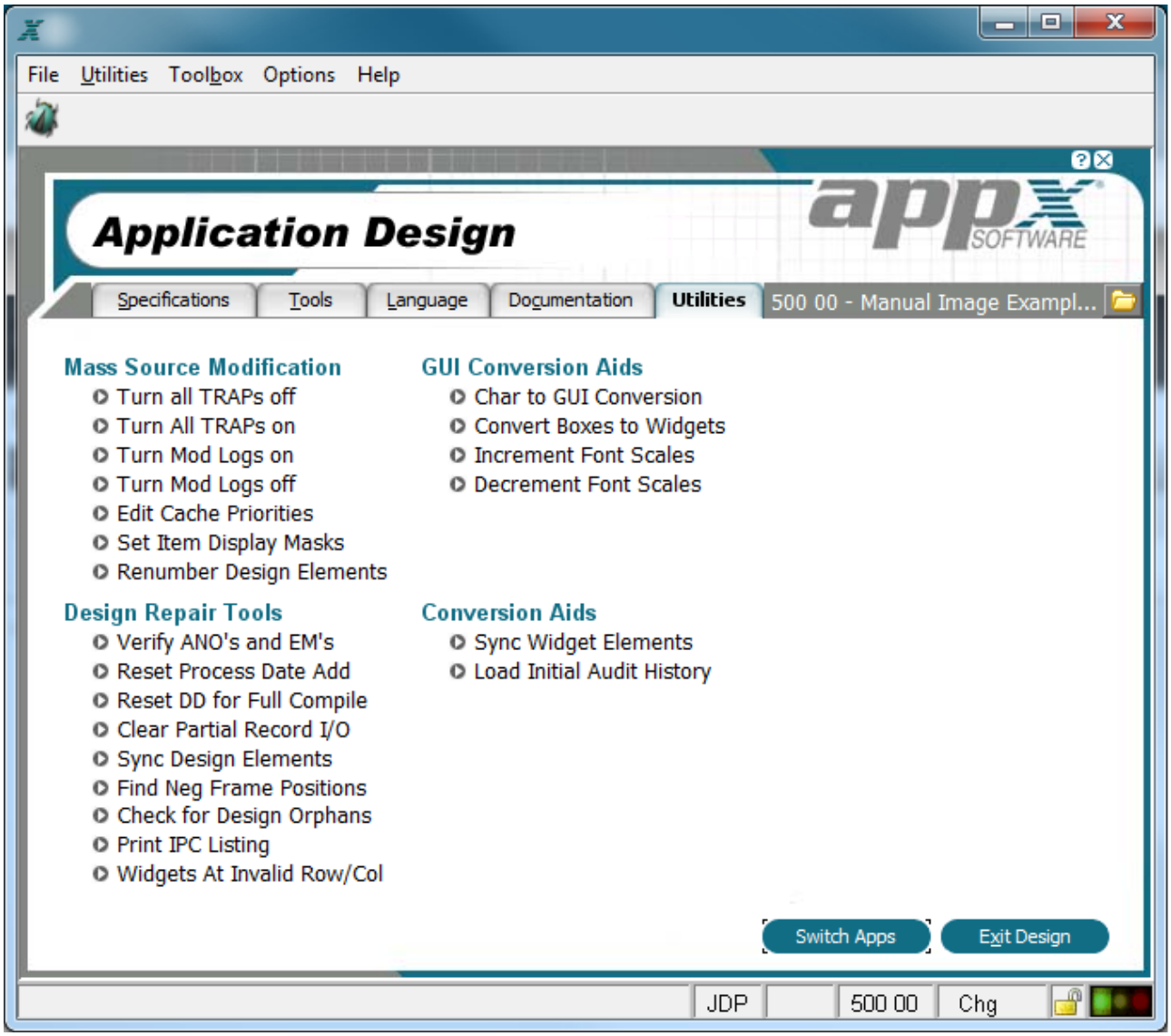


Application Design Language Menu

The Application Design Language Menu provide options to maintain language translations for the current application, produce listings and reports, and other functions. For more information regarding this facility, refer to the *Language Translation Manual*.

Utilities

When you select the Utilities tab from the primary Application Design screen, the Application Design Utilities Menu is displayed, as shown below.



Application Design Utilities Menu

The Application Design Utilities Menu offers options for a variety of special purpose utilities including the following:

Mass Source Modification

Turn All TRAPs OFF turns all debugger traps off within the application so the debugger is not invoked during process testing.

Turn All TRAPs ON turns all the debugger traps on within the application so the debugger is active during process testing.

Turn Mod Logs ON . Modification logs list all additions, deletions, and changes to the process control file (PCF). Use this utility feature to turn Mod logs on for the entire application where the Mod log prefix is set in addition attributes. A message will appear in on the message line when this utility is invoked, see below.

Example of message when Mod Logs are turned on

Turn Mod Logs OFF . Turn data modification logging off for currently application. The message will indicate when Mod Logs are Turned OFF.

Edit Cache Priorities . This option allows you to edit the cache priority of all processes within the application. Cache Priority is also modifiable under each processes' additional attributes in application design.

Set Item Display Masks. This utility give you a global way to change all Item Masks. For example, you could change the date format on all inputs and outputs. You will be prompted for an 'old' and 'new' mask. All Items that match the old will be changed to the new.

Renumber Design Elements. Appx assigns sequence number as design elements are added during application development. This utility will allow you to renumber or re-sequence records within the application. This is useful when you Field sequence numbers, Sort Order sequence numbers, Frame or Child sequence numbers do not have enough of a gap between them and you wish to reassign them. You will be able to choose individual files, all files, individual processes, all processes of a type, or all processes. You can also choose to renumber the entire application.

Design Repair Tools

Verify ANO's and EM's generates a report of any process that have a duplicate date added. These result in duplicate Executable Modules and may cause problems. The report also shows duplicate 'area numbers' or ANO's. These are internal pointers used to locate variables in memory.

If a duplicate EM is reported:
1. Delete all EMs for the application
2. Run the reset process date add fields option on this menu.

If a duplicate ANO is reported:
1. Delete all EMs for the application
2. Initialize the BITMAP, ELEMENT, FILE, and INTIAL design files for the application
3. Run "Reset DD for Full Compile"
4. Process the data dictionary for the application
5. Restructure the application's end user data files

Reset Process Date Add will assign every process a unique Date Added. Use this if the "Verify ANO's and EM's" utility reports duplicate EM names.

Reset DD for Full Compile. This utility will clear the Area Numbers (ANO's) from the Data Dictionary. Use this if the "Verify ANO's and EM's" utility reports duplicate ANO's.;

Clear Partial Record I/O. This utility clears a now obsolete field in Appx. Process which contained a non-blank value in this field will be listed.

Sync Design Elements. This will synchronize various fields used in the design files. Normally, you only need to run this when instructed, such as when a new release of Appx is installed, but it can be run anytime without harm.

Find Neg Frame Positions. List all Frames in the application where the "Row Position" is negative. This will flag any frames which exceed the bottom of the screen. This utility can be used to find Frames where the negative row position may need adjusting.

Check for Design Orphans. Orphan detection is a series of reports that will access design elements in the application. An error will be generated if any higher level design elements in the ancestry are missing. A design element which has something missing in it's ancestry is commonly referred to as an orphan. For instance, an Image for Process "XXX", and Record Frame "100" would an Orphan if either the Process or the Frame were not currently on files.

> Note that these reports may not list all orphans. For instances, in the prior example if there was a second Image for the same Process and Frame, they would both be orphans. However only the first Image would be listed. This is because it sufficiently would identify any missing elements in the ancestry to remedy the orphan status of both images.

If you add a missing design element, the orphans should them become visible again. You can then decide if you would like to delete any design elements from the application.

Some reports also do other types of internal consistency checking.

Print IPC Listings. IPC (Inter Process Communication) fields are used to define and control the sharing characteristics of Appx Design Elements. Appx designers do not have direct access to these fields. They are automatically maintained by Appx based on the designer entry in fields such as "File Type" and "Share Class".

The listings on this menu can be used to list the IPC fields, focusing on any exceptions from standard values. Any exceptions found can also be corrected by these utilities.

Widgets at Invalid Row/Col. This job creates a report of all widget records that are located at an invalid row or column on an image. This utility does not remove a widget and does not attempt to correct the location of a widget.

GUI Conversion Aids

Character to GUI Conversion. Provides access to utilities that can be used to convert character mode components of the current application to GUI components.

Convert Boxes to Widgets. Boxes were originally implemented as character mode records in release 4.0. With 4.1 they have been re-implemented as records in the WIDGET file. Character mode boxes are now obsolete.

This job will allow process selection by a query. Then for each process selected, any box character records found will be converted to a widget record. A log of what processes were changed will be produced.

The only reason a conversion of a box should fail is if there already happens to be a widget at the same location on the image.

Increment Font Scales. This will increment the font scale on all your widgets by one. For example, a font set at 100% will go to 105% (the next increment), or 800% will go to 900%.

Decrement Font Scales. This will decrement the font scale on all your widgets by one. For example, a font set at 105% will go to 100% (the next increment), or 900% will go to 800%

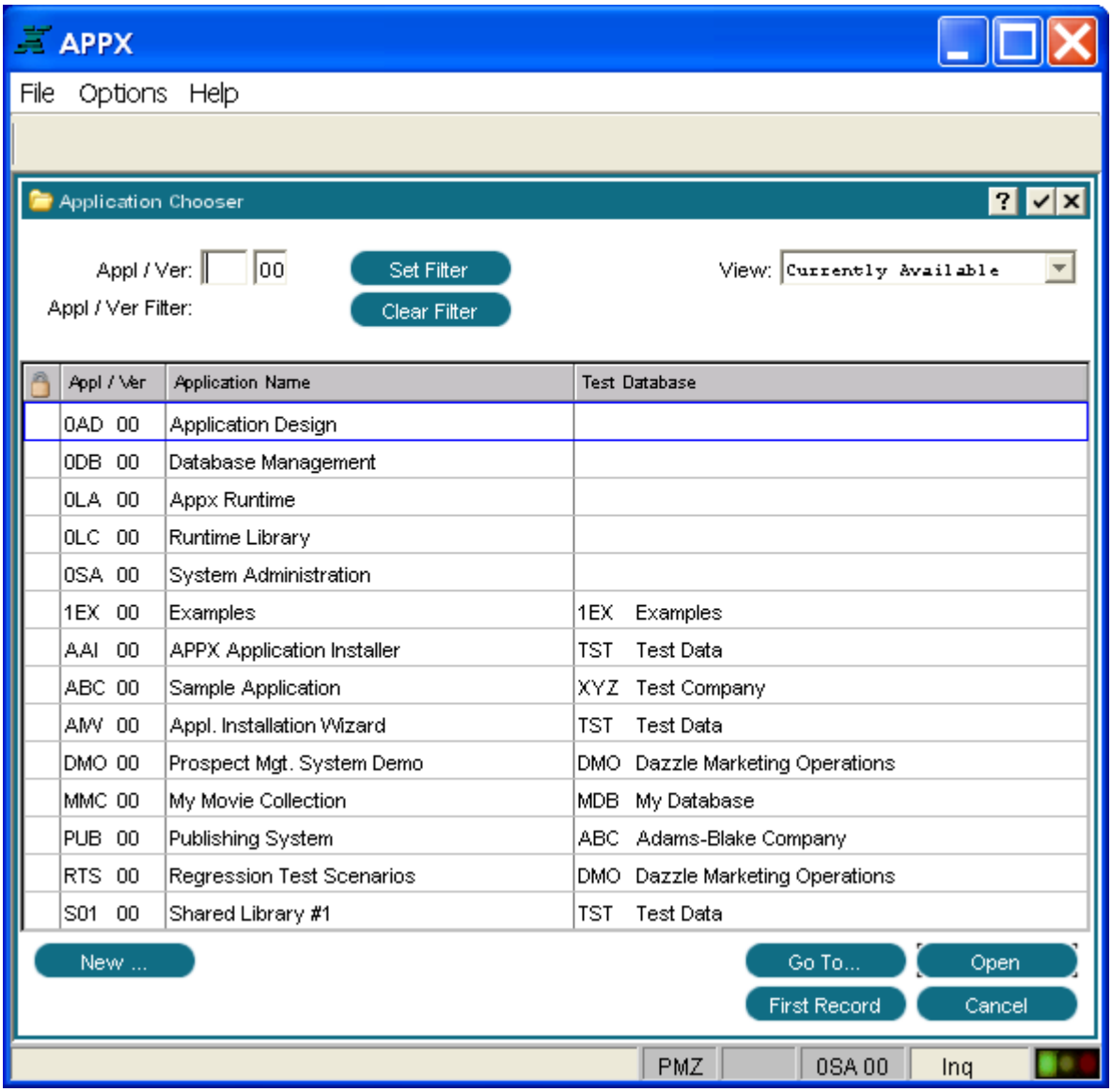
Conversion Aids

Sync Widget Elements. This job updates the records in the WIDGET file for an application by initializing new field and, in some cases, correcting values in old fields. This job should be run when upgrading from any release prior to APPX release 4.2.0. This job only needs to be run once for each application. However, no harm will be done if this job is run more than once for a particular application. This job does not normally produce a printed report. It will return to the menu when completed.

Load Initial Audit History. This job will populate the new Audit History files (introduced in release 5.0). It will use the existing date added/changed, user added/changed to fabricate the new detailed audit history. This should be done as part of the upgrade to 5.0. Once the audit history files contain data for a particular Domain/File/Field/Process, this job will not add more data, therefore if you have made changes to your application using 5.0, the old audit information will not get converted.

Application Chooser

When you select the design an application option from the Main APPX Menu, the Application Chooser screen is displayed, as shown in the figure below.



Application Chooser Screen

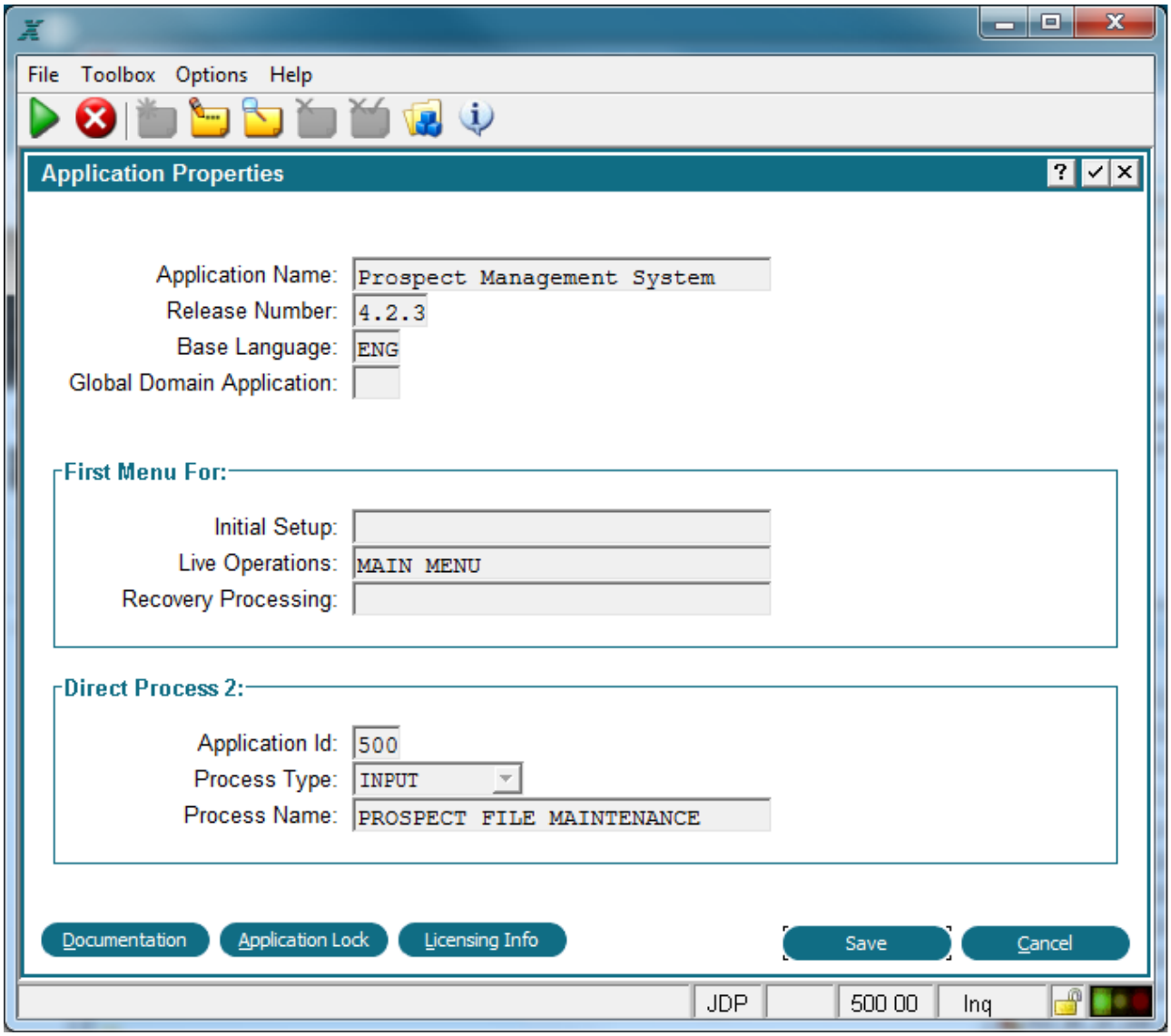
The Application Chooser screen displays a list of the applications in your system from which you can make your choice.

The set filter option allows you to constrain the list to a particular application or version. The clear filter option clears the filter and redisplays the unfiltered list. The 'Currently Available' view lists only those applications for which you have design rights. The 'All Applications' view lists all the applications in your system but you must have design rights in order to enter Application Design for that application.

The new option allows you to specify a new application and version, add the entry to the Applications file in System Administration, and perform Design File Management functions for the new application.

Application Properties

When you select the application properties option from the Application Design Specifications Menu, the Application Properties screen is displayed, as shown below.



Application Properties Screen

The Application Properties screen contains the following fields:

Application Name. Enter a descriptive name for this application.

Release Number. Supply the release number for this application.

Base Language. The language the application is presented to the user in. This encompasses all parts of the application made visible to the user such as menus, input processes, warnings, errors, etc. The Language ID file can be scanned to make a selection but this field is needed only if the Language Translation feature is in use at your site.

Global Domains App. Enter the three-character ID of the application that contains your global or universal domains.

You use the Global Domains application to help default domain names when entering the data dictionary. If you add a domain-type field, and the field name contains the name of a domain within the application, that domain name is supplied as the default for that field's domain. If no match is found in the current application, and if the field contains a domain name that exists in the Global Domains application you identify here, APPX will use that domain name as the default.

First Menu For

Initial Setup. Enter the name of the startup menu that should be presented to the user when the application's operational phase is Initial Setup.

Live Operations. Enter the name of the startup menu that should be presented to the user when the application's operational phase is Live Operations.

Recovery Processing. Enter the name of the startup menu that should be presented to the user when the application's operational phase is Recovery Processing.

Direct Process 2

Application ID. Enter the application ID that should be executed when the end user chooses Direct Process 2 while in this application.

Process Type. Enter the type of process that should be executed when the end user chooses Direct Process 2 while in this application.

Process Name. Enter the name of the process that should be executed when the end user chooses Direct Process 2 while in this application. If this is a menu, all of the optional processes defined on the menu will also be listed under the Application selection from the user's menu bar while in that application. If Direct Process 2 is defined as a single non-menu process, then only that process will appear as a selection under Application.

The Applications Properties screen contains these options:

Documentation contains user and technical documentation regarding the application.

Application Locks are the method by which APPX applications can restrict run-time and design access in the licensing of their applications. Applications locks may or may not be included for this application. The Author ID field and each of the Lock fields in this overlay refer to individual Product Registrations which must be present in your APPX System Registration before you will have access to the corresponding feature within this application.

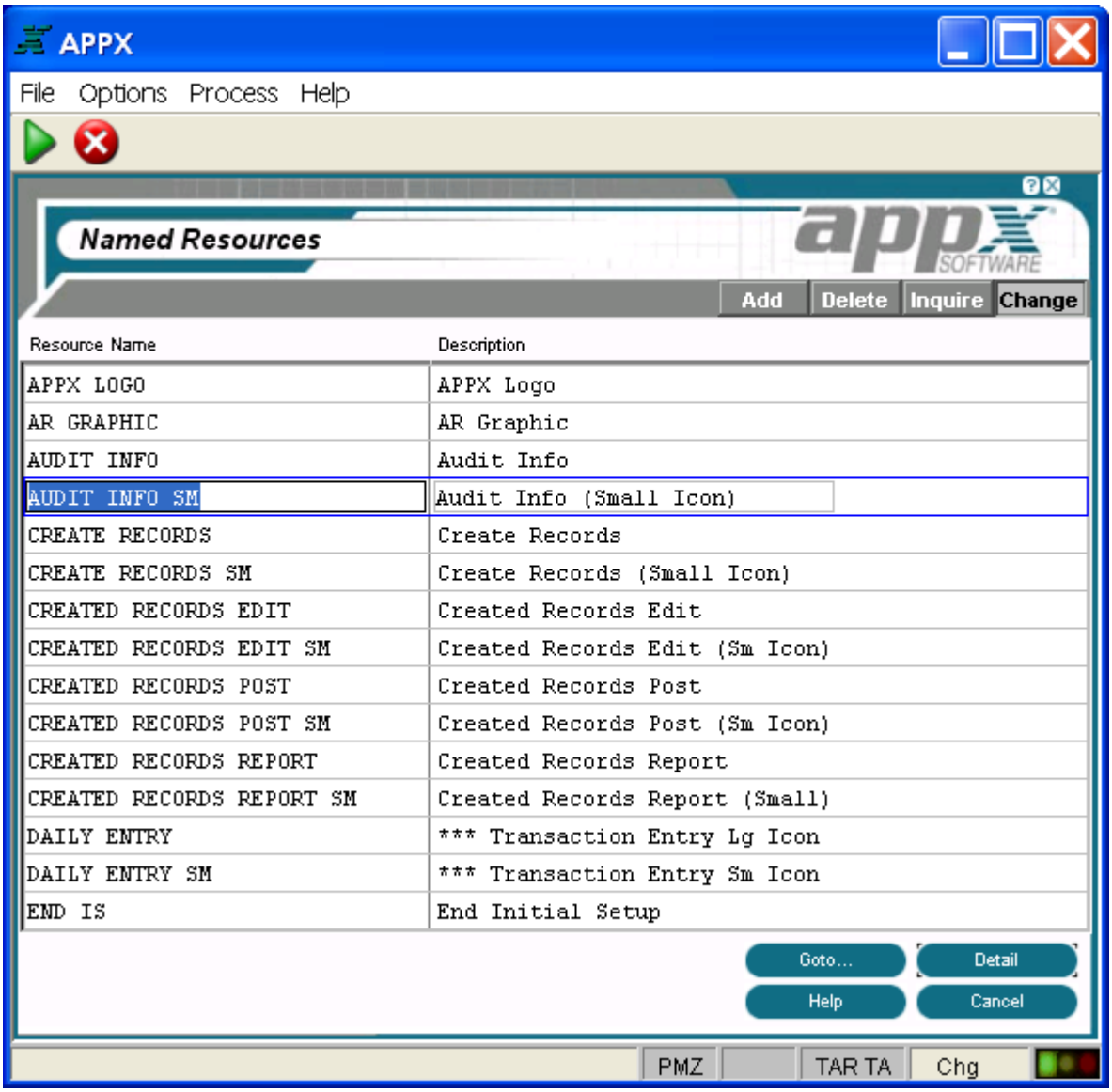
Named Resources

The named resources option is used to define a resource name for referencing a group of related graphic files within the application. Once a named resource has been defined, any references to the named resource on a GUI Attribute screen will result in the bitmap for the appropriate state being displayed on the image or object. This feature is used when designing GUI images that include buttons, icons and pictures. The type of image file being used varies based on where the graphical attributes are being defined. Typically, a resource is used in this manner:

Defined At	Graphic File Normally Contains
Frame	Title bar icon, wallpaper bitmap
Image	Title bar icon, wallpaper bitmap
Child	Menu icon (pull-down, toolbar, pop-up)
Button	Button icon for one or more states (enabled, disabled, pressed, rollover, etc.)
Picture	Picture of image file

Named Resources

When you select the named resources option from the Application Design Specifications Menu, the Named Resources screen is displayed, as shown in figure below.



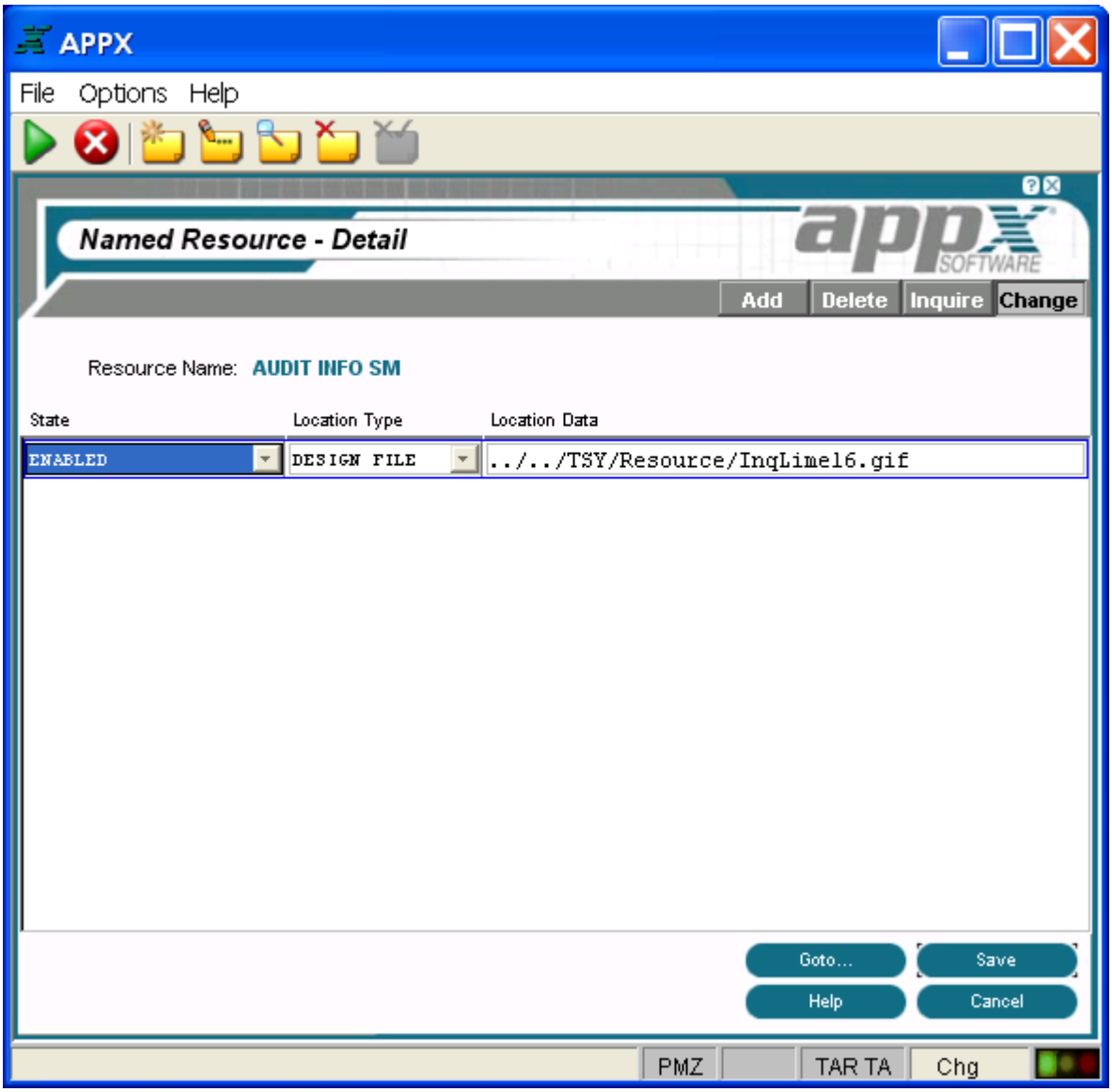
Named Resources Screen

The Named Resources screen is a scrolling display which contains the following fields:

Resource Name for assigning a name to a related group of bitmaps

Description to further define the Resource Name

Select detail to further define the selected resource. The detail display, shown in the figure below, allows you to define the 'states' for this resource.



Named Resources Detail Screen

The Named Resources Detail screen contains the following fields:

State identifies a separate bitmap for each of the various states which an object may assume.

ENABLED to indicate the object is active and available for use to the user

DISABLED to indicate the object is not available for use to the user

SELECTED to indicate the object is currently selected by the user

ROLLOVER to indicate the mouse pointer is positioned over the object

ROLLOVER SELECTED to indicate the mouse pointer is positioned over a selected object

PRESSED to indicate the object has been pressed (clicked on) by the mouse pointer

WALLPAPER to indicate that the resource can be used as a wallpaper for a menu or input image.

Location Type for defining the location of the bitmap

CLIENT URL for a URL to be interpreted by the client

CLIENT FILE for a specific file located on the client

DIRECT indicates that the bitmap is stored in a 2K field within the resource record

SERVER URL for a URL to be interpreted by the server

SERVER FILE for a specific file located on the server

DESIGN FILE for a bitmap file stored in the application's Resource directory

Location Data for defining the specific location information that corresponds to the Location Type used.

CHAPTER 1-2

Getting Started

Before You Begin

Before you begin to design an application, you should fully understand the concepts presented in the *APPX User Manual* and the *APPX System Management Manual*. In addition, there are some system administration tasks discussed in the next section that you or your APPX system administrator must perform. These are all one-time actions that need to be taken when APPX is first installed on your computer, or when a new application is being created.

System Administration Tasks

The following steps are amoung those performed by a system administrator (a user defined with system administrator privileges in the Users file):

The addition of your name to the Users file.

The addition of the name of the new application to the Applications file.

The addition of your name to the Application Designers file for the new application.

The establishment of one or more test databases for the application. Each database must appear in the Databases file, the Database/application combination must be defined, and your name must be associated with the database/application in the Database Managers file.

As part of an ongoing process to separate the job functions of System Administrators and Designers, Appx System Administrators are no longer automatically granted Design Rights.

After installing 5.1, you may have to grant yourself design rights. If there is only one System Administrator (other than user 'appx'), you will be able to grant yourself design rights. If there is more than one Appx System Administrator, you must get one of those administrators to grant you design rights.

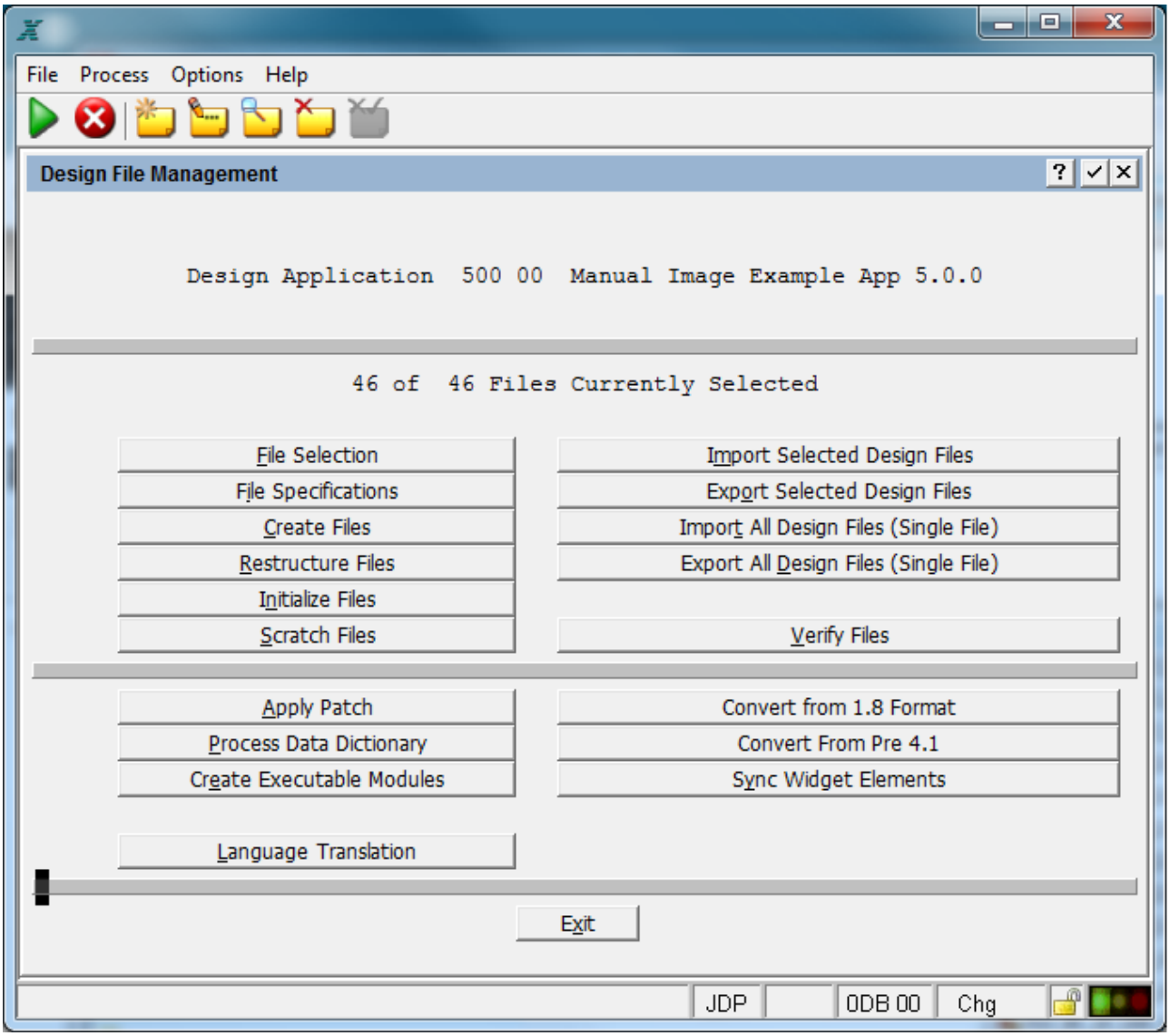
These steps are all part of APPX's overall security measures that prevent the unauthorized use of the APPX design facilities.

Managing Design Files

All of the information that you specify about an application, including specifications for the data dictionary, processes, statements, and painted screens, is stored in a number of APPX *design files*. The information stored in these design files comprises an application. When a user runs an application process, APPX produces the appropriate actions and/or screens by interpreting the information that you specified.

When you make modifications to an existing application, APPX applies the changes to the appropriate design files. Before you enter specifications for a new application, you first provide an estimate of the number of records that each design file will contain. Next, you create the design files for the new application. APPX uses the estimated file sizes to generate the initial file extents; if this initial space is exceeded, additional space is made available. The design or operation of an application is not restricted by these initial estimates.

To create design files, select the design file management option from the System Administration menu, which accesses the Design File Management overlay. The Design File Management overlay then accesses the Design File Management menu shown below.

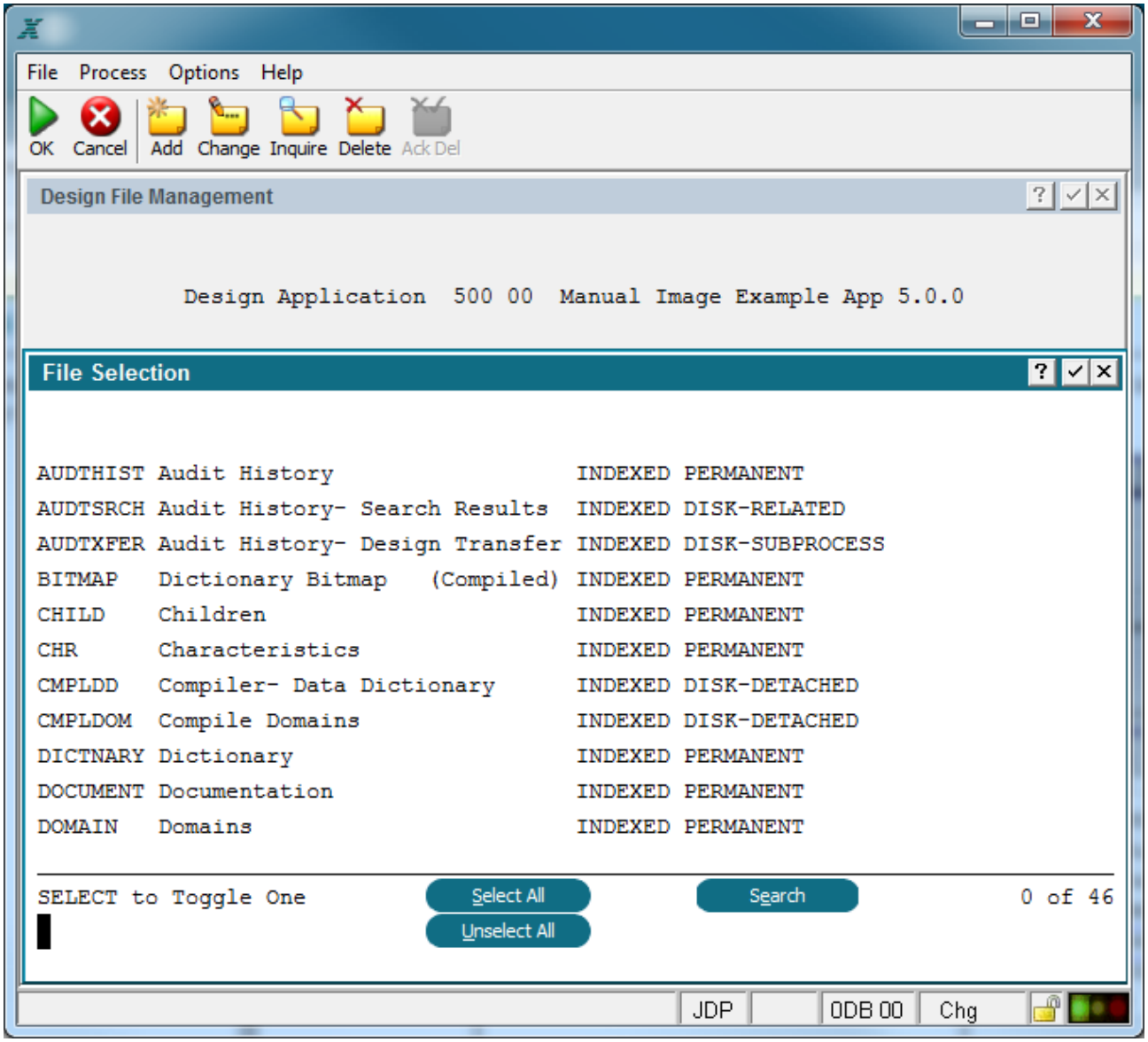


Design File Management Menu

The Design File Management menu contains the following options:

File Selection

Normally, you perform an operation (creating files, for example) on all the design files of an application at the same time. There are times, however, when you may want to operate selectively on one or some of the design files. This option allows you to designate specific files. When you select file selection, the screen shown below appears.

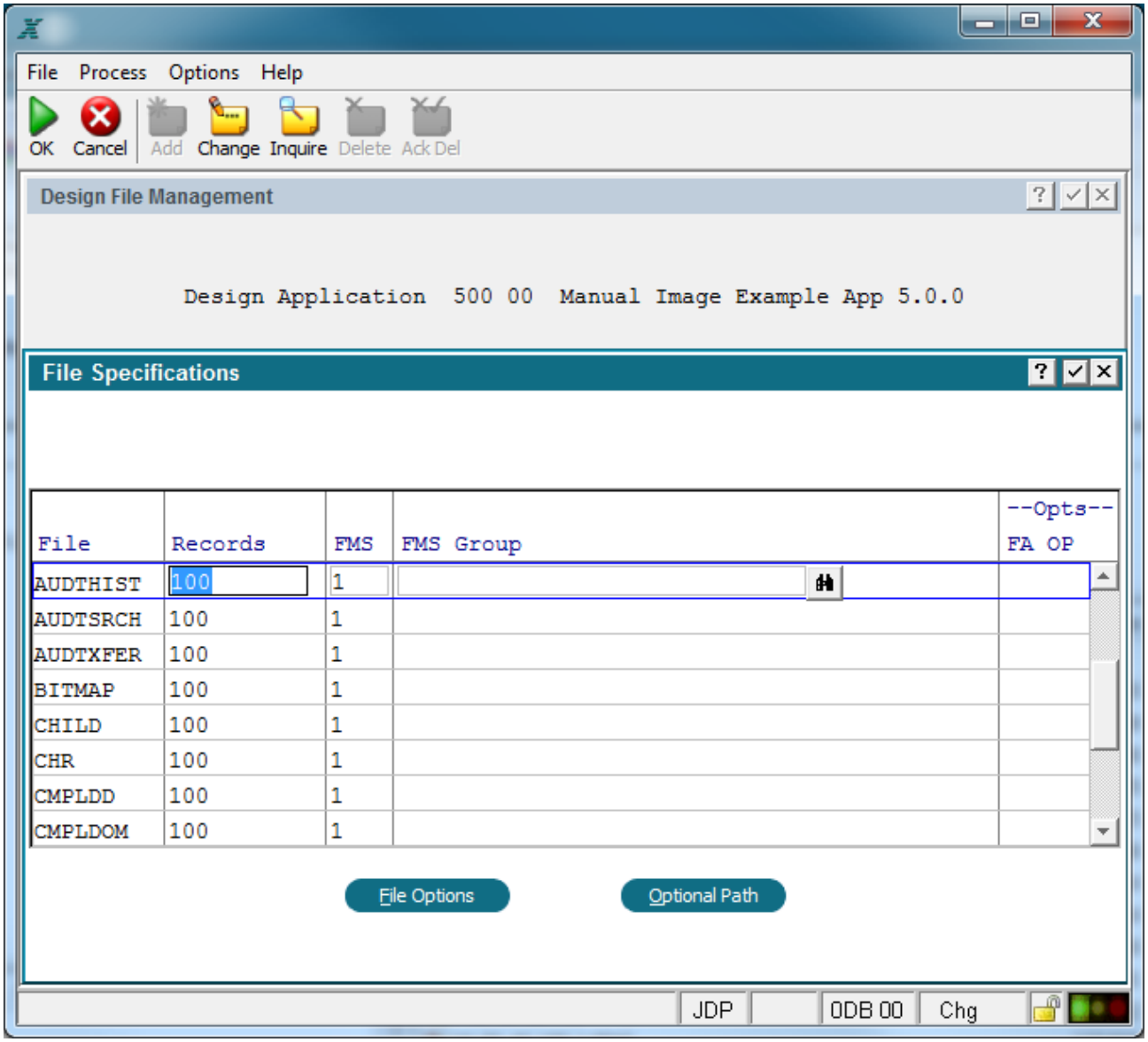


Design File Management File Selection Screen

Click search to find a specific file or files that begin with a specified letter or letters. Use the select key (f3) to select or unselect a given file. Select select all to select all files. Use unselect all to unselect all files. When you have selected the files you want, select end ☒ to continue.

File Specifications

Use this screen to estimate the approximate number of records for each of the design files of a new application. Remember, the numbers you enter represent the total number of records of each type for the entire application. When you select file specifications, the screen shown below appears. You may also use this option to verify you have selected the files you intended to before proceeding with other file management tools that may destroy data.



Design File Management File Specifications Screen

Following is a description of each type of design file for your information.

BITMAP. The bitmap file contains Data Dictionary processing control information.

CHILD. This file contains one record for each optional or automatic child defined in an application.

CHR. The characteristic file contains one record for each set of characteristics specified in an application. A *characteristic* is an attribute of background text on an image, such as bold, blink, or underline.

CMPLDD. This work file contains information used in the compilation of the data dictionary

CMPLDOM. This work file contains compile information for domains.

DICTNARY. This file contains dictionary entries for this application that are used by the language translation feature.

DOCUMENT. The documentation file contains one record for each page of documentation in an application.

DOMAIN. The domain file contains one record for each domain specified in an application. You can estimate this number by counting one domain record for each field to be specified in an application, because many fields have a single domain associated with them.

DOMWRK. This work file is used during the processing of domain fields.

DOMXFLD. This work file is used when processing fields with domains.

ELEMENT. The element file contains one record for each dictionary field after processing.

EXCEPT. Used by the language translation feature, this file contains exceptions, or overrides, to previously defined translations.

FIELD. The field file contains one record for each field specified in an application.

FILE. This file contains one record for each file specified in an application after processing.

FRAME. The frame file contains one record for each frame specified in an application.

IMAGE. The image file contains one record for each image defined in an application.

INITIAL. The initial file contains two records for each record in the file.

ITEM. The item file contains one record for each item specified in an application. An *item* is a field that is entered or displayed on an input screen or displayed on a report. To compute an estimate, multiply the number of images by the average number of items for each image.

PARAM. The parameter file contains one record per application.

PROCESS. The process file contains one record for each process defined in an application, including menu, input, output, update, query, and subroutine processes.

RECORD. The record file contains one record for each file specified in an application.

RESNAMES. The file contains names of resources such as icon files, pictures, etc.

RESOURCE. The file contains path names of graphic resources.

ROW. The row file contains one record for each row specified on all the menu, input, and output images in an application. To compute an estimate for the rows file, multiply the number of images by the average number of rows for each image.

SAVTRACE. This file contains saved trace information used in the debugging of APPX applications.

SELECT. The select file contains one record for each child constraint and each query selection constraint that is specified in an application.

SORT. This file contains one record for each query-related sort specification defined in an application.

SPELLIN. This work file is used during spell checks and contains the original text entries.

SPELLOT. This spell check work file contains corrected text entries.

STMT. This file contains one record for each statement included in an application's ILF routines.

SXAP2, SXDOM2, SXFLD2, SXPROC2, SXREC2. These work files are used to store selections of various APPX elements during the application design process.

TOKEN. The token file contains one record for each tokenized value specified in an application.

TRACE. This work file contains trace information used in the debugging of APPX applications

WIDGET. This file contains graphic file names for buttons.

XLAT. This file contains translation maps used to translate a dictionary entry of one language to the dictionary entry of another language.

XREF. This work file is used during the generation of an element (files, fields and processes) Cross Reference report.

XREFNAV. This work file is used during the generation of a Cross Reference report and contains Hyper Links, or direct paths for the maintenance of APPX elements shown on the report.

The File Specifications screen contains the following fields.

File. The files are itemized in a scrolling input window.

Records. Enter the approximate number of records you will need. If you do not know how many records you will need, leave the default value of *100*; the files can be optimized later.

FMS (File Management System) is a system-dependent value that designates a specific file management system on your computer. Refer to the instructions in your system installation guide for specific values that apply to your computer system. (two numeric characters).

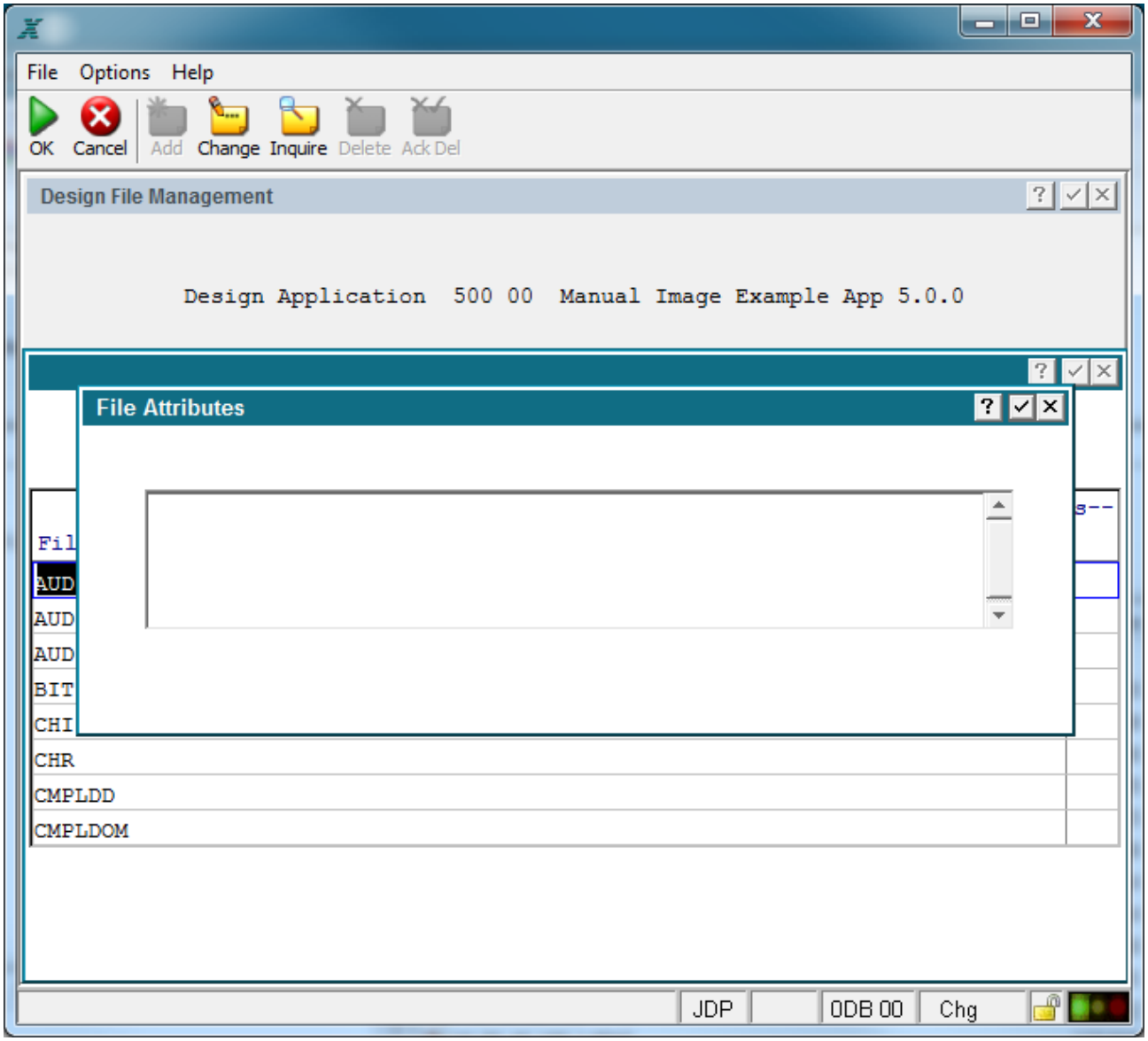
FMS Group (optional) allows you to specify the file management group that this file belongs to. The FMS Group and the FMS (above) reference the system defaults file in system administration, which provides default values for certain file specifications.

Additionally, there are two options available on the File Specifications screen:

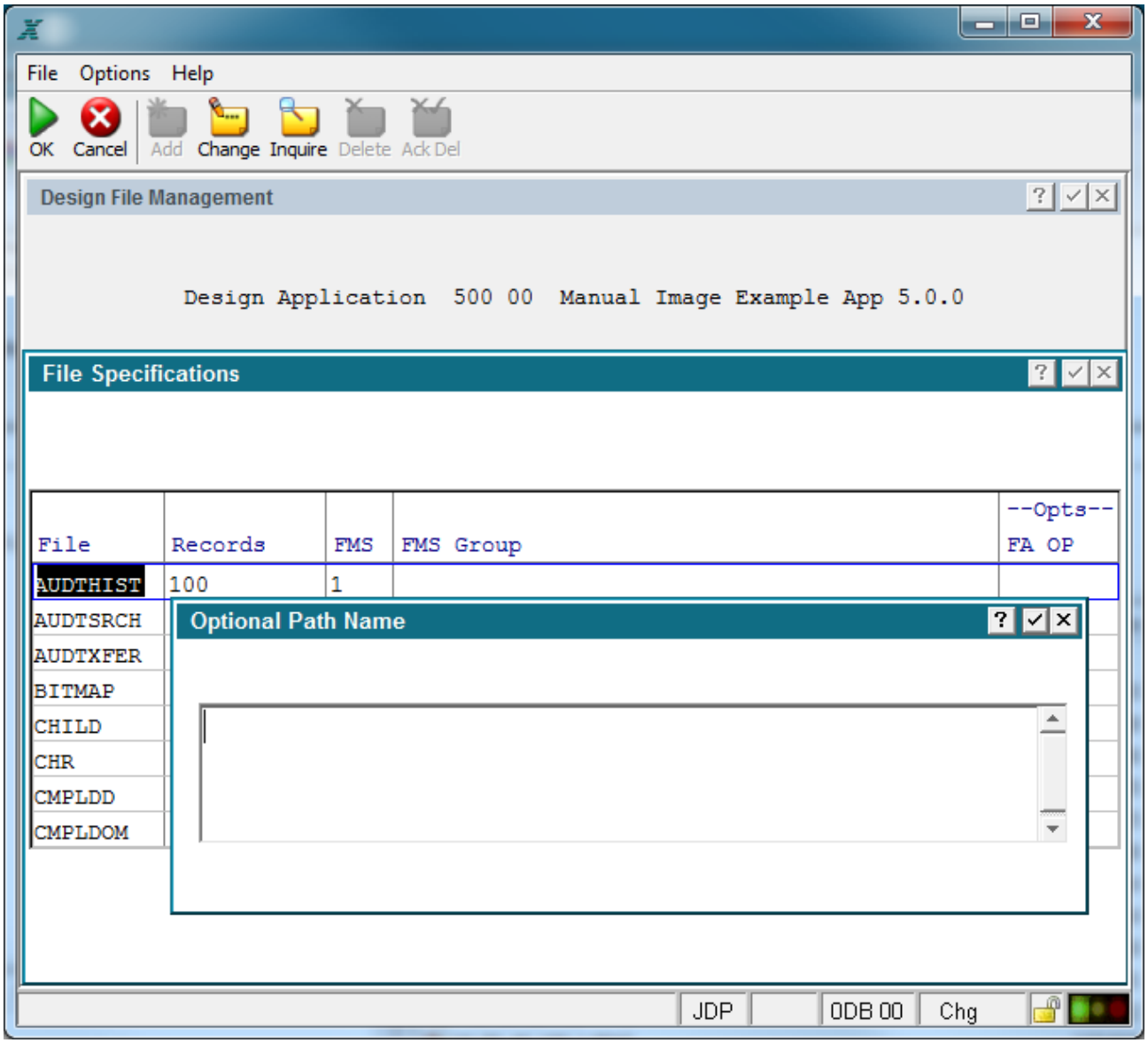
File Options can be entered to provide necessary information for accessing files for certain FMS types. For instance, the database server and database name for RDBMS's such as Oracle or Sybase. Beginning with APPX 4.1, specification-based FMS controls are available for some FMS types. The older FMS Control String is still supported but the specification-based controls are encouraged. If specification-based controls are available for this FMS type, you will receive a message. Clearing your old FMs Control String and selecting Enter will give you access to the specifications for this FMS type. See below.

Optional Path. APPX allows you to enter a unique path for each file, if necessary. Usually, all files are located in the same APPX-defined directory. However, for unusually large disk files or unusually small disks, it may be necessary to designate a different directory. See below.

Select Enter ☑ to save the information for this file.



File Options Overlay



Optional Path Name Overlay

Create Files

Select this option to create the design files for which you have just provided estimated sizes. When this step completes, you can enter the Application Design menu and begin to enter specifications for an application.

> **NOTE:** When running *Create Files* for a database in database management, you may get some strange error messages, one of which might be, 'Data Dictionary Defini.' These messages occur because the ELEMENT and BITMAP files are 'out of sync' with your version of APPX. To correct this situation, initialize ELEMENT, BITMAP, FILE, and INITIAL; run process data dictionary from the *Toolbox* menu; and then run restructure files on data structure files.

Restructure Files

When a structural change is made to one or more files in an application, this option is needed. A structural change is one that affects the record layout of a file. Examples of this include adding a field, deleting a field, or changing the length of an existing field. APPX does not allow users to run a process that references a file if it needs to be restructured.

Initialize Files

Occasionally the need arises to erase the contents of one or more files. This option allows you to delete all the records in a file at once. You will receive a warning message when you select this option, advising you that you will destroy data if you continue. You can then choose to return to the menu instead of initializing the file. If you continue, you will see a 'status' screen that shows you each file as it is being initialized. Select proceed to continue.

Scratch Files

Occasionally the need arises to eliminate one or more files completely. This option allows you to remove the selected files from the disk. You will receive a warning message when you select this option, advising you that you will destroy data if you continue. You can then choose to return to the menu instead of scratching the file. If you continue by selecting proceed, you will see a 'status' screen that shows you each file as it is being scratched.

Import Files

If you are converting an existing application from an outside design, you can use this option to import the existing data. It must be in the specific format required by the import process.

When you select this option, the overlay shown below appears.

>

Import Files Overlay

The following fields are available on the Import Files overlay.

Disposition of Native File. Enter 1 if you wish to merge the external file with any data already in the existing design file. Enter 2 if you want the external file to replace the existing design file. If there are no records in the existing design file, enter 2.

Select proceed to begin the import. A 'status' screen will show you each file as it is being imported.

Export Files

This option allows you to create external files for transporting to other systems. Select proceed to begin the export. A 'status' screen shows you each file as it is being exported.

Rebuild Key Files

This option allows you to rebuild the key files (.key extension) for the selected files in the event these key, or index, files become corrupted and need to be recreated. When executed, the key file is deleted and initialized, then the data file (.dat extension) is read. The appropriate keys for each data record read are written to the key file. A 'status' screen shows you each file as its key file is being rebuilt.

Process Data Dictionary

If your site has Application Design Rights, this option invokes a menu that allows you to select from these options:

Enter and modify information about the application's domains (field prototypes).

Specify and maintain information about the application's files and fields.

Define and maintain the application's work fields.

Compile the data dictionary when newly defined, or after any changes have been made to existing information.

Otherwise, this option automatically compiles the data dictionary for all domains, files and work fields in the specified application.

Create Executable Modules

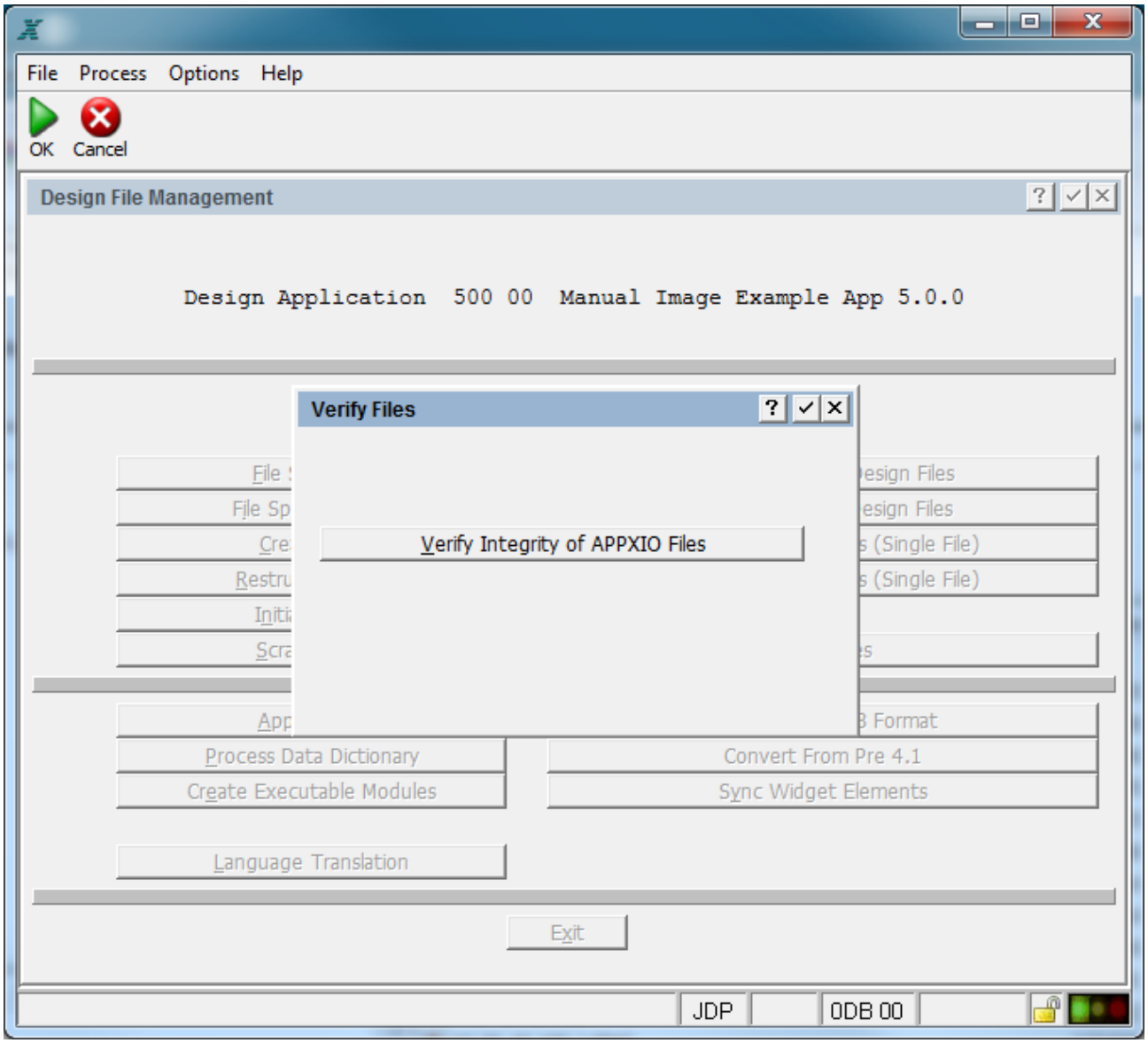
This option compiles all processes in the application and creates Executable Modules (object code) that are used during runtime. This is recommended immediately following APPX version upgrades or other mass changes to eliminate processes from having to be compiled at runtime. An error log is created and contains all processes with compile errors.

Convert From 1.8

Converts APPX applications from a version prior to 2.0 to the 2.0 format. Applications in versions prior to 2.0 are not compatible with APPX versions 2.0 and later.

Verify Files Menu

The option contained on this menu, shown below, is used to verify the integrity and structure of APPX files. This utility is used in the event an APPX file appears corrupted or otherwise dysfunctional.



Verify Files Menu

Verify Integrity of APPXIO Files is a utility that checks database integrity of all selected files. A log is created in your default print directory and is displayed on your screen. Any error messages contained in this log should be reported immediately to APPX Technical Support.

Apply Patch With Design Transfer

This option accesses the design transfer process to transfer all design components from an indicated application into the selected application. This feature can be utilized by APPX developers to 'patch' their applications at customer sites. The developer can create a 'patch application' which contains new or modified design components. The patch application can be distributed to customers and transferred into the appropriate application using this feature. The Release Number field in Application Parameters will be set to the value in the patch application.

Once the design files are created, proceed with developing an application's processes. The following section provides some approaches you may want to consider as you perform your analysis and design.

Planning Your Application

This section describes a typical APPX approach for developing and implementing application systems. Because the system design process is complex, and because designers approach system design from different viewpoints, there is no single best way to use APPX. It is a flexible tool that can accommodate a variety of design methods. This section presents an approach that new designers may want to use as a pattern to develop their initial applications. As you become more familiar with APPX, you can make adjustments that suit your own design style.

Design Methodologies

In complex application environments, it is likely that a designer has followed some general methodology as a guideline for defining the components (including files and data fields, inputs, outputs, and menus) of a proposed application. In less complex applications, the methodology may be much less formal, using only outlines, lists, notes, and sketches.

APPX places no restrictions on the design methodology you choose, and enables you to translate the system requirements/conceptual design into a functional APPX application.

Approaches to System Design

There are three fundamentally different approaches to defining a data processing system: data-driven, output-driven, or process-driven. Each of these is discussed below.

Using a *data-driven* approach, you first define all the data fields for an application. Next, you specify the relationships between the data fields and then develop supporting processes. Proponents of this approach believe that if they can define all data-related information in advance, processes to support the entry, update, review, and retrieval of data will flow naturally as a by-product of data definition.

In an *output-driven* design, you first define all the required outputs (both screen displays and printed reports) and, then, you develop the data structures, and input and update processes that you need to derive them. If the desired outputs can be defined, they can work 'backwards' through the system design to define all the supporting structures that allow the system to produce the specified outputs.

Using a *process-driven* approach, you define each step in the work process (such as shipping finished goods, preparing invoices, etc.) and develop parallel steps in the application system to support the normal work flow. Proponents of this approach feel that a computerized application should be developed to reflect the day-to-day business operation of a company or organization. If the processes are well-defined, the details of data entry and retrieval can be logically defined as a secondary task.

APPX supports any of the three approaches that are described above. After you have developed the preliminary definition of a proposed application, however, there is a preferred sequence of steps to make the building of an application in APPX more straightforward.

Analyzing Your Requirements

Before you actually enter the APPX Application Design menu, you may want to think through the application by following a series of steps. You may choose to document the results of your analysis in some written fashion, although it is not required. On the other hand, there is no penalty for 'thinking through' your design by using APPX directly as a prototyping tool, and making additions and revisions as you go along. The specification screens are organized so that you can develop your application in a logical way.

Although the sequence of design steps is not fixed, the following list represents one approach to performing a preliminary analysis before entering information into APPX:

Identify the tasks or functions you expect the application to perform. Organize the tasks into menus. Remember that, in APPX, a menu is a type of process, and you define menus just as you do inputs and outputs.

Next, consider what processes are required to accomplish each task defined above. Some tasks may require more than one process to achieve the desired result. Identify processes by type (menus, inputs, outputs, etc.) and assign names to each one. You may want to assign corresponding names to related processes, such as CUSTOMER QUERY and CUSTOMER LIST.

Define and analyze your application's data requirements. Identify the files and fields to be used in the application. For each file, specify the information that you need to provide when you define the file. Define the keys and other fields contained in each file to determine what attributes each field will have. Analyze all of the files in your application to identify fields with similar attributes that can be created as domains.

After you gather this information you are ready to create the design files for the new application.

Remember that APPX is very flexible, and allows for revisions and additions at any time. Do the best analysis that you can in advance, enter the specifications in APPX, and make modifications as you discover things you omitted.

Entering Specifications in APPX

At this point, you are ready to enter information into APPX and actually begin the application specification process. To initiate this action, select the Application Design menu, and proceed as follows:

Select the *Domains* option under Data Elements and Structures, and proceed to specify all the domains in your application. Domains are generic definitions for fields in an application that share a common set of attributes. If you later find that you forgot to enter any domains, you can enter them as required. Then select the *Files* option and specify the information for the first file. From here, you move automatically to the Field screen, where you specify each field contained in the first file. Continue to enter the specifications in the same manner for each file.

After you complete the data dictionary specifications, the data dictionary will process so that it is in a format APPX can use as you define the application's processes.

Return to the Application Design menu and select the *Processes* option. Typically, your first step is defining menus. Enter the required information, and paint the first menu screen. There are two ways to do this:

You can first paint each option on the menu and immediately identify and specify all the details of the process to be invoked when this option is selected. Then, paint the second option and specify it in its entirety and continue to modify the original menu as each option is added.

OR, you can paint the entire menu screen at one time, identifying all options in a single pass, and then go back and specify the details of each process in any sequence you choose.

Either method results in a complete specification of a menu, its options, and the processes to be invoked when each option is chosen. This pattern (of two or more fundamentally different ways of proceeding) is common throughout APPX, and demonstrates its flexibility.

If you can separate your application into discrete functional components, you may wish to define and specify one component at a time in APPX. You can then review what you have entered, and begin to test the partial application to see if it works properly to that point. This approach may help you isolate problems and inconsistencies within one area before going on to the next. APPX allows you to define test databases to test your application immediately after making any changes, without leaving the application design environment.

After you make a first pass at specifying the entire application, or one or more distinct application components, you are ready to begin testing. You first need to define and create the appropriate application data test files. This is a function of database management and, depending on how security privileges are assigned in your environment, you may require assistance from your database administrator to create the test files.

Test all the processes and capabilities in the new application. Verify your results and use the statement debugger as needed to help trace logic problems. When you are satisfied that your application operates properly, the database administrator can create production data files and the application is ready to use.

Once an application is in production, APPX supports all of the steps involved in the normal maintenance cycle during which changes and enhancements are applied. When you make changes to the data dictionary, APPX will process the files that are affected; if structural changes occur (such as

adding a new field to a file), you need to perform a *restructure*. You do not have to take any extra steps if you make changes to processes. APPX automatically keeps track of changes and compiles new versions if required.

Application Parameters

With the Application Parameters utility, the application designer can define or modify the parameters for an application. When you select application parameters from the Utilities menu.

The Application Parameters screen contains the following fields:

Application Name. Enter a descriptive name for this application.

Release Number. Supply the release number for this application.

Base Language. The language the application is presented to the user in. This encompasses all parts of the application made visible to the user such as menus, input processes, warnings, errors, etc. The Language ID file can be scanned to make a selection but this field is needed only if the Language Translation feature is in use at your site.

Global Domains App. Enter the three-character ID of the application that contains your global or universal domains.

You use the *Global Domains* application to help default domain names when entering the data dictionary. If you add a domain-type field, and the field name contains the name of a domain within the application, that domain name is supplied as the default for that field's domain. If no match is found in the current application, and if the field contains a domain name that exists in the *Global Domains* application you identify here, APPX will use that domain name as the default.

First Menu For

Initial Setup. Enter the name of the startup menu that should be presented to the user when the application's operational phase is *Initial Setup.*

Live Operations. Enter the name of the startup menu that should be presented to the user when the application's operational phase is *Live Operations.*

Recovery Processing. Enter the name of the startup menu that should be presented to the user when the application's operational phase is *Recovery Processing.*

Direct Process 2

Application ID. Enter the application ID that should be executed when the end user chooses *Direct Process 2* while in this application.

Process Type. Enter the type of process that should be executed when the end user chooses *Direct Process 2* while in this application.

Process Name. Enter the name of the process that should be executed when the end user chooses *Direct Process 2* while in this application. If this is a menu, all of the optional processes defined on the menu will also be listed under the *Application* selection from the user's menu bar while in that application. If *Direct Process 2* is defined as a single non-menu process, then only that process will appear as a selection under *Application*.

The Applications Parameters screen contains these options:

Documentation contains user and technical documentation regarding the application.

Application Locks are the method by which APPX applications can restrict run-time and design access in the licensing of their applications. Applications locks may or may not be included for this application. The Author ID field and each of the Lock fields in this overlay refer to individual Product Registrations which must be present in your APPX System Registration before you will have access to the corresponding feature within this application.

CHAPTER 1-3

Data Dictionary

The Data Dictionary: Cornerstone of an Application

A *data dictionary* is a repository of information describing an application's data. In APPX, this information includes both data specifications and supporting documentation.

Data specifications include information such as a file's *Descriptive Name* or a field's *Length*. The data dictionary is the cornerstone of application development. All processes operate on the basis of specifications in the data dictionary. In APPX, you use the data dictionary to define all the attributes of data.

Characteristics of the APPX Data Dictionary

The data dictionary is *active* in that its specifications are used by, and place real-time restrictions on, both designers creating applications and users operating them. For example, assume you defined a numeric, five-digit CUSTOMER ID field. APPX uses the length specification to provide the proper *mask* when a designer paints the field onto an input image. APPX also uses data dictionary specifications as a basis for validation when an image is executed. The system displays an error message if a user attempts to enter a non-numeric character into the CUSTOMER ID field. An active data dictionary maximizes consistency, productivity, and integration. It minimizes the chance for error, both when designing and using applications.

To enhance performance,you process APPX's dictionary before using it. Specifications entered into the data dictionary are translated into a format more directly usable by APPX during process execution. The process also searches for logic errors (such as invalid key definitions or illegal record lengths), constructs a default value record for each file, computes field lengths, establishes the starting position for each field within a record, and determines whether or not the changes may affect the structure of existing data files.

The dictionary provides for integrated documentation, including entry screens for online help text and printed technical documentation.

To ensure integrity, the dictionary is automatically monitored for structural changes. Examples of structural changes include adding a field to a file or expanding the length of an existing field. By contrast, changing the standard column heading for a field is not a structural change. Whether you make a structural or non-structural change to the dictionary, all processes that reference changed elements are automatically updated. APPX flags existing files that require restructuring, and the restructure facility (available as an option on the File Management menu) enables your database

administrator to convert them to the new structure. This facility reduces the need to 'freeze' the file structures in applications. Data dictionary changes requiring restructure should be made when the file is not in active use by the end user.

Accessing the Data Dictionary

You access the APPX Data Dictionary from the Application Design menu by selecting either the Domains, File Structures, or Work Fields option. These options are described in detail in later chapters of this manual.

The Components of the Data Dictionary

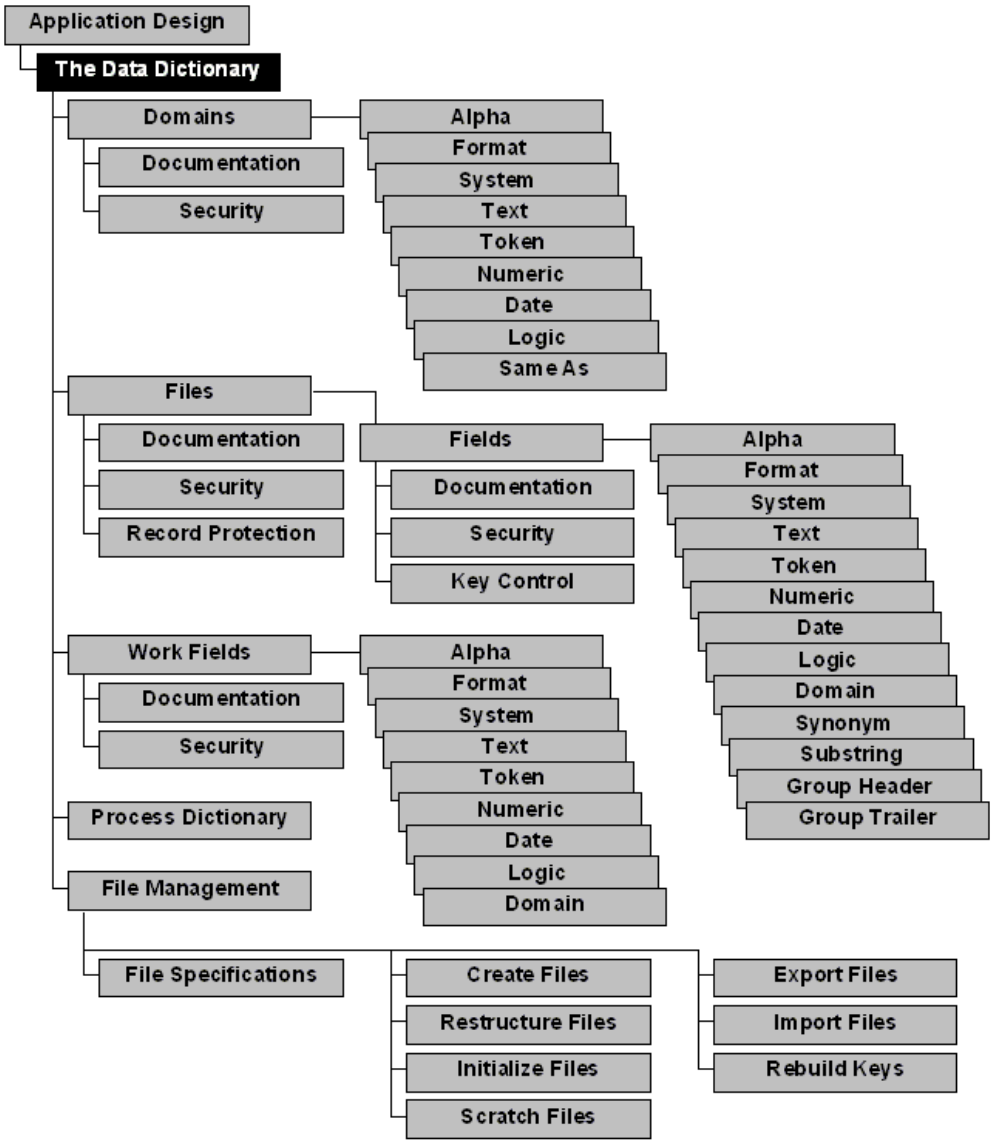
The principal components of APPX's data dictionary are the application's *domains*, *files*, *fields*,and *work fields*.

Domains are generic definitions, or patterns, for fields that share a set of common attributes. For example, your application may include a number of different fields that store a vendor number'a purchase order vendor number field, an accounts payable vendor number field, an invoice entry vendor number field, and so on. Each of these fields is the same length and has the same alpha and numeric components. You define these common attributes in a 'vendor number' domain, and have each of these fields reference the same domain.

Files are data storage structures that consist of a collection of related *records*. Each record contains one or more *fields*. The record layout for a file is determined by the fields defined for that file within the data dictionary.

Fields are the most elemental data storage structures of applications. They store the individual items of information available to users of APPX applications.

Work fields are temporary fields that are not stored in a file, but which you can use in APPX processes. You cannot save the contents of work fields after a user exits APPX, although you can move work field values to other fields that are stored in permanent files.



The Data Dictionary

Domains and Domain Types

Domains are generic definitions, or patterns, for fields and work fields that share a set of common attributes. These attributes include such things as the physical space a field requires, the set of values it can contain, and the way a field is presented to a user.

There are nine types of domains in the APPX data dictionary*:*

Alpha domains are patterns for fields comprised of letters, numbers, and special characters (-, #, or &, for example), where the primary characteristic is field length.

Format domains are like alpha domains except that an edit mask is the primary characteristic.

System domains are patterns for fields that contain data provided by the system, often referred to as audit fields.

Text domains are patterns for fields comprised of blocks of text.

*Token*domains are like alpha domains except they have specific values that are stored as corresponding numbers.

Numeric domains are patterns for fields restricted to number, decimal (.), and sign (-) entries.

Date domains are patterns for fields that contain dates and/or times, from a hundredth of a second through a century.

Logic domains are patterns for fields with possible values of yes ☑ or no ☐, or ? to represent an unknown value (Y, N, or blank using Character Mode).

Same As domains are patterns for fields that share the same characteristics as a domain in another application in your database.

The Functions of a Domain

Each domain specification provides one or more of the following:

Storage definitions from which APPX determines the internal storage length and format of any field that references the domain.

Display characteristics for items painted on an image, such as display masks or justification options.

Constraints and restrictions on a field's valid values, including range checks, validation tables, edit masks, and data lookup.

Other field attributes including column headings, descriptive names, default values, and security codes.

The Advantages of Using Domains

Domains provide a number of significant benefits, including:

Minimization of development effort by eliminating duplicate entry of common field attributes and assumed values.

Minimization of maintenance effort by providing a single location from which changes flow through to all related fields in an application.

Assurance of consistent database definition throughout the system. The length or edit attributes of the customer number, for example, will never vary from CUSTOMER file, to INVOICE file, to CASH RECEIPTS file, and so on.

An Example of a Domain

One example of a domain might be employee number which should have the same number of characters and the same editing characteristics wherever it is used in a system. You can define such common attributes (including a descriptive name if desired); once, in an EMPLOYEE NUMBER domain. Domain attributes apply to all fields referencing that domain and cannot be overridden at the field level. Thus, any attributes that are not appropriate for each field based on the domain should be left blank in the domain definition. For instance, the employee master file may include employee number fields for both the employee and the employee's supervisor. While "Employee Number" is a good descriptive name for the first field, "Supervisor Number" is more appropriate for the second field. To accommodate this situation, just leave *Descriptive* blank in the domain definition and enter individual names instead. Meanwhile, both employee number fields remain subject to the same format and editing criteria defined for the domain.

Fields and Field Types

Fields represent the smallest units of data storage in an APPX application. Each field contains an item of information in a database. While a domain establishes a set of common attributes (such as required physical storage space) for one or more fields, it is the field that is used to store application data. The data information stored in a field is referred to as a *field value*. Fields are grouped together as records stored within files.

There are thirteen types of fields in the APPX data dictionary:

Domain fields are fields that directly express the attributes defined in a domain while they define and occupy new physical space in a file. There are nine distinct domain-type fields: Alpha, Format, System, Text, Token, Date, Logic, Numeric, and Same As. Refer to the Domains and Domain Types section for additional information. You can choose to set up physical fields to exclusively reference domains, or you can set up individual field types directly.

Alpha fields are comprised of numbers, letters, and special characters (-, #, or &, for example).

Format fields are like alpha fields except that an edit mask is the primary characteristic.

System fields, often referred to as audit fields, display data that is provided by the system.

Text fields allow the user to enter blocks of text on the data entry screen.

Token fields are like alpha fields, except that they have specific values that are stored as corresponding numbers.

Numeric fields are restricted to number, decimal (.), and sign (-) entries.

Date fields are patterns for fields that contain dates and/or times, from centuries through hundredths of a second.

Logic fields are fields with possible values of yes ☑ or no ☐, or ? to represent an unknown value (Y, N, or blank using Character Mode).

Synonym fields provide alternative names for referencing existing APPX fields. They occupy no physical space in a file aside from the fields they reference.

Substring fields represent discrete portions of longer alphanumeric fields. They occupy no physical space in a file aside from the fields they are a part of.

Group header fields are used to group other fields by identifying the beginning and ending fields in a group of fields. The group can then be referenced by the name of the group header field. Group headers occupy no physical space in a file aside from the fields that comprise the group.

Group trailer fields are optional placeholders to allow for terminating a group without referencing a physical field. They provide a streamlined method to allow for additions to the end of groups. They also provide visual clues as to the ends of groups when scanning the Data Dictionary. Group trailers occupy no physical space in files.

Work Fields

You can define temporary domain-type fields called *work fields* to calculate, temporarily store, or display values that are not stored in a file. A work field is analogous to a record that has no file storage characteristics and contains a single field. A work field has no sequence number and no relationship to any files, records, or other work fields. You can manipulate work fields in much the same fashion as any other field.

You cannot save a value in a work field after a user exits APPX. To save a work field value, you must copy it into a field that is part of a permanent file's record. You cannot define a group of work fields because they are not arranged in a predictable order. Work fields cannot be keys because they are not part of a record structure within a file.

When adding work fields to the data dictionary Appx will start the work field name with the word WORK by default. This is similar to naming fields begining with the file name. This helps to identify the field as a work field throughout your application. You can overwrite the word WORK if you so prefer.

Audit Trail

APPX provides for an automatic audit trail within the data dictionary by the use of audit fields (i.e., system fields or system domain fields*)*. These fields track when and by whom records are updated for a file within an APPX input process, as described below:

Date-added fields contain the date or date/time that the record was added to a file.

Date-changed fields initially contain the date or date/time that the record was added to a file, and are updated each time any user modifies the record.

User-added fields contain the user ID of the person who originally added the record to a file.

User-changed fields initially contain the user ID of the person who added the record to a file, and are updated each time any user modifies the record.

Storage Options and Files

You determine whether the records you define in the data dictionary are to be stored in files and, if so, whether the files are maintained on disk or in memory. There are several factors to consider when selecting which type of storage to use:

Permanence. Do the records need to be retained permanently or only for a specified period during current processing?

Capacity. Is capacity a limitation that needs to be considered? How much space do you expect the collection of records to consume?

Shareability. Are there many users that may need to access records in the collection simultaneously?

Performance. How important is it that records can be accessed very rapidly during processing?

Database dependency. Are there security considerations that must be addressed when defining file attributes and storage options?

There are three types of storage options within APPX: *disk* (permanent and temporary)*, memory,* and *working-storage*. Each type implies a number of characteristics and offers certain advantages, as described in the following sections.

Permanent Files

Permanent files are disk files and are shareable among users and stored on a disk surface defined in file management. The system will always take longer to retrieve data from files stored on disk than to retrieve data from files stored in memory. Disk files have an advantage over memory files because they are less limited in capacity.

Disk Files (Temporary)

As described in the preceding paragraph, permanent files are stored on disk. You can, however, define temporary files that are stored on disk as well. Temporary files are not shareable between users and not retained after you exit APPX. Note that the system will always take longer to retrieve data from files stored on disk than to retrieve data from files stored in memory. Disk files have an advantage over memory files because they are less limited in capacity.

There are three different levels of interprocess communication between disk files: *subprocess*, *related*, and *detached*. See Interprocess Communication for information.

Memory Files

Memory files are user-specific files (i.e., they can never be shared between users) loaded into the system's main memory, and are not retained after a user exits APPX. Because the files are maintained in memory, the quantity of data these files contain is generally relatively small. Excessive or improper use of memory files can result in a memory overflow condition.

The principal reason to use a memory file is to improve performance. The system will always take less time to retrieve data from files maintained in memory than to retrieve data from files stored on disk.

There are three different levels of interprocess communication between memory files: *subprocess*, *related*, and *detached*. See Interprocess Communication for information.

Working-Storage Files

A file with a *working-storage* specification can be used to enter data, perform edit checks and computations, and execute statements without actually storing data. This type of file provides you with the equivalent of work fields that can be grouped in a record format. It may be beneficial to use this storage-type when dealing with a group field, such as a general ledger account number with distinct but related subparts.

These files are often used in record comparisons. You create a *work record* that contains the same fields as the disk-based record and, using a group field that includes the entire record, copy the contents of the disk record into the work record with a single statement. You can then compare this stored record with another record from the disk file.

Calculator functions are another example of the use for this type of file. You could use a *working-storage* file-type to receive principal and interest rate data, and compute and display a monthly payment amount. Users could re-enter different values, and the computation and display can be performed as often as necessary without saving the entered or calculated information.

Working-storage fields have a SUBPROCESS scope. They can be shared between a process and its subprocesses.

File Organization

APPX supports three types of file organization: *one-record*, *sequential*, and *indexed*. Your selection of a file organization-type will affect performance and the methods used to access data in a file.

One-Record File Organization

A *one-record* file is stored sequentially, and is therefore subject to all the restrictions that apply to sequential files (see the next section). Unlike other sequential files, however, a single-record file communicates to an APPX input process that it can expect at most one record. Based upon this information, the user interface is streamlined. For example, APPX automatically checks for the existence of a record in a file. If there is no record, APPX places the user in add mode. If there is a record in the file, APPX places the user in change mode.

A parameter file is an example of a single-record file. Using a single-record file to hold specifications that are referenced by more than one process in an application avoids unnecessary duplication, and simplifies design and maintenance.

Sequential File Organization

Sequential files organize records according to the sequence in which they are added to a file, by adding each new record at the end. The system retrieves records based upon their relative position in the sequence by using unique record numbers. A sequential file does not contain keys so its records cannot be retrieved by a key path. To select a record based upon field value, APPX must process all records, ignoring those that do not satisfy selection requirements.

In most computer systems, APPX retrieves records from uncompressed, fixed-length record sequential files faster than from indexed files.

A sequential file can contain an unlimited number of records, subject only to available storage space or operating system limitations. You cannot, however, simply delete specific records from this type of file. To eliminate specific records, you must first transfer all records that are to be retained to another file and then scratch the original file.

Indexed File Organization

For an *indexed* file, the system retrieves records based on the content of specified key fields. APPX requires one primary key field for each file and optionally permits up to 16 alternate keys.

Key fields, when used by the system to retrieve records, are referred to as *key paths*. This method of record retrieval is inherently slower than the method employed for sequential files but is more flexible and allows you to perform more sophisticated processing operations.

An indexed file can contain an unlimited number of records, subject only to restrictions imposed by available storage space and operating system limitations. Unlike records in a sequential or a one-record file, you can directly change or delete records from indexed files, even if they are of variable length.

File Keys

For each indexed file, you specify a *primary key* and up to 16 *alternate keys*. A primary key is required for each file, while alternate keys are optional.

A primary keyprovides the default key path by which to access and retrieve specific records in an indexed file. Unless otherwise specified by a user or designer, the primary key path is always used. The field you designate as the primary key should generally be short and must be unique. A primary key is often used as a link to data in other files. Examples of primary keys include a customer number in a customer file or a product code in a product file. Appx Date/Time fields normally cannot be used as a primary key since the speed of computers would most likely create multiple records within a hundreth of a second, the smallest level of precision for a date/time field.

Alternate keys provide optional key paths by which to access and retrieve specific records in an indexed file. A user or designer may optionally choose to change from the primary key path to any alternate key path for record access and retrieval. Examples of alternate keys to a customer file might include customer name or phone number.

APPX allows you to have duplicate alternate key values in a file, although a unique primary key is required. For each key path, you specify whether duplicate key values are allowed.

When you define a field to be the key to your file, there are two fields in the Key Control pop-up box in addition to *Key Type*:

Key/Field Order

Can be defined as ASCENDING or DESCENDING. The default is ASCENDING.

User Selectable?

Determines whether or not a user can switch to a key path with the Select Access Path option from within an input process. The default is 'yes' ☑.

A field does not have to be designated as a key to be used as a sort field in query processes. During sorting, APPX can use any fields to generate the required sort order.

A ***File Key Field*** cannot contain an occurrence specification. This is true for both a single field or a field defined within a Group.

Default Value Records

A *default value record*, created during compilation of the dictionary, includes the default values optionally established by the designer for each field in a file. APPX uses the default value record as a modifiable starting point on an input screen, for example, or to initialize a record before setting selected fields and writing the record to a file.

Default value records are maintained by APPX; they are not stored in the data file.

Data Dictionary Processing

Processing the data dictionary analyzes the data dictionary specifications and translates them into a format more directly usable by APPX during process execution. It does not generate machine or object code.

Dictionary processing performs the following actions:

Creates an element record from domain and field specifications.

Creates a file record from record specifications.

Searches for logic errors (such as invalid key definitions or illegal record lengths).

Constructs the default value record for each file.

Computes field lengths.

Establishes the starting position for each field within a record.

Determines whether or not changes may affect the structure of existing files.

You must process the data dictionary for each new application before its domains, files, and fields can be referenced by processes. In addition, APPX will process the appropriate files or work fields any time you change the specifications. If the data dictionary requires processing, APPX prevents processes that reference it from executing.

A designer must always be aware of making any changes to the data dictionary for "live or production" files. The change to the dictionary most likely will require the file to be restructured. The file will be unuseable until a successful restructure has been executed. Depending the file size and the change made, this could take awhile.

When Processing is Required

The data dictionary's input processes track modifications that, when they occur, require the dictionary (or selected portions of it) to be processed. By tracking situations that require processing, APPX can eliminate errors by removing the possibility that other components within APPX will access obsolete data specifications.

The following paragraphs describe conditions for which processing is required:

Domains require processing after they are added to the dictionary and whenever their specifications have been modified. Processing of domains is automatic in APPX. If a domain requires processing, all fields that reference the domain also require it. If a domain is deleted from the dictionary, any remaining fields that reference the domain must be modified and processed.

Files require processing after they are added to the dictionary and whenever their specifications are modified. Processing of files is automatic in APPX. In addition, a record/file must be processed whenever fields are added or deleted, or a field specification is modified. If a record/file is deleted from the dictionary, its associated fields are automatically deleted.

Work fields must be processed whenever a work field is added or deleted, and whenever a specification for any work field is modified. Processing of work fields is automatic in APPX. If any work field requires processing, all work fields are processed.

The Appx Designer must take care when modifying the Data Dictionary, especially when working with "live" files. Most changes made in the dictionary will require the file be restructured. This is an automatic condition which, when encountered, cannot be ignored or undone. The file will have to be restructured (see File Management). Restructuring a file can take a significant amount of time. Users will NOT be able to access the file until the file is successfully restructured.

Restructuring Files

As noted previously, you or your database administrator must run the restructure facility when a structural change is made to one or more files in an application. A structural change is one that affects the layout of a record. Examples of this include adding a field to a record, deleting a field from a record, or changing the length of an existing field. **APPX does not allow users to run a process that references a file which needs to be restructured.**

Security in the Data Dictionary

Within the APPX data dictionary, you use *field* and *record* security specifications to control which users can view and modify data presented on images in applications.

To secure fields on input and output images, you assign a *read rights security code*. Read rights govern whether or not a user can see the contents of a field as defined on an image either input (transaction entry or maintenance screens, for example) or output (journals, lists, or reports). If a user does not have read rights to a secured field, the contents of the field are invisible and non-editable. Refer to the discussion on Database Security for more information.

Field security specifications, unlike record security specifications, do not restrict access to fields when developing or modifying an application within application design. For example, a designer can define statements to modify values in secured fields, or to load the contents of secured fields into unsecured fields. The contents of a secured record, however, cannot be accessed or modified with statements.

You define read and modify security specifications for each of the following components of the dictionary:

Domain security specifications cannot be overridden for any domain-type fields and work fields that reference them.

File security specifications control read and write access to files.

Field security specifications control read and write access to fields. If security specifications are blank, access to the field is unrestricted.

Work field security specifications control read and write access to work fields. If security specifications are blank, access to the work field is unrestricted.

In addition to the file/field-level security described above, you can establish record-level security as described in the next section.

Record Protection Fields

Record protection fields instruct APPX to verify whether or not a user is allowed to delete a record or change a primary key value in a record. Use of these fields allows you to maintain *referential integrity* within an application.

Delete Protection fields govern whether or not a user can delete a record while executing an input process. These fields can be used to prevent the creation of 'Orphan' records, by prohibiting the deletion of any record that is referenced by other records in the application.

Key Protection fields govern whether or not a user can modify the *primary key* to a record while executing an input process. These fields can be used to prohibit modification of primary keys that are referenced by other records, thus also preventing 'orphan' records.

Record Access fields contain designer-designated security codes that automatically restrict the ability to retrieve a record (and by implication any field on the record) to users with security profiles that include this code. If a user does not have access to the record, APPX responds as if the record is not on file. The designer must maintain the values in this type of field.

CHAPTER 1-4

Understanding Process Design

APPX Processes

The data dictionary, described in the previous chapter, provides the central location for file and data information for an APPX application. The other key components of an application are the processes you develop. A process consists of a set of related specifications and ILF routines to perform one or more desired operations. Processes include references to data dictionary specifications. There are ten types of APPX processes: Menu, Job, Input, Output, Update, Query, Inquiry, Status, Subroutine, and Tables.

Processes Compared With Programs

A process is very similar to a program in traditional data processing systems, in that:

You execute a process to perform one or more related functions or activities.

A process is the smallest unit of an application that can be executed separately.

A process consists of a series of detailed instructions performed in a specified sequence. These instructions consist of process specifications, their associated painted images, data dictionary references, and ILF routines.

APPX compiles the process source specifications into instructions more suitable for machine execution.

There are, however, some significant differences between a process and a traditional program, including the following:

A program consists entirely of line-by-line procedural coding, while a process is comprised of an integrated set of specifications.

You must compile a program as a separate step before executing it but a process is compiled automatically at runtime, if required.

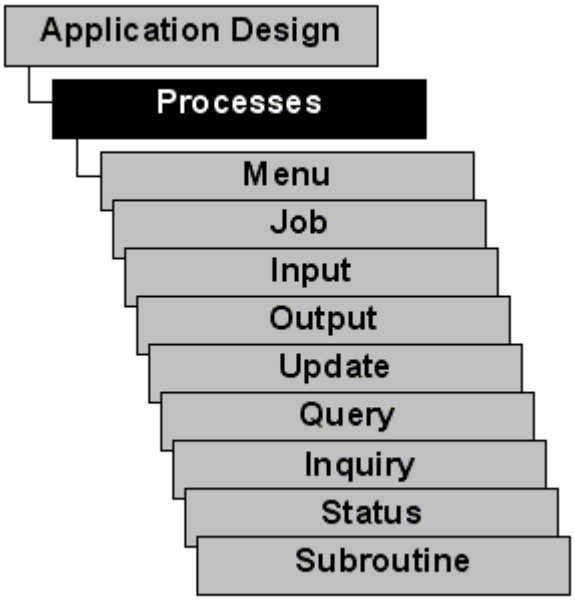
A program must include a detailed definition of the files and fields that are referenced, whereas all data referenced by a process (including local temporary data) is defined in the data dictionary.

In a program, you must explicitly control when each instruction is executed, while an APPX process automatically executes based on the specifications.

You use a standard editor to develop and modify a program, while in APPX you use the specification screens to guide development.

Each program represents a separate file, but all the processes for an entire application are stored in a set of APPX design files.

You access the process definition facility from the Application Design menu. The first screen you see allows you to specify the type and name of the process you are defining or editing. After you identify the process, you see displayed the remainder of the specifications that are applicable to the type of process (menu, input, etc) you selected. From this point on, APPX moves you automatically through the family of screens that comprise the process definition facility. On the facing page is a schematic diagram of the process definition design components.



The Process Family

Process Concepts

An application consists of one or more related processes that together support all the required business-related functions. As noted earlier, there are several different types of processes. The next sections of this chapter discuss some of the features of each type of process. Later in this manual there is a more extensive overview of the process facility and provide definitive descriptions of the specifications needed for individual process types.

The Menu Process

You use a menu process to permit users to select and run other processes. In a typical application, you begin process definition by designing and specifying the main menu that is presented when a user first enters the application. You then proceed to identify what happens when each of the options on the menu is selected. APPX allows you to define up to 249 options (choices) on each menu. An option may invoke another menu, and the number of 'nested' menu levels that you can specify is unlimited.

When you define a menu (as with each type of process), you first provide some basic information about it, including a unique name. Process names must only be unique within a process-type. For example, you can have both a menu and input process called ORDER ENTRY.

Next, you paint a menu *image* using the Image Editor and then identify the process associated with each option on the menu. Because APPX supports panning (the ability to move about on a surface that is larger than the terminal's physical screen size), a menu can be any dimension up to 449 rows and 250 columns.

Refer to Menu Processes for detailed specifications on defining menu processes.

The Job Process

You use a job process to serve as a 'manager' for a group of related processes that are to be performed in a specified sequence. For example, you may want to allow users to select an option from a menu that produces three reports, each with an associated query. To accomplish this automatic sequence of steps, you can specify a job process that, in turn, controls the execution of all query and output processes.

Refer to Job Processes for detailed specifications on defining these processes.

The Input Process

An input process allows users to enter, modify, delete, and inquire about data in an application. Included in the basic information you provide for an input process is the *Process Control File* (called the PCF) associated with the process. For example, the PCF for a customer file maintenance input process would be the CUSTOMER file. Each input process can have at most one PCF.

Each input process consists of one or more *frames* (refer to the description of process components later in this chapter). For example, if a file has more input items than will fit on a single screen, you can define two frames that operate one after the other so the users can enter all of the required information.

Each frame may have one or more *alternate images* (also described in more detail later), which are the screen representations that appear to the users. If more than one image has been defined, one of them is selected to display based on previous user input.

A complete input process provides many different event points (described later) at which you can incorporate an ILF routine (set of statements) to supplement the basic process specifications. For example, you may want to calculate an extended price based upon the unit price and the quantity entered by a user.

As with a menu process, you paint the images that are to appear in an input process. Within the context of the Image Editor, you specify where each input item (user-entered field) is to appear. APPX automatically references the data dictionary to validate each item you paint, and displays the field as a series of either 'pseudo blanks' for Character Modes applications, or a rectangle widget using the GUI client, based on its length defined in the dictionary. The image editor also allows you to define any of several characteristic attributes. These characteristics variy widely depending upon the presentation mode (client) you are using.

Although the data dictionary already contains information about how a field should be formatted on an image (its default display mask), you can override this on each image. For example, you may want to display a date field, normally displayed as '12/31' (MM/DD), as 'December 31'.

There are many other optional or automatic features provided in an input process including:

Data lookup to retrieve and optionally display data from another related file (such as, in an order entry process, using a CUSTOMER ID to look up and display a name from the CUSTOMER file).

Automatic retrieval of the next record on the file each time a user completes an input action.

Partial key option, by which you designate whether a user can enter a partial key or needs to enter a full key to identify a record on file.

Automatic update and/or deletion of records in related files. If so specified, APPX effectively allows a user to change key values in one or several associated files.

Automatic field validation against the data dictionary when data is entered by a user.

Scrolling *of records.* Each frame and a selected alternate image may appear once or, you can specify that it scrolls. APPX supports both vertical and horizontal scrolling.

Refer to Input Processes for detailed specifications on defining these processes.

The Output Process

You use an output process to define a report that the application is to produce. Included in the initial information you provide for an output process is the report name, the PCF to be used, an 'In Progress' message, and whether you want to use standard page and column headings.

You then proceed to specify each frame for the output process. Output processes may consist of the following special frame types:

Report class frames (*start* and *end*) that operate only at the beginning or end of a report.

Page class frames (*start* and *end*) that operate only at the top or bottom of each page.

Range class frames (*start* and *end*) that operate when a sort control break occurs (if specified in the related query).

Record class frames that operate on each individual record included in the PCF (and as constrained by a query, if so specified).

For each frame, you define the related images. For example, in a start-of-report frame, you paint the image of text and/or items you want to appear at the beginning of a report. You use the same image editor facility as described earlier under input and menu processes. For the record class frame, you specify all the data fields that you want to appear on the 'detail' lines of the report. For an end-of-range frame, you can specify subtotal or grand total information and text. You specify as many frames and images as required to produce the report.

As with other process types, there are a number of event points available to supplement the basic specifications with ILF statements.

APPX lets you specify reports very quickly by using the standard defaults provided. You can also define very complex report formats by using the optional features available. Some of the report specification features include:

The ability to use standard page and/or column headings; or, you can design customized headings for any output process.

Vertical and horizontal scrolling capabilities.

Automatic totaling.

Sort and control breaks up to a maximum of 255 levels.

Comprehensive page-change, line, and spacing control.

Support for printing forms, such as invoices and checks.

Sophisticated, relative image positioning; that is, the ability to print the components of a report below or beside each other.

The ability to browse a report on the screen.

The ability to use default display masks for items as defined in the data dictionary, or to override them for a specific report.

The ability for an end user to specify several print disposition values, such as the printer ID, type of form, and number of copies.

The ability to automatically build Range-Start and Range-End frames based on runtime query specifications.

Refer to Output Processes for detailed specifications on defining these processes.

The Update Process

You use an update process to perform file update functions. For example, you may define an update process to update a master file with transactions that have accumulated since the last update occurred. An update process still has only a single PCF (in this example, the transaction file), although it can also update records in the master file using statements in an ILF routine. An update process can produce a log file of all informational and error messages generated during the course of processing.

Refer to Update Processes for detailed specifications on defining these processes.

The Query Process

A query process allows you to:

Select a subset of data from a file by providing (or having a user provide) selection criteria.

Sort the selected data by specifying (or having the user specify) one or more sort fields.

You frequently use a query process in conjunction with an output process (described later), to produce a predefined report format for the data as selected and sorted in the query. You can also use a query before an update process to select subsets of a file to be processed in a prescribed sequence.

Included in the general information you specify about a query is the name of the PCF (process control file) and the key you want to use to access the file (if other than the primary key).

In specifying the selection criteria for a query, you can identify as many field constraints as you wish for both key and non-key fields. Each constraint allows you to specify a relation (such as *equal to* or *greater than*) between fields, or between a field and a constant. There is also an *includes* relation that you can use to constrain records by the presence of words or word strings in text. Note that these selections are case-sensitive.

The Record Selection screen also provides an area that allows you to combine several individual constraints into logical expressions, including parentheses, ANDs, and ORs. As a designer, you can predefine some or all of the selection constraints, or you can allow a user to specify the constraints dynamically at runtime.

As with the selection criteria, you can choose to sort a file by any number of key or non-key fields. You can predefine any or all of the sort criteria, and allow end users to modify sort requirements dynamically. Each sort field is potentially a 'control break/subtotal' level in an output, and you or a user can specify print-related information about each sort field, such as whether to print subheadings or go to the top of a new page.

Refer to Query Processes for detailed specifications on defining these processes.

The Inquiry Process

You use an inquiry process for quick access to a specific record or set of records. Inquiry has all the options that output does, in addition to the ability to ask for the record key.

Refer to Inquiry Processes for detailed specifications on defining these processes.

The Status Process

You use a status process to do special error-checking procedures. For example, you may want to ensure that certain reports have been printed before closing an accounting month.

Refer to Status Processes for detailed specifications on defining these processes.

The Subroutine Process

You may want to include several standard functions in an application that you can accommodate by defining and invoking a single ILF routine. If you define each of these standard functions using a subroutine process, you can invoke the same process at appropriate points throughout an application. By invoking the same set of statements during an event point within another process, you can save development and maintenance time, and ensure that the common function operates consistently each time it is used.

Refer to Subroutine Processes for detailed specifications on defining these processes.

Relationships Between Processes

You have now learned about the nine different types of processes in APPX and the functions you can perform with each type. An essential part of application design is to specify the relationship between the processes you define. For example, when a user selects an option from a menu, an input screen may appear. Or another option when selected, may cause the generation of a report preceded by a query. In both of these examples, the functions operate together properly as a result of the specifications you provide. With the exception of a start-up menu that displays automatically when a user first enters APPX, no APPX process is invoked until you specify its relationship with at least one other process.

Process Genealogy

A simple genealogical metaphor describes the relationships between and among processes. For example, a *parent* is a process that invokes one or more *child* processes. In APPX, a child is associated with only a single parent (that is, the process that invoked it) at each invocation occurrence. But the

same process can be invoked by more than one process in the same application and, thus, may have several parents. Two processes with the same parent are *sibling* processes. *Ancestor* processes include the parent process and any *grandparent* processes. *Descendent* processes include any child and *grandchild* processes (and so forth). All these relationships can be clearly depicted with diagrams that resemble a family tree. The term *process family* is applied to a parent and all its descendents.

Any or all of these family-related terms can be applied to any APPX process (menu, input, output, etc.), depending on its relationship in the context of an application. For example, a menu process can be the parent of several children (all the processes that correspond to the options on the menu), one of which is a job process. This job process can be the parent of a query and output process. The same menu described previously as a parent can also be the child of a previous process such as another menu.

Process Components

Each process operates as one or a series of related parts, called *frames*. Each frame, in turn, can include one or more *automatic children,* as well as one or more *images* that comprise all or part of a terminal screen or report. Each image can have *optional children*. Both automatic and optional children can have selection criteria associated with them. An image is comprised of *background text* and *items*, which are data fields on a screen or report that are displayed and/or filled in by a user. Processes also have *event points* at which ILF routines are defined and invoked. This section discusses the relationship between the various process components.

Processes

You have learned about each of the nine different process types. Although each type is distinct and has its own unique features, there are many similarities among all process types. The process itself is the first component you define; you specify several pieces of information, including a name, description, security group, and process control file.

Frames

A *frame* is the next component level of a process. Every type of APPX process (except subroutine, menu and status processes) includes one or more frames that are invoked in the sequence you specify. A frame can serve two primary purposes:

Controlling the sequence of activities that occur within a process.

Grouping a set of alternate images.

To demonstrate the sequencing function, consider a customer input process in which there are so many fields for a user to enter that they cannot all fit on a single screen. You therefore design a two-screen input process that will display to the user one screen at a time in a designated sequence. To accomplish this, you define two frames, numbered so that they execute one after the other (frames operate in ascending sequence), for each customer record.

The other primary function of a frame is to control the presentation of alternate images. In this sense, think of an analogy to a picture frame that you could use to mount any of several photos. Another version of a customer input function demonstrates this type of usage. In this version, there are two major types of customers, domestic and international. The information you need to capture for each type of customer has many similarities but some fields apply uniquely to only a domestic or international customer. To satisfy this requirement, you define two frames. On the image for the first frame, the user enters the information that applies to both customer types and also indicates the customer type. In the second frame, you define two alternate images as part of a single frame. Then, depending on the customer type entered in the first frame, the second frame selects which of the two alternate images is to appear on the screen.

In most cases, a frame executes exactly once before a subsequent frame is invoked. You may, however, specify that a frame is optional or repeating and, through statements, control whether a frame executes at all, or more than one time. As an example of an optional frame, you may have defined an input process for entering customer information. In the first frame, a user enters the customer name and several informational items, including whether the customer is domestic or international. For international customers only, a second frame allows the user to supply additional information. The second frame does not operate for domestic customers, and no image appears in this case.

When you are defining a process, APPX automatically displays the frame specification screen after you enter the process-level information.

Automatic Children

An *automatic child* is a process that is invoked directly by another process without a user's intervention or choice. For example, a job process may automatically invoke, in sequence, a query and an output process. One of the steps during application design is to specify if a process is to invoke any automatic children. Only input, output, inquiry, job, or update processes can have automatic children associated with them.

Selection Criteria

Another factor in process relationships is whether there are constraints on the data selection for the process control file of a child. For example, if an input process for orders invokes a line item input process as an automatic child, you may constrain the line item file to select only records with a matching order number. You can specify *selection criteria* for either optional or automatic children, and you can define constraints for both key fields and non-key fields. Constraints must be specified as equalities, such as the ORDER NUMBER of the records in the child process must be equal to the ORDER NUMBER of the record selected in the parent process.

Images

An *image* is the visual representation of *painted* text and items that comprise a display on a terminal screen or report. An individual image may occupy an entire screen surface or page size, or only a portion of it. A complete report page, for example, may consist of several images, including page headings, column headings, detail lines, subtotals, and a grand total.

You control the layout of each screen or report by specifying the size and placement of each image. For example, you may specify that a menu starts in the upper left-hand corner of a screen, and consumes all the rows and columns of a typical terminal screen. Or, you can create a 'pull-down' menu by positioning a menu in the top center portion of the screen, making it stand out by drawing a box around it (the box is controlled by a YES/NO question for each image).

An image is uniquely associated with only one frame within a process. As noted previously, a single frame may have more than one image associated with it, called alternate images. You use an ILF routine at the frame level to control which image is to appear during process execution.

You paint screens and report pages using APPX's image editor facility. This facility allows you to paint *background text*(constant, non-editable areas on an image) and *items* (data from fields) according to your layout requirements. In addition, you can specify *characteristics* for text and items, by which you can highlight parts of the image with such attributes as underline, bright, and inverse video. You can also define graphical components and attributes on your images to give them a decidedly Windows look and functionality.

Background Text

Background text consists of descriptive text and identifying labels on an image. For example, column headings on reports and field labels on input screens are usually part of background text. You often design the background text as the framework within which to define individual items, described in the following section.

Items

An *item* is the appearance of an individual field on an image. For example, an input process image may include several items so a user can enter, review, and modify data in a file. You can specify whether an item in an input process is modifiable or not. You also specify items in output process images, but they cannot be modifiable.

When you define an item on an image, it automatically assumes the attributes of its data dictionary specifications (such as field length and display mask) unless you override them for this image. You also can specify the item's display characteristics, as described in the following paragraphs.

Characteristics

A *characteristic* is an attribute that affects how items and text appear on the terminal screen or in a report. Examples include underline, inverse/normal, blink, and bright/dim. Some characteristics are applicable only to a terminal image and cannot be applied to a printed report.

When you define an item on an image, you can specify one or more characteristic attributes to apply to the item. For example, you could display a single item as modifiable, bright, and inverse. A similar set of characteristics may be applied to any portion of background text on an image.

Graphical Characteristics

Using the GUI features of APPX's Image Editor, you can add buttons, icons, pictures, wallpaper, title bars, and other graphical components to your menu, input, output, and inquiry process images.

Optional Children

An *optional child* is a process that a user invokes by selecting an option on a menu (or from an input process, discussed later). On a menu, for example, Option 1 may invoke an input process, Option 2, an output process, and, Option 3, a job process. One of the steps during application design is to specify all the optional children for each menu. These processes are called *optional* children because they are never invoked unless a user selects the corresponding option on a menu.

Although a menu is the primary place from which to invoke optional children in APPX, you can also invoke optional children from an input process. For example, you may allow the user to select from among three options, descriptions of which are on the input image.

As with automatic children, you can specify selection criteria that constrain the records to be processed in the optional child's process control file.

Event Points

An *event point* is one of a number of predefined chronological points during the execution of a process at which an ILF routine can be invoked. Certain process components, including processes, frames, images, and children have event points associated with them. For example, there is a Pre-Display event point for an image. If you develop an ILF routine for this event point, it will be invoked just before the image is displayed on the screen (or written to a report). Event points have names that describe when the associated ILF routine executes.

Preparing for Runtime

When you choose to run a process after initially defining or modifying it, APPX needs to prepare it for operation. During this preparation step, called *compilation*, the system translates the source specifications into detailed instructions that optimize runtime performance. This translated format of a process is called an *executable module*, abbreviated as *EM*. Because each process has its own EM, usually only a small portion of an application needs recompilation at runtime. APPX is designed so that you can immediately invoke a new or modified process without having to execute a separate step to compile it. Whenever you choose to run a process, APPX automatically determines whether compilation is required by checking all referenced components in the application, including the data dictionary, to see if any changes have been made since the last compilation. If changes are detected, the system recompiles the process and creates a new executable module; if not, the system uses the current executable module.

The system also processes the data dictionary specifications into an executable format. The dictionary operates differently from processes, and requires a separate processing step. If you make any changes to the data dictionary specifications, APPX will process them before executing any process that references modified dictionary components. A separate step is provided to allow you to process the dictionary and to coordinate other related design activities, such as file restructuring.

The Sequence of Operation

The components of a process operate in a defined sequence so that there is a consistent pattern of operation, no matter what type of process is defined. For example, if a process has several frames that include optional and automatic children, and many of the frames also contain images, you need to understand APPX's processing sequence to achieve your intended design objective.

The primary control mechanism within a process is a frame. If a process has more than one frame, they operate in sequence based on a number you assign. APPX executes one complete *process cycle* (all frames one after the other) for each selected record in a process control file. For input processes, users select the records. For update and output processes, records may be selected by a previous query process; otherwise, the entire file is used. Thus, for an update or output process, if there are 100 selected records from the PCF, the entire frame cycle will execute 100 times.

A frame may include an image (or several alternate images), and invoke one or more automatic children, as well. APPX executes all the components of one frame before proceeding to the next.

Child processing is controlled in two fundamentally different ways. An optional child is always invoked by a user selecting an option key, and is always invoked from an image. An automatic child is invoked at the appropriate time without user intervention. For example, as soon as a user finishes entering data for an order in an order entry input process, a line item input process may automatically be invoked when the user selects Enter .

Because of the basic difference between optional and automatic children as described above, there is not a conflict with the order of invocation. Because a child is also a process, it can include a number of its own components. The same rules regarding order of invocation as described previously also apply for a process that is itself a child. You can therefore design a process that has various levels for which the sequence of operation is always predictable.

An Example of the Process Cycle

The following example demonstrates the sequence of operation for a sample *process cycle.* In this example, a process has one frame that has ILF routines at the Start of Frame and End of Frame event points. The frame has one image, which has ILF routines defined for the Pre-Display and Verify event points. The frame also includes one automatic child, which has ILF routines defined at the Pre-Invocation and Post Invocation event points. For each selected record in the process control file, the sequence of operation is as follows:

Read the process control file record.

Invoke the Start of Frame event point.

Perform image processing:

Invoke the Pre-Display event point.

Display the image on the screen.

User completes data entry.

Invoke the Verify event point.

Invoke the End of Frame event point.

Perform automatic child processing:

Invoke the Pre-Invocation event point.

Perform processing as specified for the child process.

Invoke the Post Invocation event point.

CHAPTER 1-5

Interprocess Communication

Interprocess Communication

In APPX, you develop applications by defining and connecting processes. When a user runs an application, information may need to be shared among the processes that form the application. *Interprocess Communication*, or *IPC*, refers to the set of specifications and statements by which you control how data is communicated among processes.

Consider an application in which the user is asked to enter the CURRENT ACCOUNTING MONTH on the first screen that is presented. You want this information to be available to any process in the application. You can use the IPC facilities within APPX to communicate the CURRENT ACCOUNTING MONTH to all the processes within the application.

Now consider an order entry function that consists of an input process to enter sales order information, and a subsidiary input process to enter individual line items for each order. In this case, the order information entered in the first process must be communicated to the line item process. For example, line item pricing may depend on information about the customer entered for the order. Again, you can use the IPC facilities within APPX to communicate between these two processes.

Interprocess Communication is specified implicitly based on the following:

Invocation type specification in the Automatic/Optional Child processes

File Type of data dictionary record structures

Share Class of Work Fields

Any process can be invoked as DETACHED or RELATED, or as a SUBPROCESS. When working with temporary files, it is important to know how the file type and the process invocation are related and interact. Child process invocations are defined at the following points in process specifications:

Menu item specifications are optional child processes. The default invocation for menu items is DETACHED.

Job/step item specifications are automatic child processes. The default invocation for job steps is RELATED.

Input frames can invoke automatic child processes, and input images can invoke optional child processes. The default invocation for input child processes is SUBPROCESS.

Output, update, and inquiry frames can invoke automatic child processes. The default invocation for these child processes is SUBPROCESS.

ILF statements can invoke any process. The default invocation when entering ILF statements is DETACHED.

Any temporary file is available only to the user who creates it. When a user creates a DETACHED temporary file, it remains available until the user exits APPX.

When a RELATED temporary file is created, it remains available until a DETACHED process is invoked, or until the process stream returns to the parent that called it with a DETACHED invocation (for example, a menu). It is important to note that, although a DETACHED child process cannot access a RELATED temporary file, that file remains available to the parent that created it until the parent itself is ended. If the DETACHED child process attempts to access that file, a new, empty copy of the file will be created.

When a SUBPROCESS temporary file is created, it remains available until a DETACHED or RELATED process is invoked, or until the process stream returns to a parent that called it with a DETACHED or related invocation (for example, a job step or a menu). As with RELATED temporary files, it is important to note that, although DETACHED or RELATED child processes cannot access a SUBPROCESS temporary file, that file remains available to the parent that created it until the parent itself is ended. If a DETACHED or related child process attempts to access that file, a new, empty copy of the file will be created.

Current record buffers, field contents, and file pointers are all available transparently through a SUBPROCESS invocation. They are not maintained for RELATED or DETACHED process invocations.

Whether or not a job step is invoked as a 'separate task' also affects the availability of a RELATED or DETACHED temporary file. If the designer allows a job step to be invoked as a separate task (i.e., submitted to background), APPX makes a copy of the RELATED or DETACHED temporary file and passes it to the child process being invoked as a separate task. The file is then available to the child process but, if the child process updates the file, those updates will never be available to the parent process.

APPX automatically scratches temporary files based on their interprocess communication characteristics. For example:

DISK/SUBPROCESS and MEMORY/SUBPROCESS files are local temporary files. These temporary files are only accessible by a single process family, and exist only for the duration of that process family. Each time a process is run that references a SUBPROCESS temporary file, a separate copy is maintained and, when that process ends, APPX automatically scratches the temporary file.

DISK/RELATED and MEMORY/RELATED files are normal temporary files. They are passed and shared to non-detached processes (to SUBPROCESS processes and RELATED processes). APPX automatically scratches a RELATED temporary file when the non-detached process family ends.

At the other extreme, DISK/DETACHED and MEMORY/DETACHED files are global temporary files. All processes that reference a global temporary file use the same temporary file. APPX automatically scratches a global temporary file only when the APPX session ends.

The exception to these DETACHED/RELATED/SUBPROCESS (also called 'Scoping', 'Inheritance', or 'Sharing') rules, occurs with QUERY processes. Please see the description under the predefined field PROCESS CODE, in Predefined Fields and Processes for a more detailed explanation of the special inheritance rules with respect to QUERY processes.

CHAPTER 1-6

Customizing Your Application

Runtime Application

APPX includes a component called the *runtime application*. This application provides a number of predefined fields and processes that are introduced in this chapter. You can make use of the features provided in the runtime application as you develop your own applications. (Refer to Predefined Fields and Processes for a complete description of these features.)

Predefined Fields (PDFs)

In the runtime application, APPX includes a number of fields called *predefined fields* or *PDFs*. These fields contain various 'points of reference', such as who the current user is and the company address. Although the names of these fields are pre-specified, you can use them as you would any other fields in your own applications. You can reference predefined fields in statements, for example, and set the values of some of them (such as ALTERNATE IMAGE NUMBER) to control processing flow. APPX keeps track of the values of predefined fields at all times, and maintains their values automatically. When you use a predefined field, you designate the application ID with three hyphens (---). APPX interprets the three hyphens as the runtime application.

Using Predefined Fields

You can make use of predefined fields in three ways:

You can display and optionally allow a user to modify the value of a predefined field by painting it on an image. For example, you may want to display the value of COMPANY NAME on an input screen for the user's information.

Using statements, you can check the value of any predefined field and, based on the result, control the flow of processing. For example, you may want to determine if there were any errors encountered during an output process and, if so, perform a special error-handling routine. You can examine the value of the ERRORS predefined field and, if it is greater than zero, pass control to the error-handling statements.

You can use statements to set the value of certain predefined fields and control how a process operates. For example, you may want to control which alternate image is to appear on the screen by examining a user's response to a preliminary question. Depending on the response, you can set the value of ALTERNATE IMAGE NUMBER to the appropriate value and cause the proper image to be displayed.

Categories of Predefined Fields

There are five categories of predefined fields:

Current status PDFs, which provide information about current values, like the current user ID.

Process control PDFs, which control what will happen next in the application.

Terminal management PDFs, which provide information about such factors as current cursor position..

Report management PDFs, which provide information about the disposition of reports, such as the print destination.

General purpose PDFs, are used as index work variables or work fields in ILF statements.

The predefined fields are described in detail in Predefined Fields and Processes and a table of PDFs is also provided.

Predefined Processes

APPX provides a number of standard processes that you can invoke, or are automatically invoked, at appropriate points in your applications. For example, APPX contains a standard DISPOSITION input process that allows users to specify certain print-related information that controls how, when, and where a report is to print. This DISPOSITION process resides as a predefined process in the runtime application. To invoke this process as a child in an application, you identify the application ID as '---', the process type as INPUT, and the process name as DISPOSITION.

You cannot modify any of the predefined processes, although you can, for example, develop your own version of a DISPOSITION process by defining an input process in your own application. Then, instead of executing the DISPOSITION input process from the '---' application, you invoke the DISPOSITION input process from your own application. It is recommended that you define all these types of processes in a separate application so that they can be referenced easily for system-wide use.

The following is a list and brief description of the predefined processes that are available in APPX:

APPX MENU, which allows a user to run database and provides access to system administration, and application design.

BEGIN LIVE OPERATIONS, which transfers the run phase from initial setup or recovery processing to live operations.

CHECK GUI CLIENT, which determines if the current engine is connected to a GUI-enabled client.

DISPOSTION, which allows a user to provide information that controls how and where a report is to print.

ENTER BILLING CODE, which allows a user to enter a value into the predefined field BILLING CODE.

GET CMD LINE PARM, which checks for the existence of a parameter on the command line used to invoke the current engine.

GET ENV VAR, which retrieves the contents of an environment variable.

GET FILE FROM CLIENT (APPX 5.4.4), which retrieves a file from the client system and stores it on the server.

PROCESS QUERY RECORD, which potentially adds a PCF record to the result set of a query.

SELECT DATABASE, which allows a user to select the appropriate database.

SEND FILE TO CLIENT, which retrieves a file from the server and stores it on the client system.

See Predefined Fields and Processes for details on the predefined processes.

Accessing Non-APPX Programs

Although you can use APPX's own design facilities to develop all your new applications, you may have existing programs or applications written in some other language that you would like to run within the context of an APPX application. APPX allows you to invoke programs or subroutines written in any programming language. To invoke other programs, you use either the CALL or RUN statements within an ILF routine.

You may also want to invoke an APPX process from a non-APPX program or procedure. You can do this by invoking a specific APPX process using an operating system command.

The CALL Statement

The CALL statement allows you to invoke non-APPX subroutines when you want to pass and share information between APPX and a subroutine. For example, you could call a special calculator function written in assembly language that is available on your computer system. You pass the appropriate field values to the called routine, and receive back the result of the calculation (by passing the result field with *Share?* specified as 'Y'for 'yes').

On some computer systems, unique identification of a subroutine name may require more than the 22 characters allowed in the CALL statement. To accommodate this situation, you can define an alphanumeric work field in the data dictionary and set its value to the complete program name. Then, when you specify the CALL statement, you enter the work field name as the program to be called. This approach also minimizes future maintenance by reducing the number of changes you need to make if a revision to the name is required.

There is an indicator that you set when you specify the CALL statement to indicate whether the called routine is to remain resident in memory after it completes execution, so that it can be re-executed by a subsequent CALL without having to read it from disk a second time.

The RUN Statement

The RUN statement allows you to invoke other programs with which APPX does not need to share information. For example, you could run a word processing program that is available on your computer system. Or, you could run a command editor available within your operating system. You can think of the RUN statement as an initiator of an entirely different program, to which APPX gives full operational control. The program that was run cannot stay resident in memory after it completes execution.

Command Process Invocation

A specific APPX process can be invoked from an operating system command. The database, application, process type, and process name are specified as part of the command. Refer to the *Installation Guide* for specific details on command syntax. Upon completion of the specified process, APPX ends.

This technique can also be used to execute processes in a background queue. If APPX is executed in the background, any terminal screen outputs will be processed as though the user pressed end.

CHAPTER 1-7

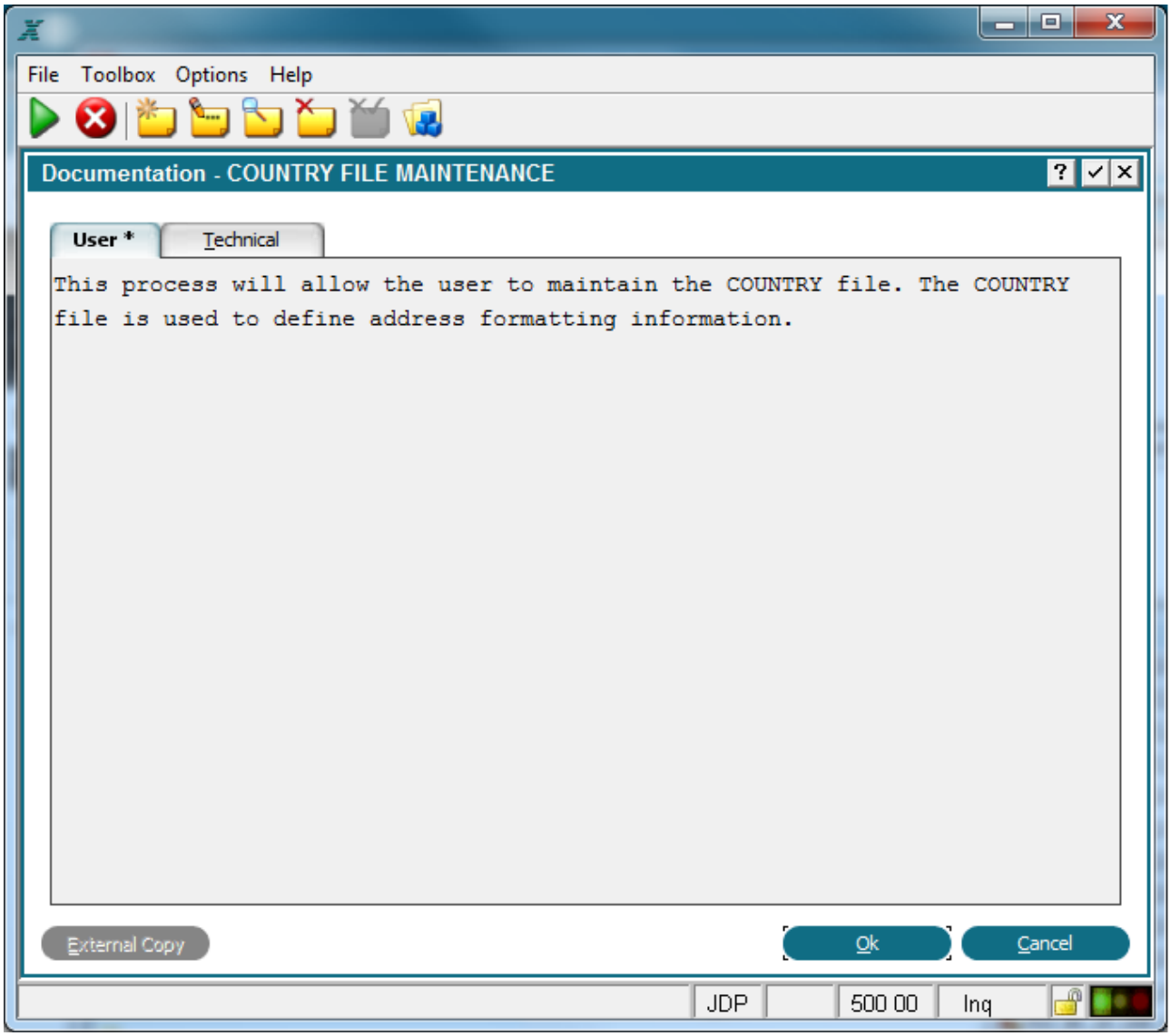
The Documentation Facility

An Integrated Facility

APPX provides an integrated documentation facility that simplifies incorporating documentation during development. As you specify an application's processes, files, and fields, each component has its own Documentation screen available. When you modify an existing component, you have an option to select the Documentation screen to review the previously entered documentation and modify it if required. Also, if you are set up as an application designer in system administration or if you have documentation design rights, user documentation can be updated from the Help screen by pressing change (*CHG*) mode.

The Standard Documentation Screen

APPX has a standard tabbed Documentation screen format that is used for all levels of components (processes, fields, etc.) throughout the system. The Documentation screen provides a text area for you to enter a description of this component of the application. A sample Documentation screen is shown below.



User Documentation Screen

Technical and User Documentation

There are two major categories of documentation available within Application Design, known as technical and user documentation.

Technical documentation is of interest primarily to designers because it contains information about how an application is designed. It is the basis of the APPX printed technical documentation. See the Application Design Documentation Menu for details.

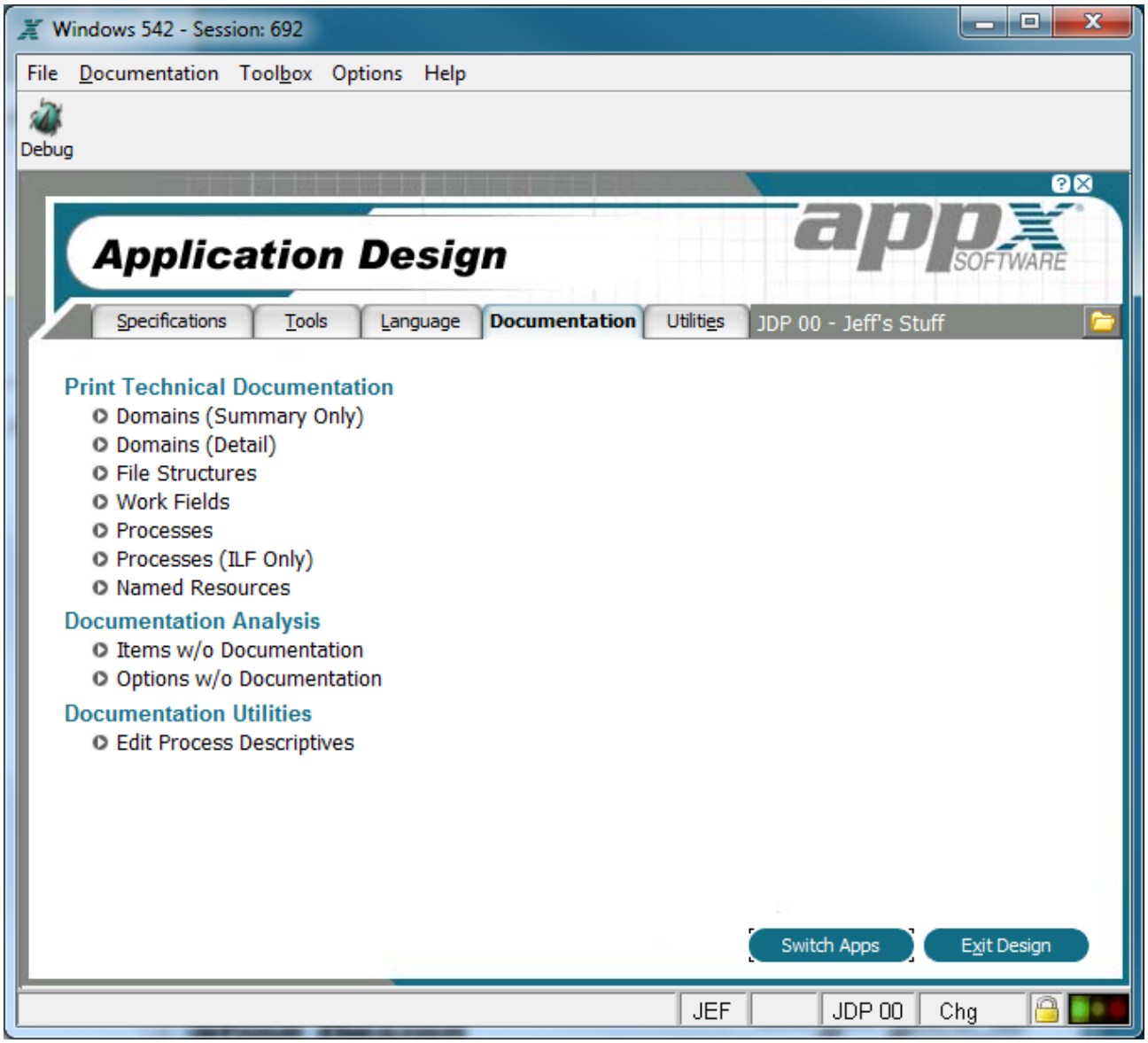
User documentation contains descriptive information about what an end user needs to know to operate an application, such as the allowable values or restrictions for an input field. It is the basis of the APPX online help facility. User documentation can be maintained both through Application Design and by using the Documentation Management option from the System Administration Pulldown Menu on the APPX Main Menu (as described in the *System Management Manual*.)

The Help Option

Users can at any time select the help button from the window or overlay title bar and display the documentation applicable to the item or option on which they then select via a mouse click. For example, if a user selected the help option then clicked on an item (field box), the documentation for the item, normally describing input rules and constraints, would appear on the screen. If the user selected the help option, they are requested to select which menu option they want to view help text for. By then selecting the desired option, the help text for the optional process that the option corresponds to is displayed.

Application Design Documentation Menu

When you select the Documentation tab from the primary Application Design screen, the Application Design Documentation Menu is displayed, as shown below.



Application Design Documentation Menu

The Application Design Documentation menu options are grouped by function.

Print Technical Documentation allows printing of domains, records and fields, work fields, processes, and named resources. For each type, you will be shown a Scan screen that allows you to select those items that you wish to print. Items can also be selected based on the date they were last modified or, in the case or processes, by type (input, output, etc.). A standard disposition allows you to print either to the screen or on hard copy.

Documentation Analysis provides visibility of any items or options in your application without documentation.

Documentation Utilities includes a maintenance function to edit only process descriptions as well as a utility to print data input forms.

Options include:

Items Without Documentation generates a list of design elements (domains, files, fields and work fields) without documentation.

Options Without Documentation generates a list of options (optional processes invoked from menus) that have no documentation.

Edit Processes Descriptive allows you to view and edit the descriptive names for every process in the application.

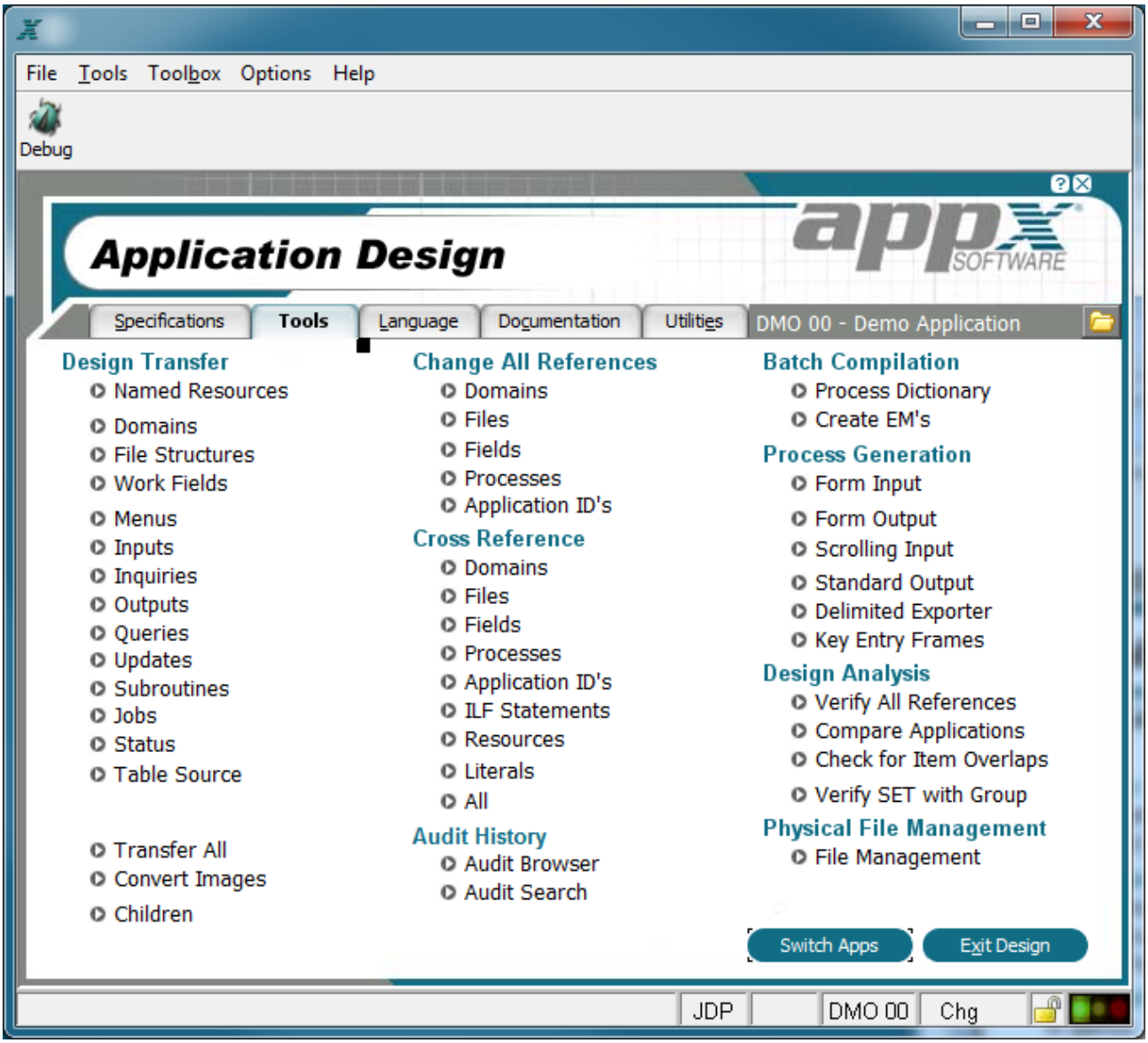
Print Input Forms produces a report of interactive images found in input processes. The images are formatted as they would appear on a user's screen and can be 'cut and pasted' into forms that can be used for data entry.

CHAPTER 1-8

Application Design Tools

Application Design Tools Menu

When you select the Tools tab from the primary Application Design screen, the Application Design Tools Menu is displayed, as shown below.



Application Design Tools Menu

The Application Design Tools menu options are grouped by function.

Design Transfer options are described under the Design Transfer section.

Change All References options are described under the Change All References section.

Cross Reference options are described under the Cross Reference section.

Audit History options are described under Audit History Tools.

Batch Compilation options are described under Other Design Tools.

Process Generation options are described under Other Design Tools.

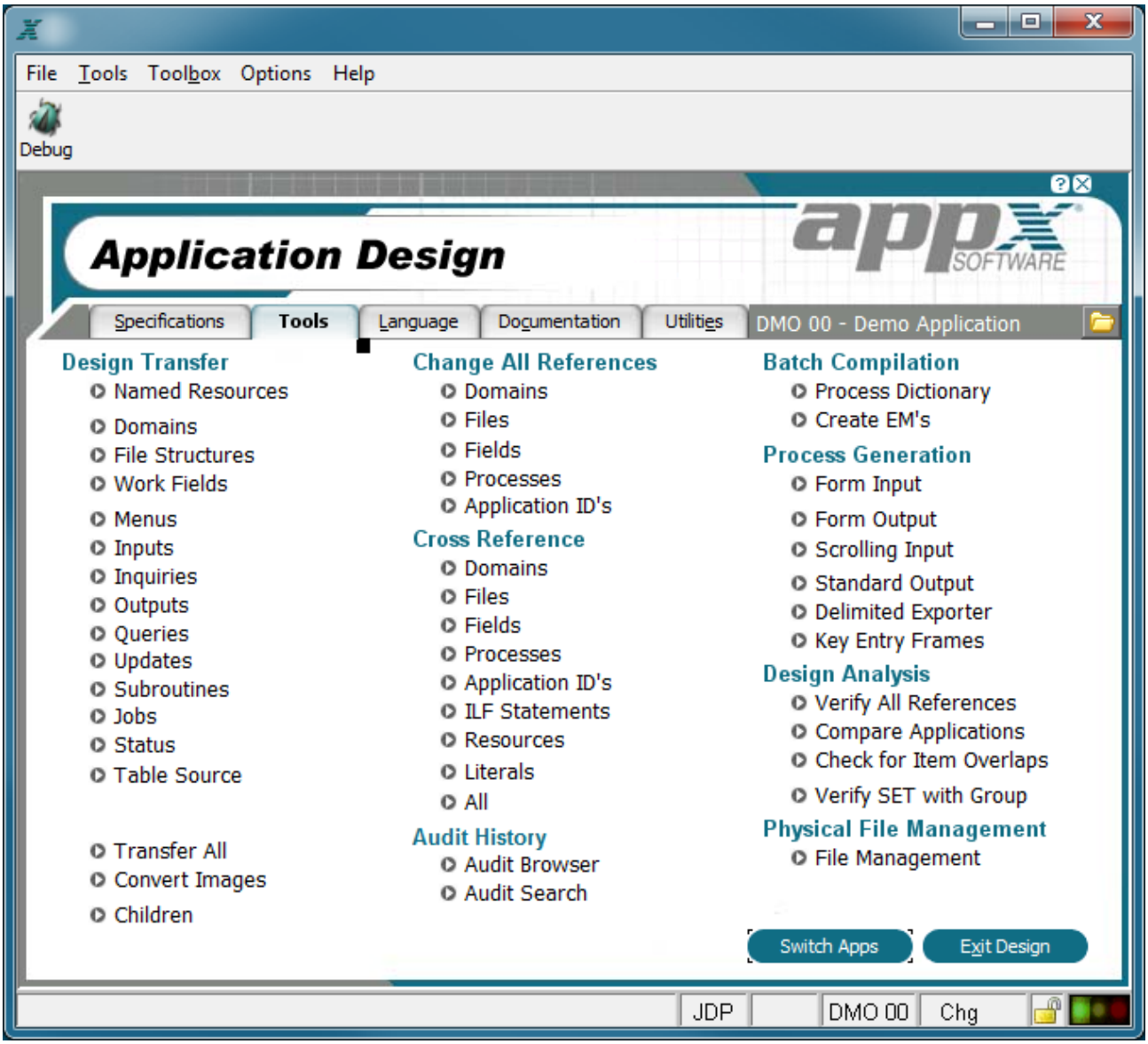
Design Analysis options are described under Other Design Tools.

Physical File Management is described in depth in Database Management, of the *System Management Manual.*

This set of tools provide a variety of special-purpose functions to facilitate the application development process.

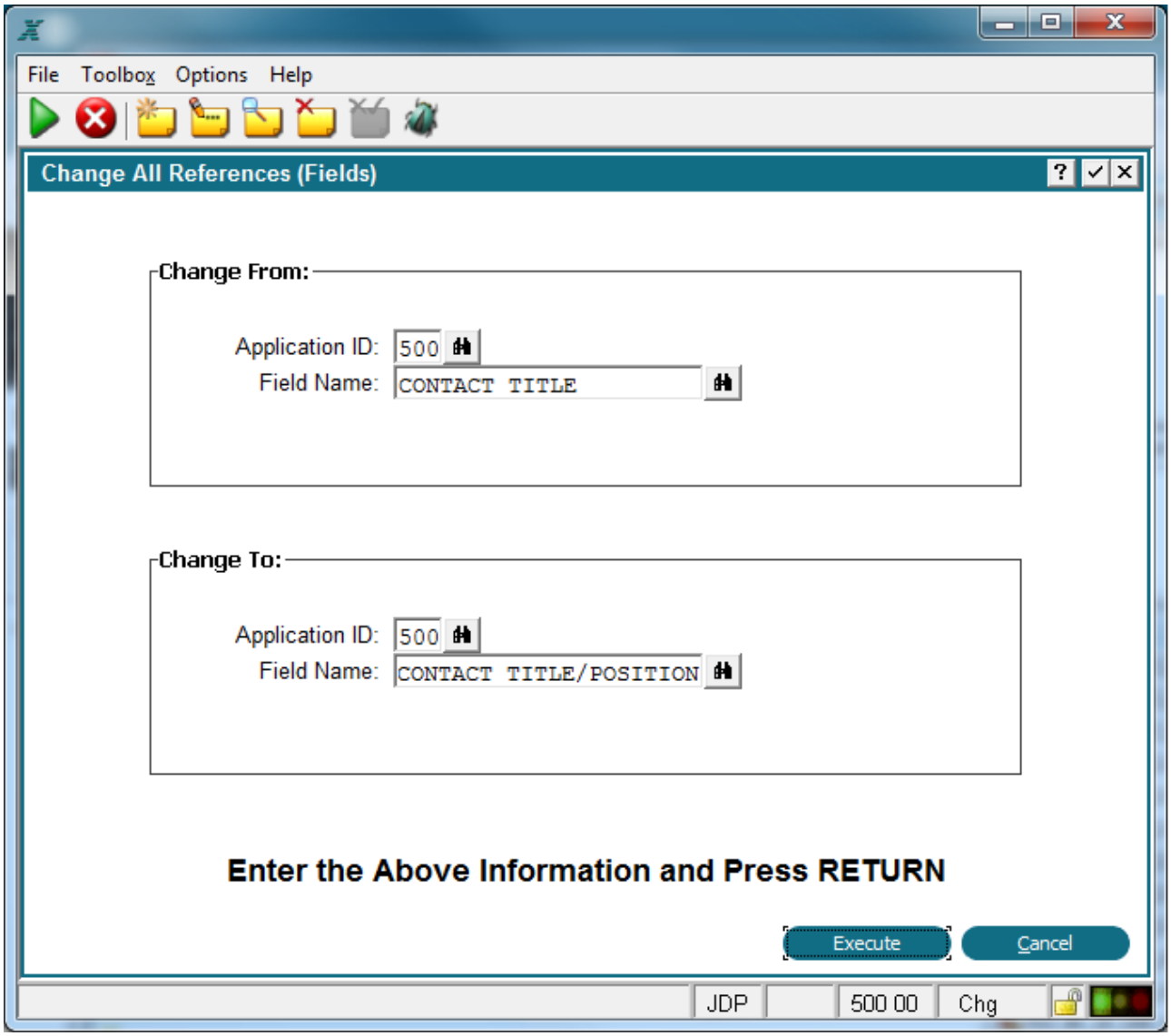
Change All References

The Change All References utility performs a global search and replace operation throughout an application's design. For example, if you rename a field, you can change all references to the field from the old name to the new name. When you select change all references from the Tools menu, the menu shown below appears.



Change All References Menu

The Change All References menu allows you to choose what type of design component to change. When you select one of the menu items, a screen much like the one shown below appears.

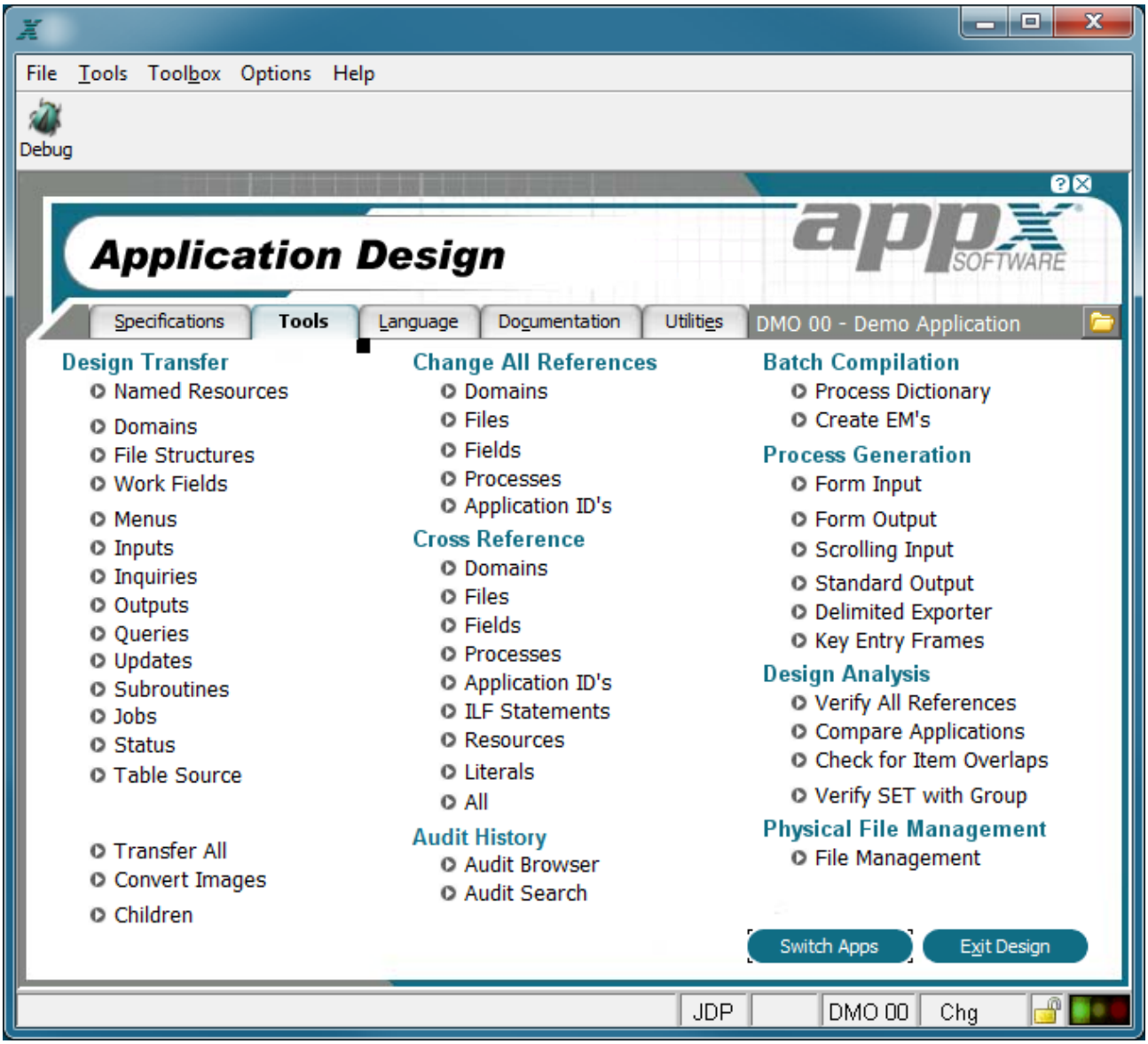


Change All References (Fields) Screen

In this example, you would be allowed to change a field name. In other examples, you might change a process name, a domain name, or an application ID. In all cases, the application ID, along with any other appropriate information, will be requested. After entering the necessary values, press return to make the changes.

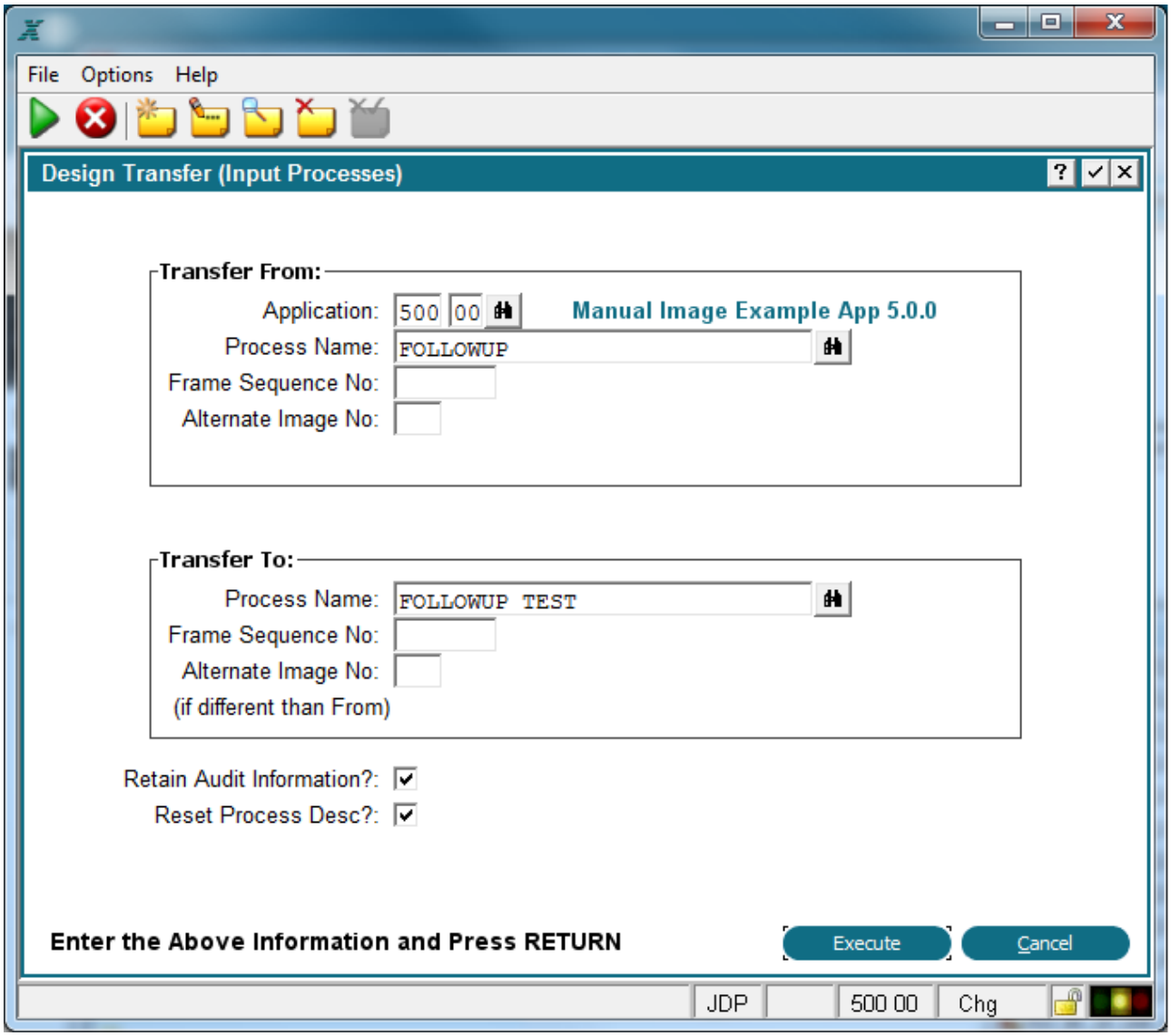
Design Transfer

The Design Transfer utilities permit all or a portion of an application's design to be transferred to or from another application or within the same application. For example, if you want to create a new report that is similar to an existing one, you can transfer the output process and assign the copied process definition a new name. After the transfer, you can then modify the copied process definition. Select to transfer from the Tools tab on the Application Design menu menu shown below.



Design Transfer

You can elect to transfer an entire application, or only parts of it, or you can transfer a process. When you select any option (other than transfer all) from the Design Transfer menu, a screen like the one shown below appears.



Design Transfer (Input Processes) Screen

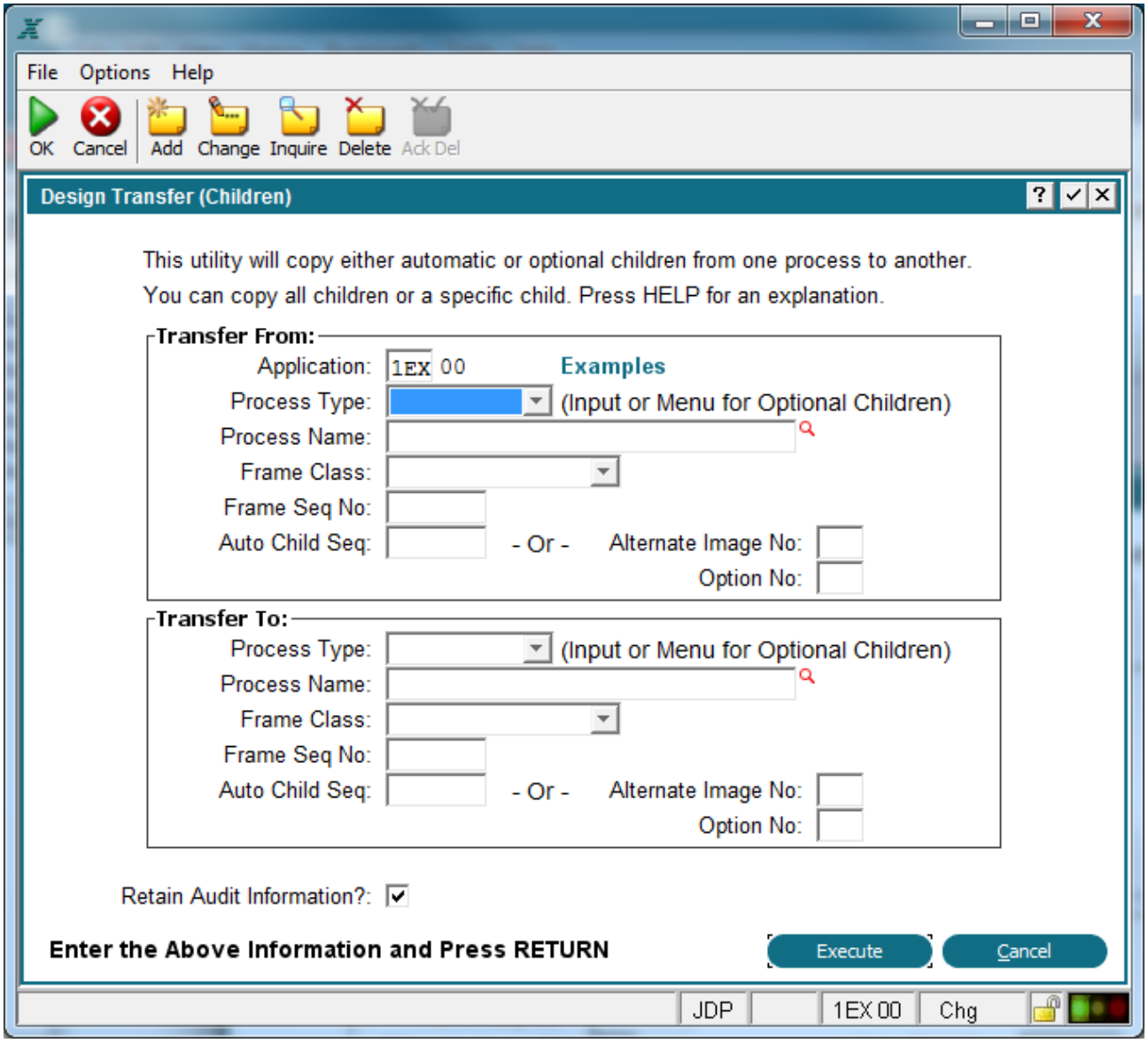
In this example, you would be transferring an input process. Notice that you have the option of transferring all or part of this process; if you enter only the process name, the entire process will be transferred. However, you can specify detail down to the image level. The same is true for design transfer for all types of processes. The amount of detail available for transfer depends on the type of transfer being made.

> **NOTE:** If you transfer a process from a version that is different from the one you are working on, and you do not transfer the process control file, APPX will issue an error when you attempt to edit the process. APPX does not 'look' across versions for a file.

All transfer options produce a log of the activity. Any problems encountered during transfer are noted.

Convert Images is used to transfer an existing image to an existing image. Use this utility to convert an Input image to an Output image (or vice versa) since there are design differences between the two types of processes. The transfer may occur from within the current application.

Design Transfer Automatic Children from frame to frame, or Optional Children from Image to Image.



Design Transfer (Children) Screen

You must first identify the Process Type, Process Name and Frame Seq No you wish to transfer from. You then have 4 possibilities for the remaining fields:

Leave everything blank. This tells the utility that you want to transfer all Automatic Children from the specified Frame.

Enter the 'Auto Child Seq' number. This tells the utility that you want to transfer that specific Automatic Child.

Enter an 'Alternate Image No', but leave 'Option No' blank. This tells the utility that you want to transfer all Optional Children from the specified Image.

Enter an 'Alternate Image No' and an 'Option No'. This tells the utility that you want to transfer that specific Optional Child.

In the 'Transfer To' section, you identify the target of the design transfer. It can be the same or a different process. You must at least supply the Process Type, Name and Frame Seq No.

If you are transferring all Automatic Children, they will be copied to the specified Frame (you must chose a different process or frame in this case).

If you are transferring a specific Automatic Child, the 'Auto Child Seq' is optional. If not provided, it will use the same number as the source, otherwise it will be transferred to the specified seq no.

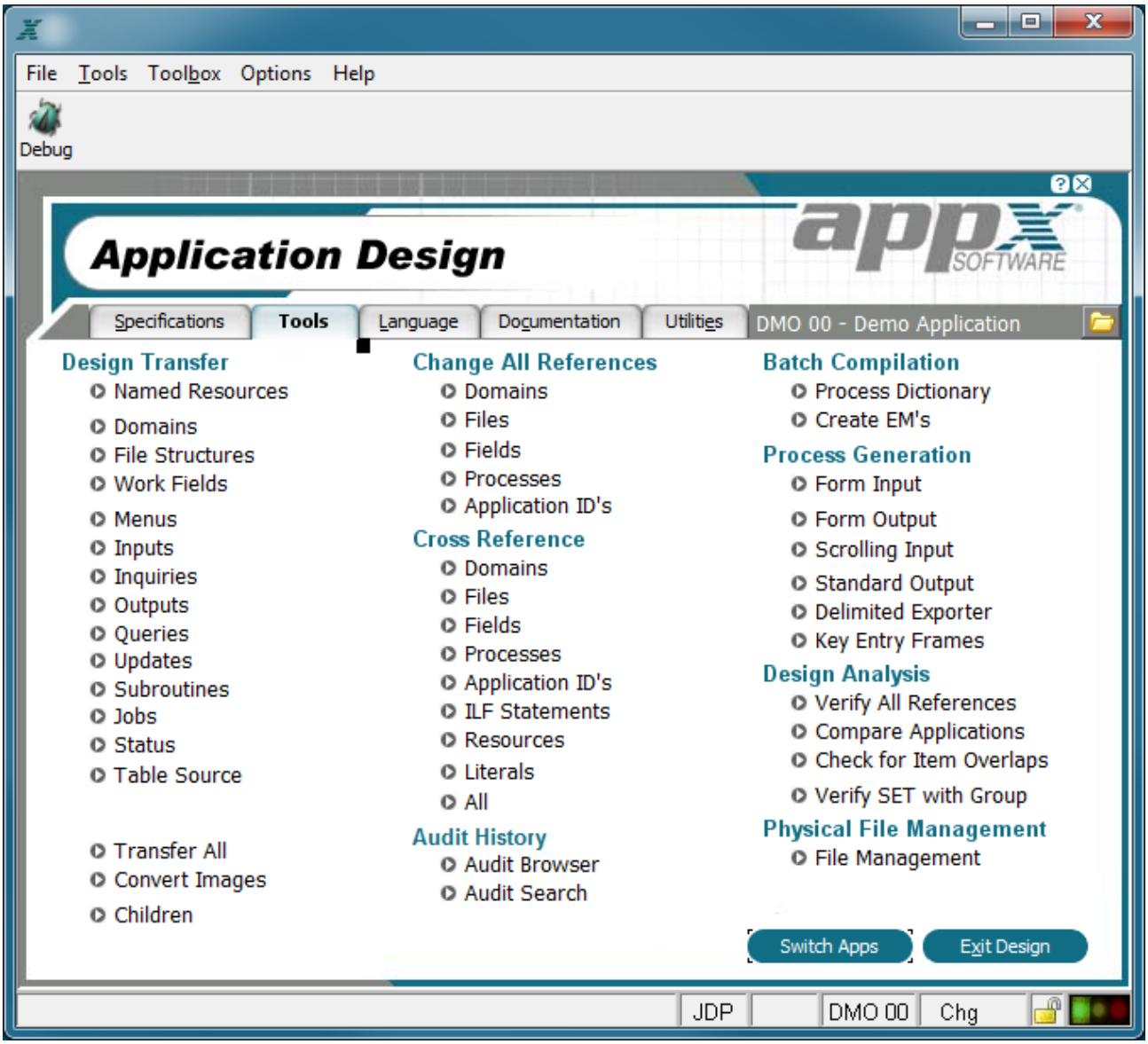
If you are transferring all Optional Children, they will be copied to the specified Image (you must choose a different process or frame in this case).

If you are transferring one Optional Child, the 'Option No' field is optional. If not provided, it will use the same number as the source, otherwise it will be transferred to the specified Option No.

You cannot supply both an 'Alternate Image/Option No' and 'Auto Child Seq', you can only transfer either Optional Children or Automatic Children, not both at the same time. And you cannot mix Automatic and Optional children on a transfer.

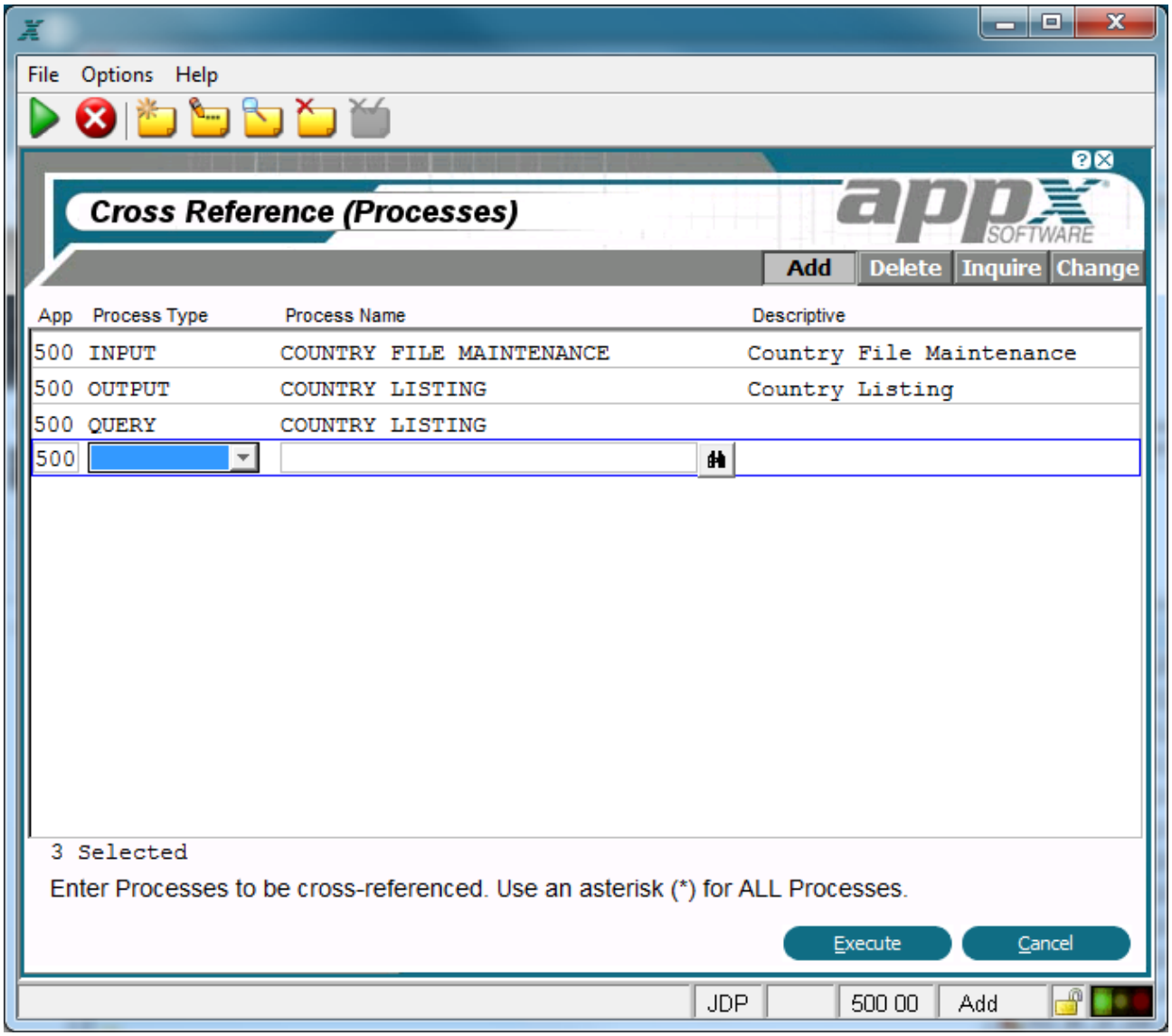
Cross Reference

The Cross Reference utility prints a 'where-used' listing or interactive hyperlink display that locate references to application IDs, domains, records/files, fields and processes. This facilitates application maintenance by locating all references to selected components. When you select cross reference from the Utilities menu.



Cross Reference Menu

Notice that although you can choose a complete cross reference by selecting the all option, you can also choose to print a partial cross reference, based on the design component. When selecting a specific design component, you are presented with an input screen like the one shown below on which you make your selections.

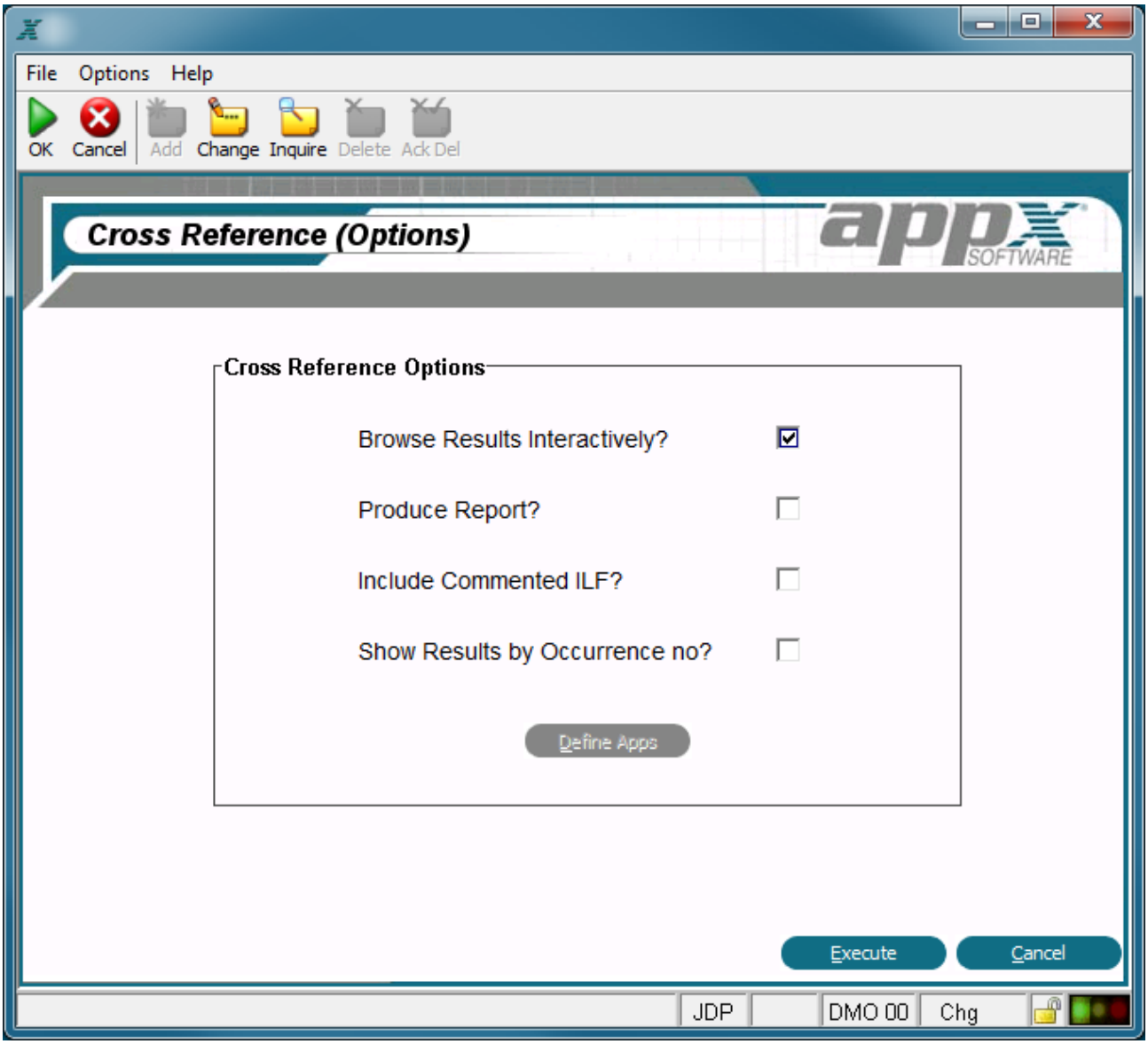


Cross Reference Item Selection Input Process

When you have finished selecting the elements you want to cross reference, select end ☒ from the title bar. The Cross Reference Options screen appears as described in the next section.

Cross Reference Options

When you have completed entry of elements you want cross referenced, the Cross Reference Options screen shown below:



Cross Reference Options Screen

Select whether you want to browse results interactively or generate a hard copy report. If you select the B*rowse Results Interactively* option, you are presented with an interactive list of elements that reference the selected elements. You can then go directly to any element you select via a hyper-text link and make changes by following the options shown on the bottom of your screen to 'drill down' into the referenced elements and processes. Be advised that selecting this option prohibits the cross reference from being run in background. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

If you select the *Produce Report?* option, a report listing all elements that reference the selected elements is generated. Note that a standard disposition screen will appear before the cross reference runs so that print and background options can be selected if you choose this option. Click checkbox to toggle between 'yes' ☑ and 'no' ☐.

Show Results by Occurrence no?. When running a field cross reference, you can optionally ask for different occurrences to be shown separately.

Usage:

Run the Cross Reference as usual, and on the 'Cross Reference Options' screen, check the box 'Show Results by Occurrence no?'.

If you check this box, each reference to a specific occurrence of a field will be shown separately on the cross reference list:

CUSTOMER ADDRESS_____-References where the Occ No was not filled in
CUSTOMER ADDRESS_001_____-References to Occ No 1 of the field
CUSTOMER ADDRESS_AI_____ -References where AI was used as the Occ No

Select Execute to run the cross reference or Cancel to cancel it.

These additional options are available to you before running the cross reference:

Define Apps. Lets you select additional applications to perform the cross reference in. If no additional applications are selected, only the current application is searched. On this screen you also have the option of selected all applications within the current application version.

Cross Reference for Literal Values

Overview

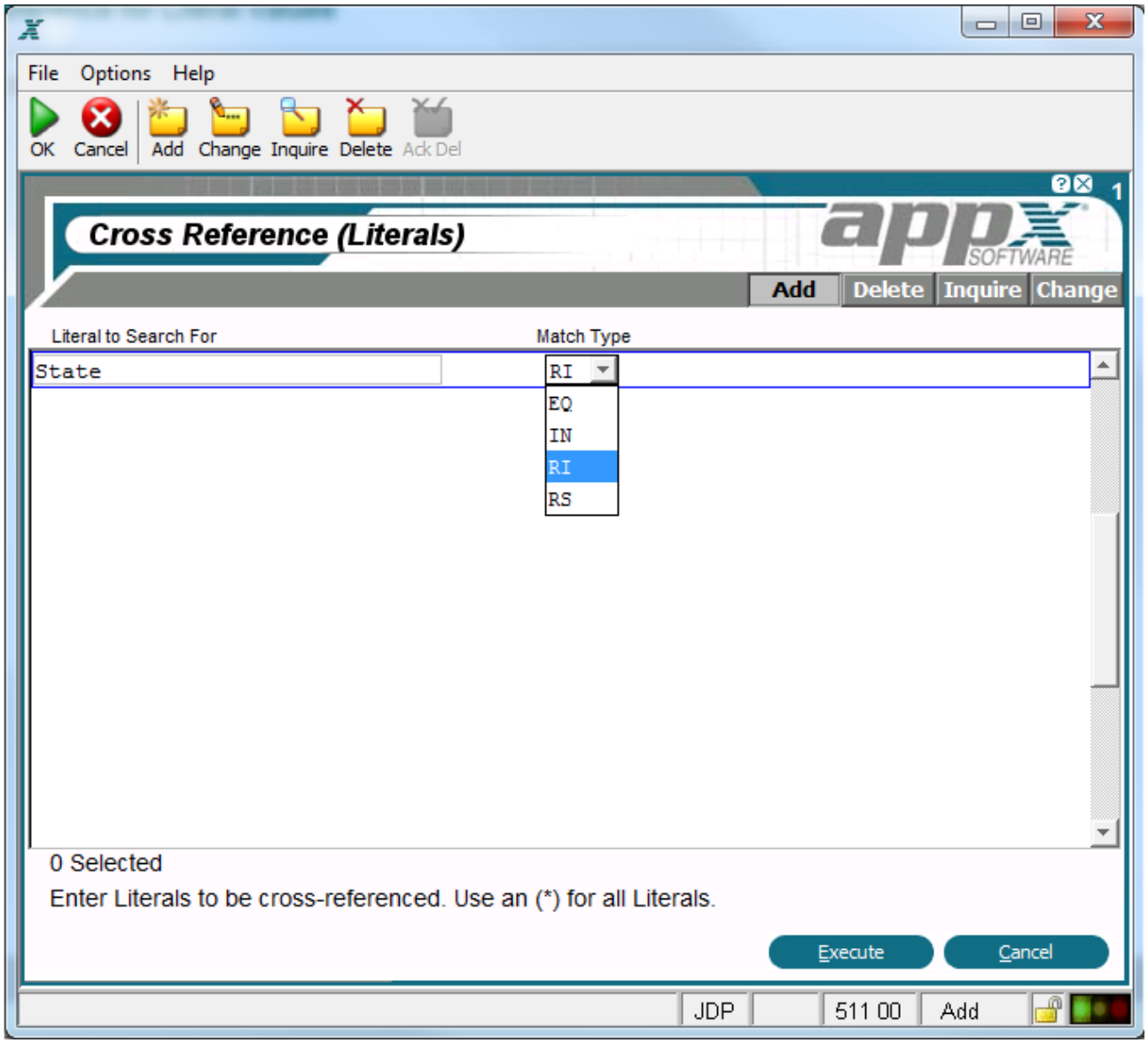
You can now run a cross reference for literals.

Usage:

On the 'Tools' tab, under 'Cross Reference', click the 'Literals' button. Fill in the literal you want to search for, or enter * for all literals. The 'Match Type' column allows you to choose the type of matching to be performed:

EQ - the literal must match exactly as entered.
IN - the literal must occur somewhere in the target
RI - the literal must match the case insensitive regular expression. For example, to find a literal "Error", regardless of case, search for "^error$" using this match type.
RS - the literal must match the case sensitive regular expression. This is the same as above, but case sensitive.

Literals will also be cross referenced when you use the 'Browse Reference' option of the Toolbox in Application Design.

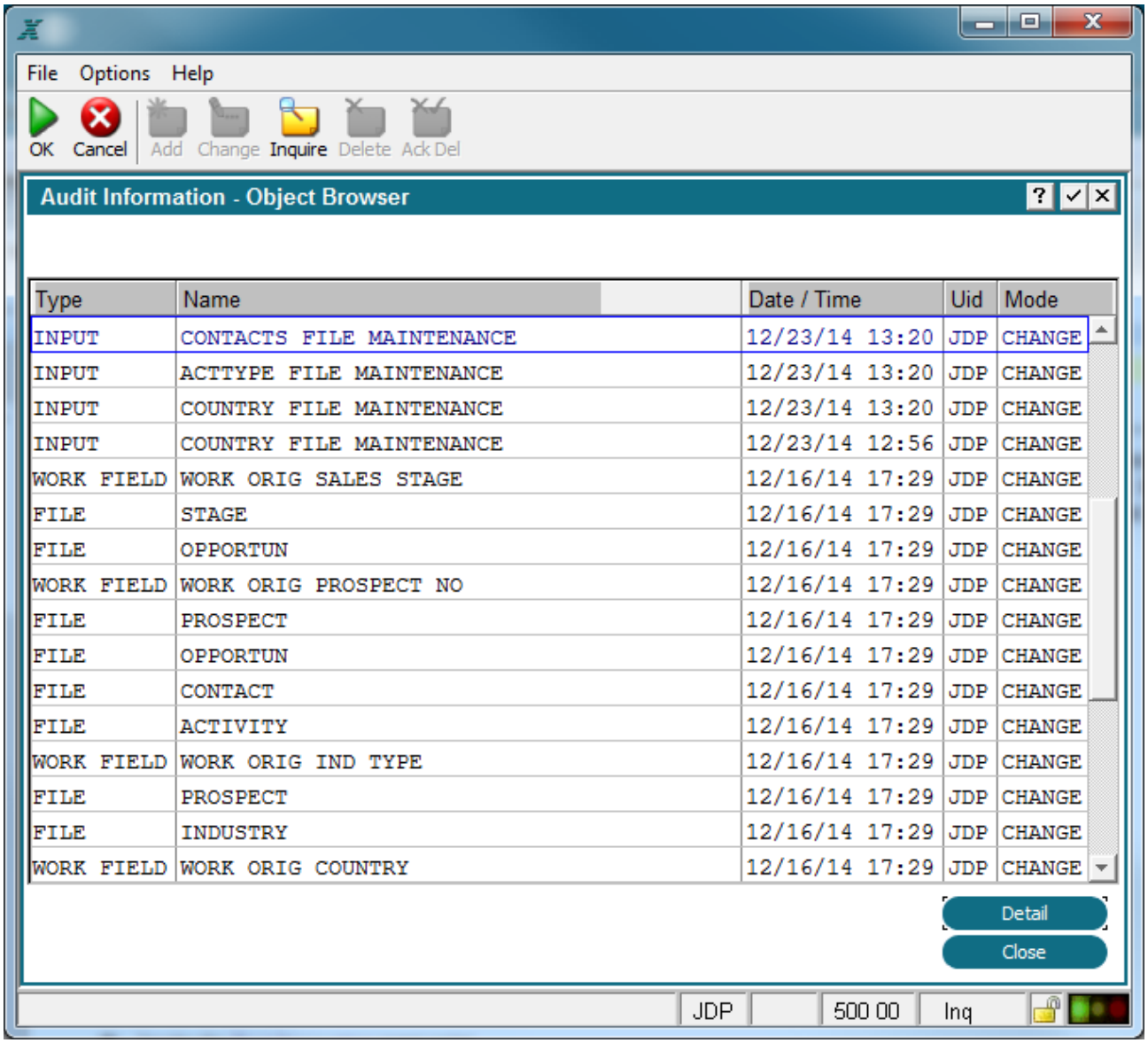


Literal Cross Reference

Audit History

While you create and modify design elements in Application Design, Appx automatically records key information on which elements were changed. The archive of this information is the Audit History.

Audit Browser allows you to page through the detailed audit history. Listed is the process type, name, date and time, user id, and Appx mode. See below; Further detail can be viewed or modified for this audit entry by clicking the Detail button in the lower right corner.



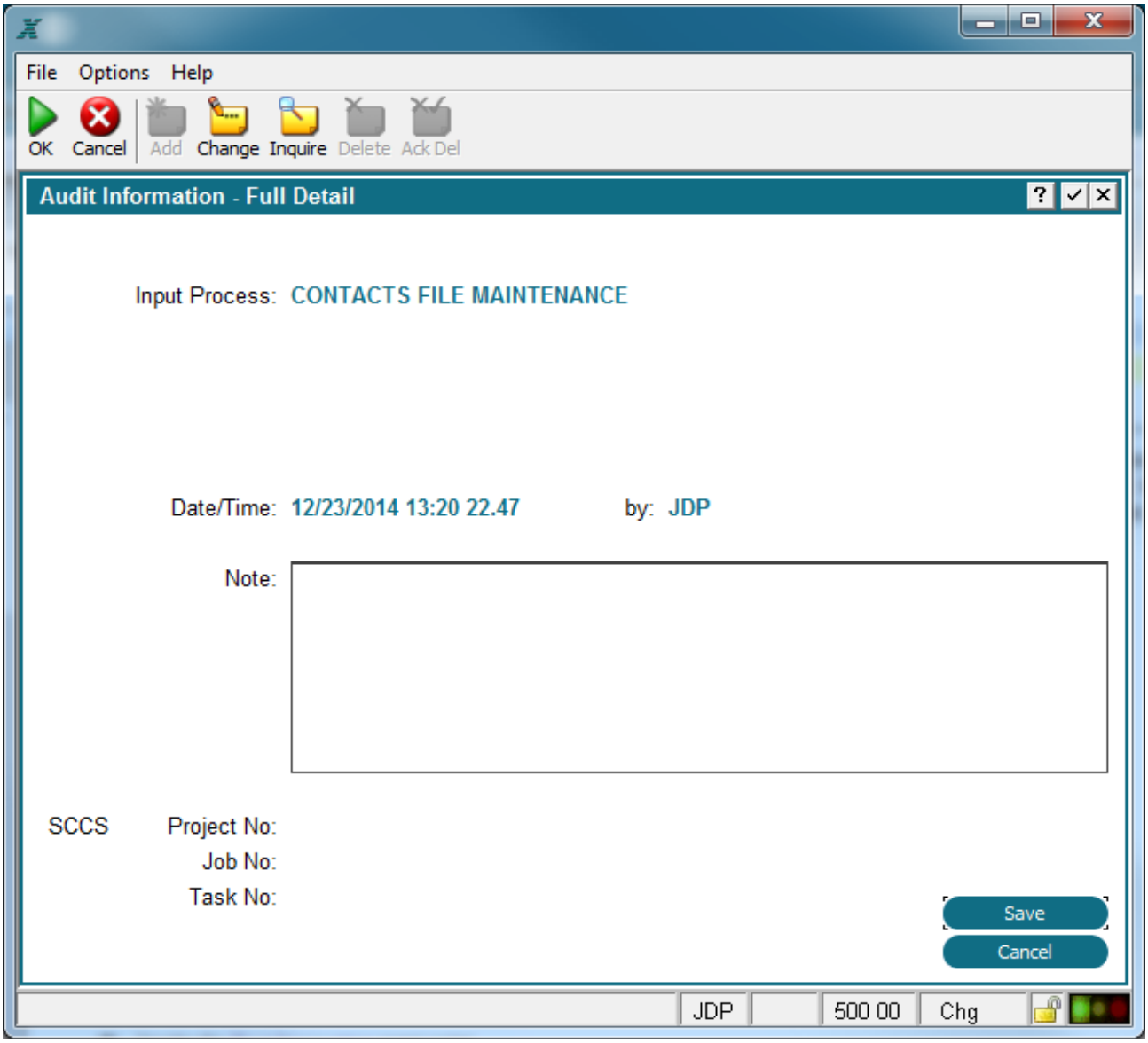
Audit Information Object Browser

Audit Information - Full Detail The Detail button on the Audit History Browser screen will display the Full Detail screen for the selected process. The process type, name, date and time, and user id are repeated from the Audit Browser. The Designer can enter a Note which further explains what was changed in this process. SCCS Project No, Job No, and Task No are also displayed if this process is associated with the Source Code Control System.

SCCS is defined and managed in System Administration. Source Code control allows you to control and track changes to your applications.

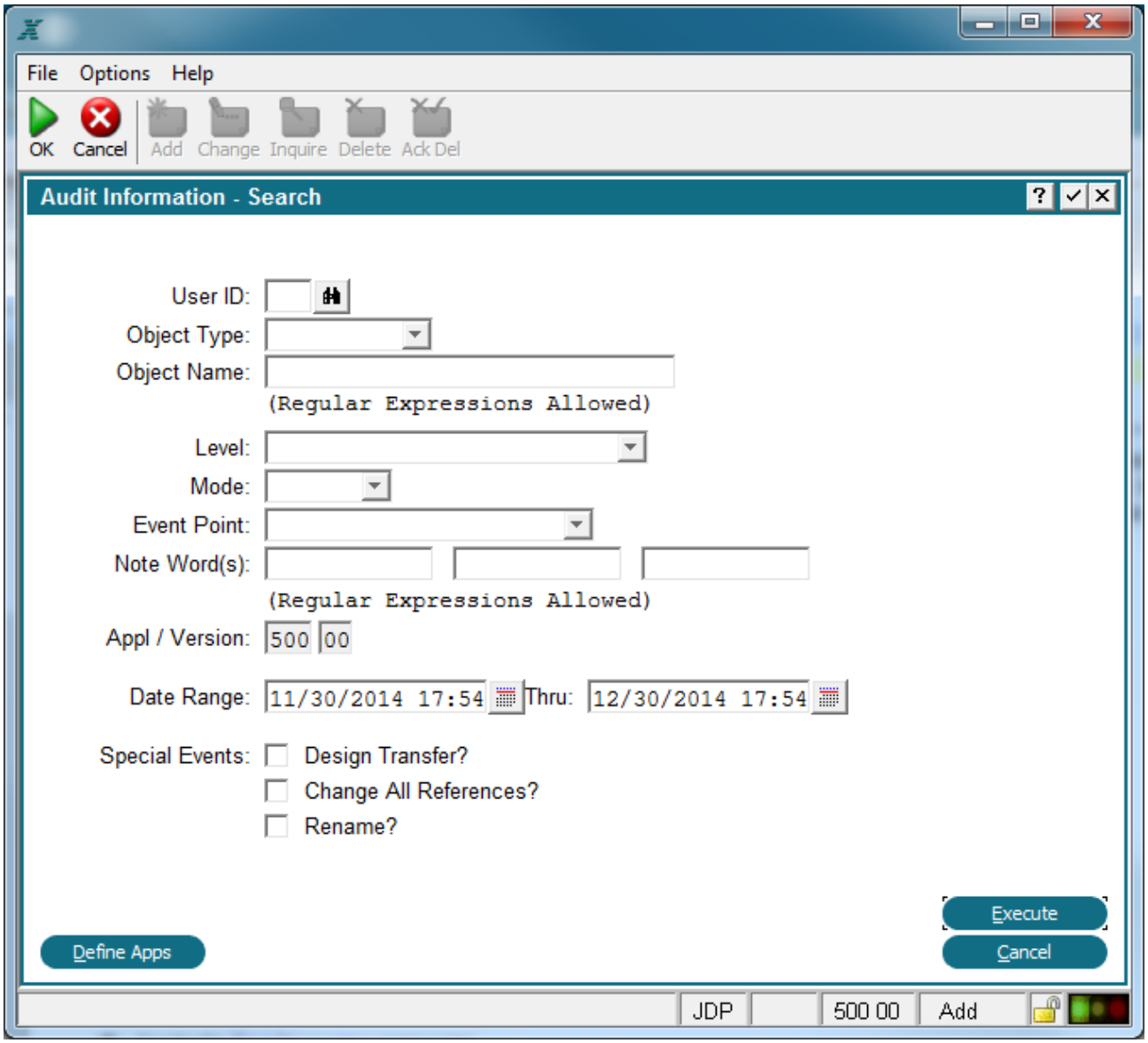
You can define Projects, which can contain multiple Jobs, and each Job can contain multiple Tasks. You can require designers to log their changes against specific Tasks, or just use the system to passively track changes.

You can also restrict the scope of changes for a given Project / Job / Task, so that only certain Appx Objects can be changed.



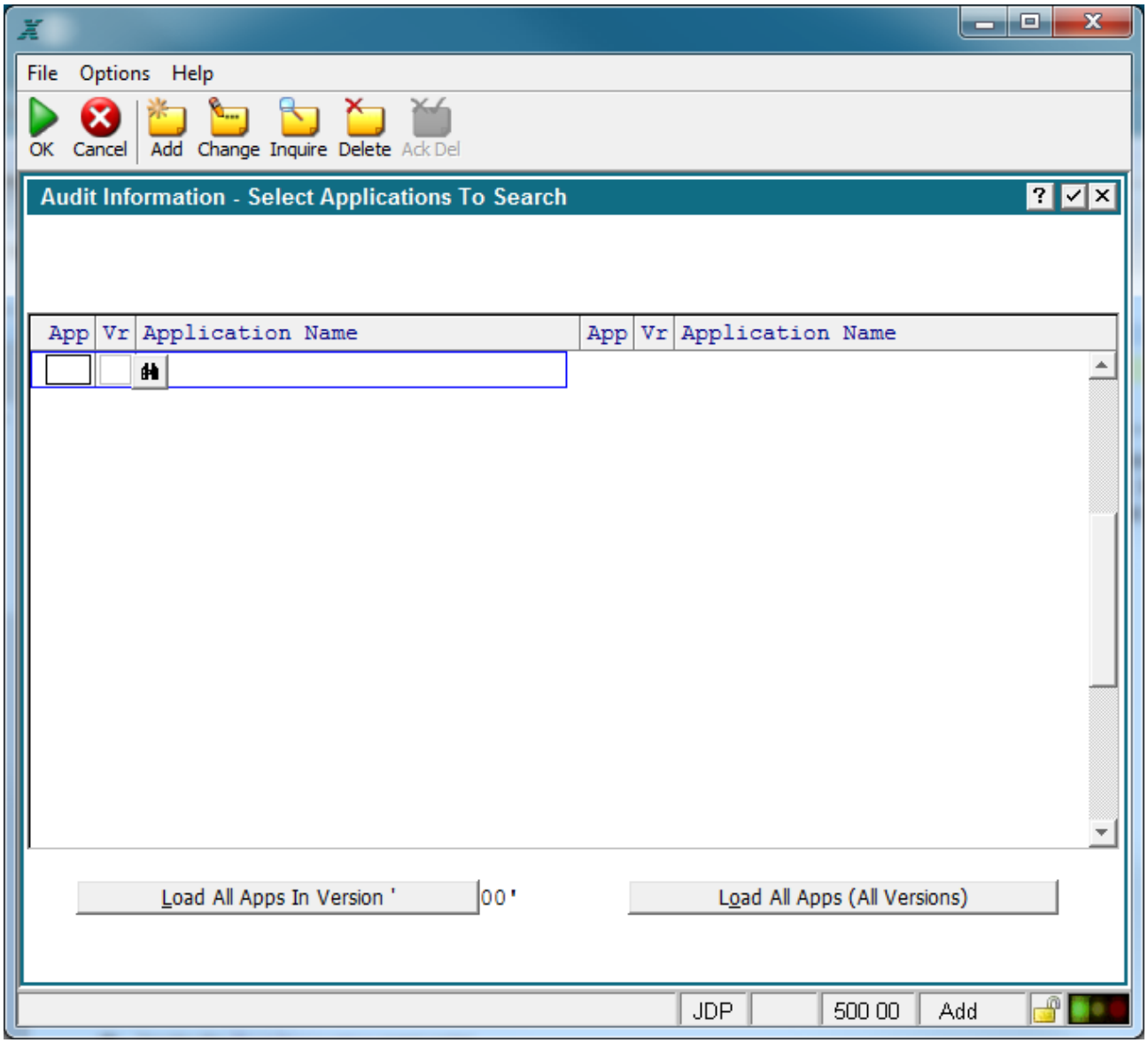
Object Browser Detail Screen

Audit Information - Search. Allows you to perform searches on the detailed audit history.



Audit Search Screen

Define Apps. Use this option to select additional applications to search.



Define Apps Screen

Physical File Management

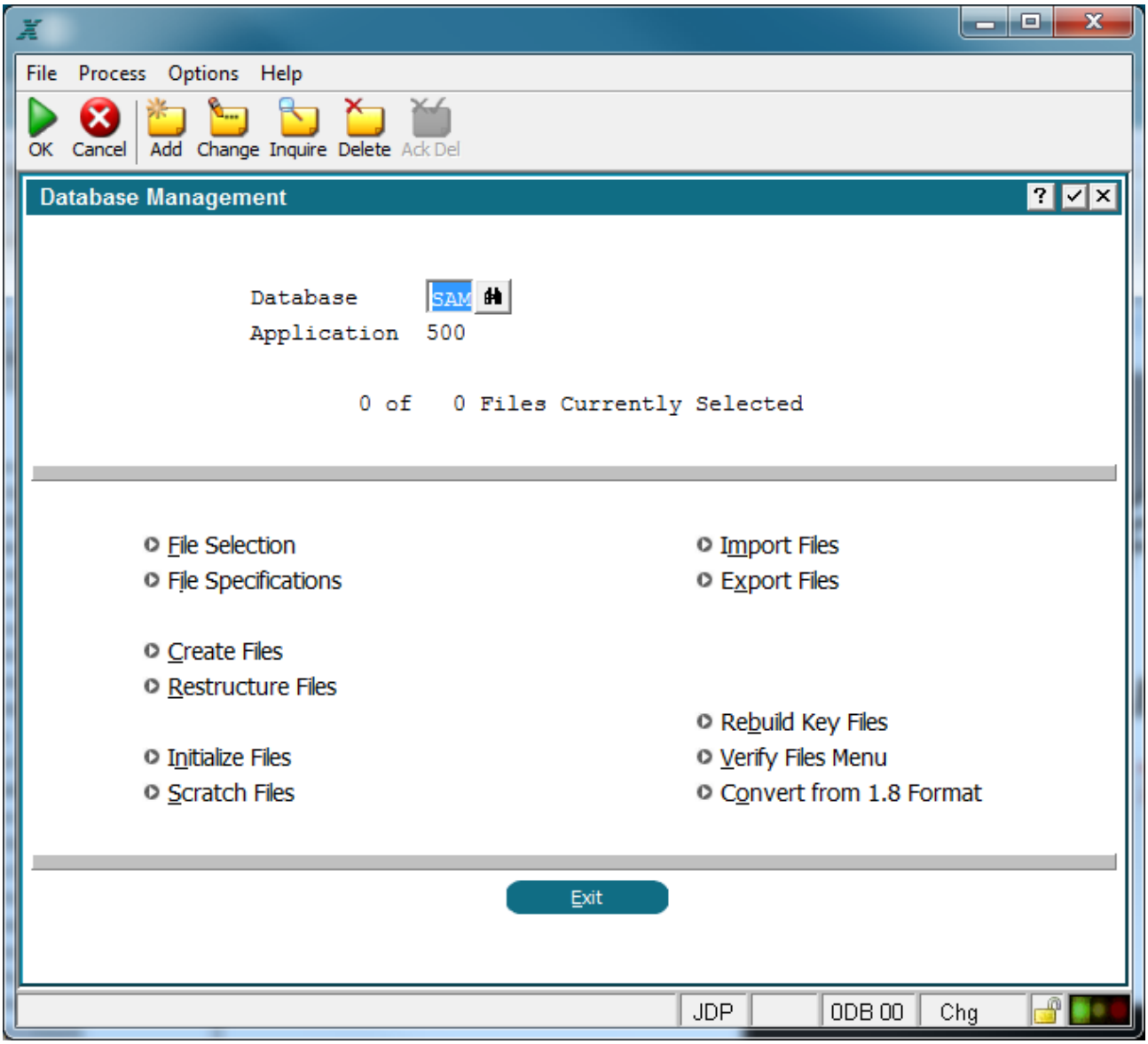
The File Management option under Physical File Management allows you to manage data files for a specified database/application.

Overview

The files you are manipulating using the File Management option are your application data files. You designed these files using the File Structures option on the Application Design Specification tab. The content in these files is what you, and your users, have entered using your processes. These files are not

to be confused with Application Design Files described earlier in this manual. Appx is written using Appx. As such the data files for Appx are referred to as Design Files. Although this management menu, below, is very similar to the Design Files menu, the files here pertain to your application.

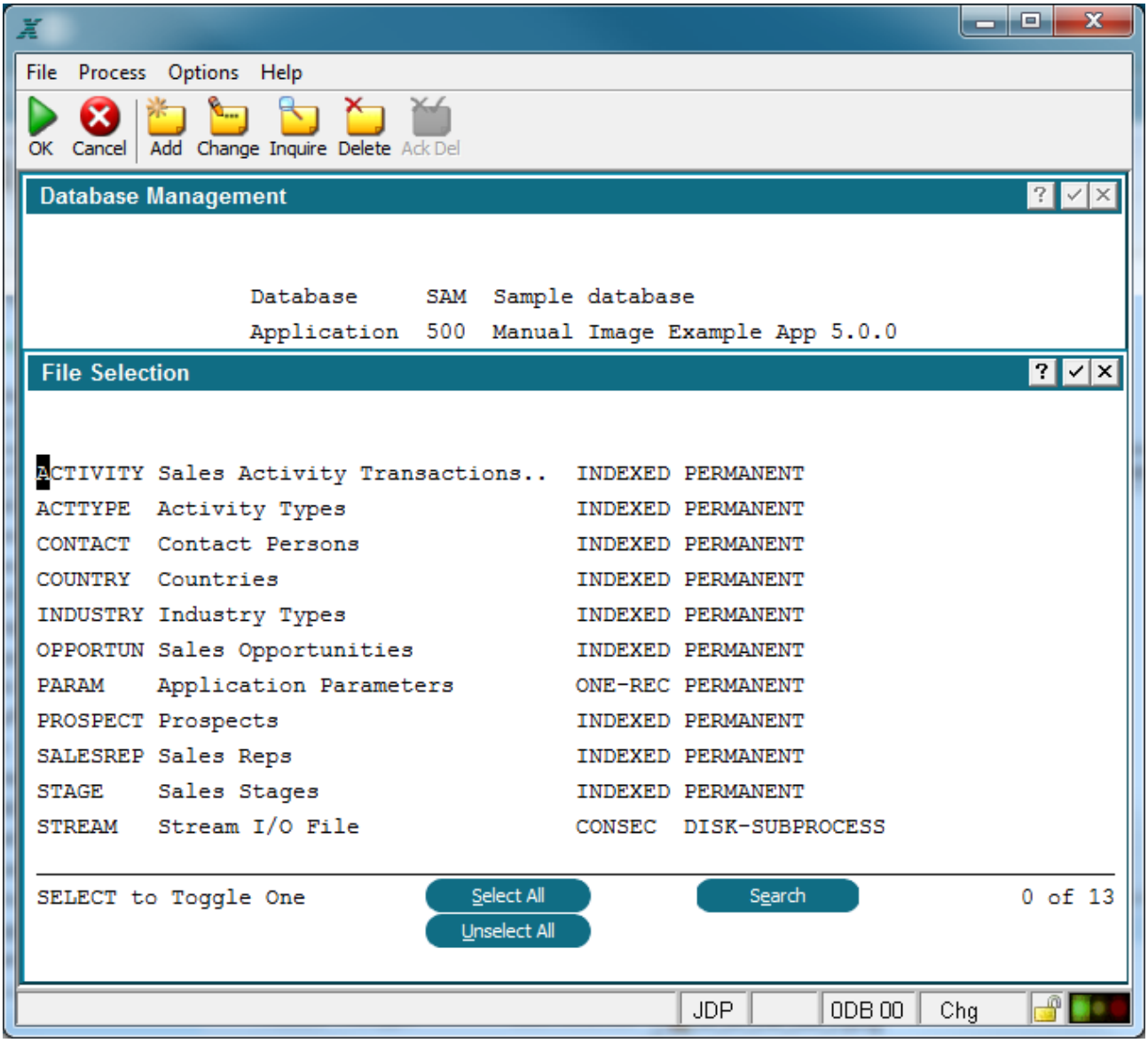
Upon entry into Physical File Management the Database Management menu will be presented. The current application and associated Database is defaulted into the search fields. You must select the particular file(s) you wish to process. Pressing Enter or clicking File Selection will select all the files for this Database (all the files defined in your application). Use the File Selection option to select the individual file(s) you wish to work with.



Database Management Menu

Database Management File Selection

File Selection. File Selection allows you to identify which files you want to work on. All the files in your application will be listed. See below.



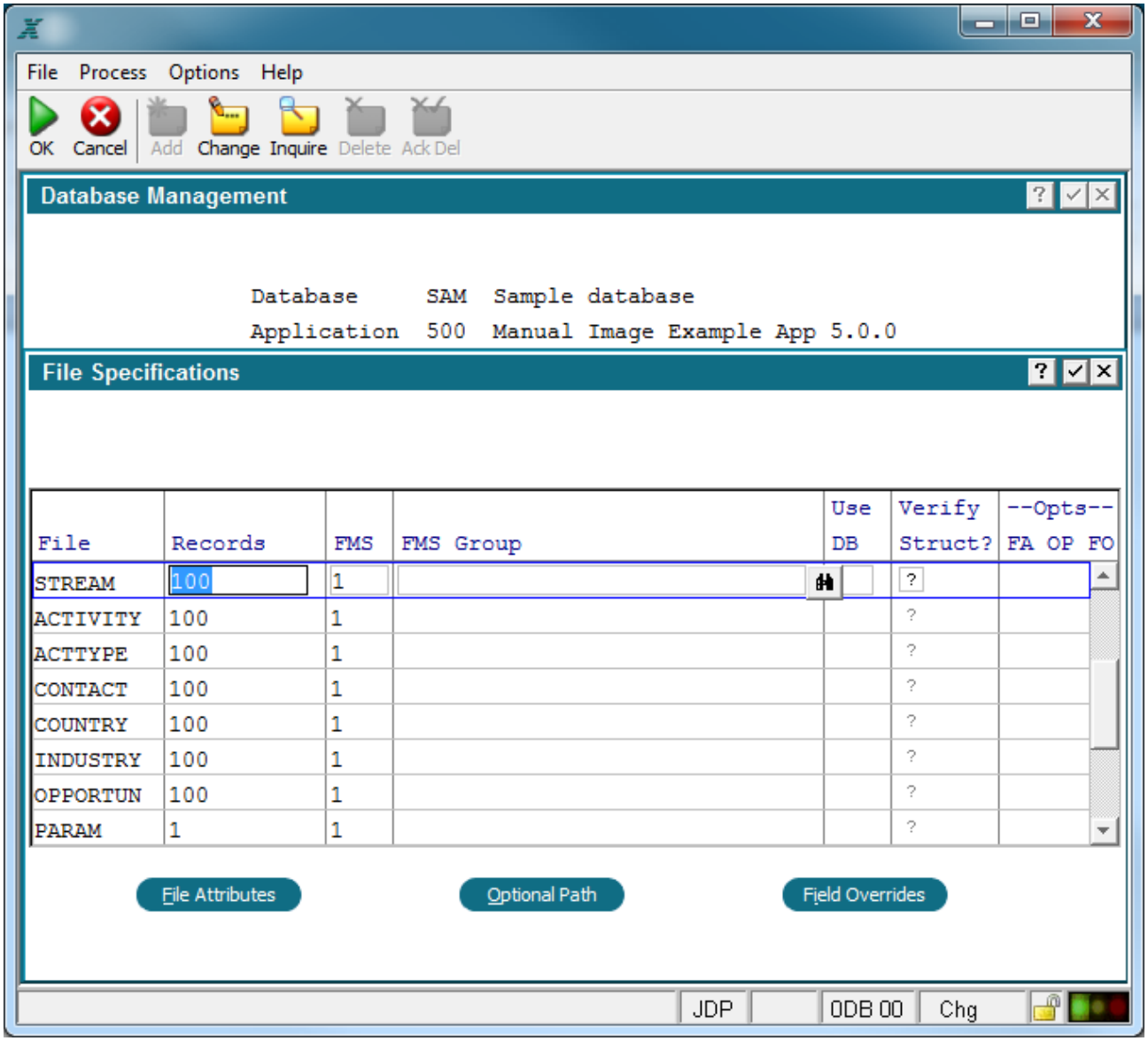
File Selection Screen

To select a file, use your down arrow key or mouse to place the black cursor on the first letter of the file name then press return. The file name text color will change from black to blue indicating the file was successfully selected. Once you have selected the files you wish to process press the Enter key. Optionally you can select all the files by clicking the Select All button. Clicking Unselect All will clear any files previously selected. If you have a lot of files you can Search for the filename. When you click the Search button enter the file name (or the first few letter of the filename) and press the Enter key. The file list will be redisplayed starting at the search criteria.

> Note the number of files selected is shown in the lower right part of the screen. You should always confirm the number of files selected before continuing to prevent accidentally processing unintended files.

Database Management File Specification

Files Specifications allows you to enter information about each file. A screen shot of the Specification display is shown below.



File Specification Screen

Records. Used to estimate the approximate number of records for each of the design files of a new application. Remember, the numbers you enter represent the total number of records of each type for the entire application. Using older computer systems relied on this estimate to reserve space on the system to store data. Today this isn't as critical.

FMS. File Management System, specifies the access method to be used.

FMS 1 - APPX's default ISAM, known as APPXIO
FMS 2 - ACUCOBOL's Vision ISAM, on Unix systems only.
FMS 3 - Informix's C-ISAM, on Unix systems only.
FMS 4 - Sybase (Not Currently Supported)
FMS 5 - Oracle
FMS 6 - ODBC
FMS 7 - APPX/Net
FMS 8 - DB/2

Some of these interfaces are separately licensed products from their respective vendors and require additional files from APPX Software.

FMS Group. FMS Group allows you to specify the file management group that this file belongs to. The FMS Group and the FMS reference the system defaults file in system administration, which provides default values for certain file specifications. You may press SCAN to get a list of Valid FMS Groups. FMS Groups are maintained in System Administration, Configuration, File System Groups. If this file is a temporary file, you may find it useful to specifically define the preferred directory for the file. APPX needs read/write/modify security clearances for anyone using temporary files.

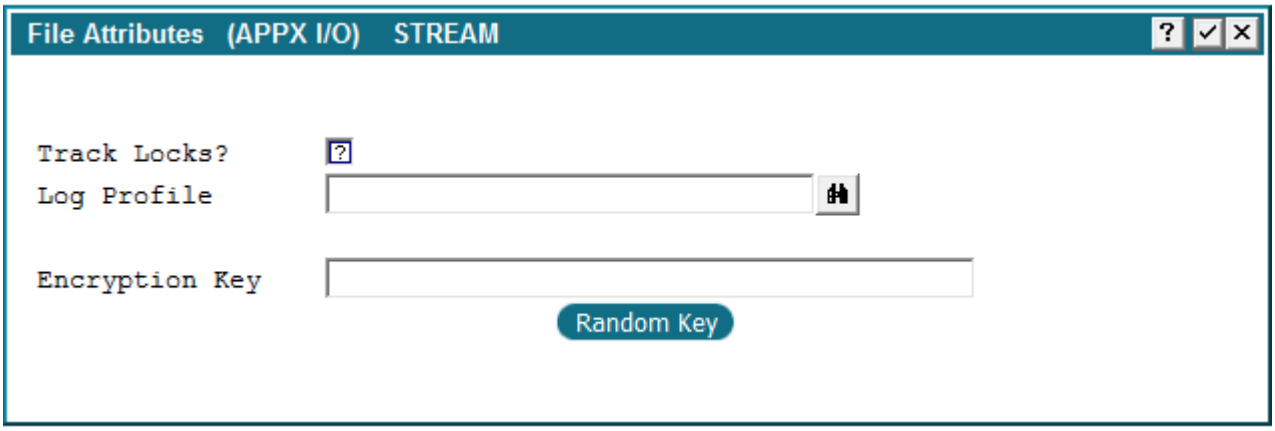
You can also establish a unique directory using the Path field in the overlay that is presented when you press RETURN.

Use DB. Use DB (Use Database) (optional) APPX allows multiple databases to share a single file or set of files. If you enter a value in this field and the estimated number of records you specified for the file is zero, APPX uses (shares) the database that you specify here when referencing the file.

Verify Struct?. This feature is not currently implemented. Do not change its default value of "blank".

Opts. Options will be highlighted if present.

File Attributes. File Attributes at the file level can be used to override the FMS Group Attributes specified at the "File System Group" level. This provides necessary information for accessing files for certain FMS Types. Some FMS Types use the older Control String. Beginning with APPX 4.1, some FMS Types use specification based attributes. You will be presented with the appropriate screen for the FMS Type. The figure below illustrates the File Attributes overlay for the STREAM file.



File Attributes Overlay

Track Locks? This is primarily used for debugging your programs. If you set this to Yes, APPX records extra information for this file whenever a record is locked. There is a performance penalty when you use this option (two extra I/O operations for each successful read with hold) so you may want to apply this option selectively.

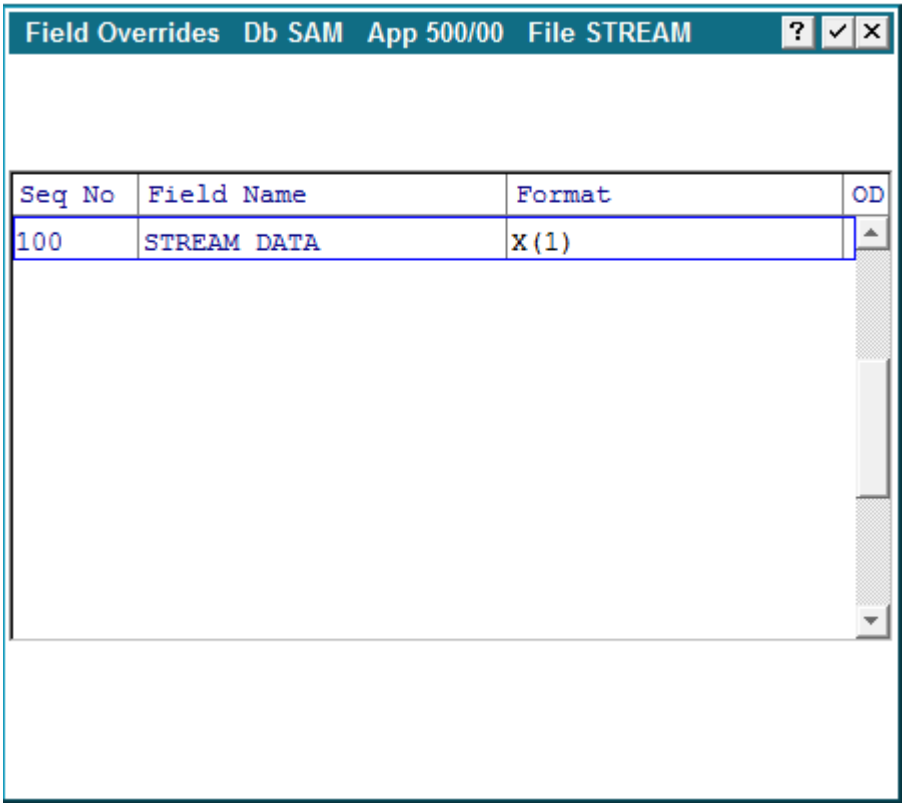
Log Profile. Log Profile is a system dependant value that designates which Log Profile to use with this FMS group. Fill this in only if you are setting up an FMS group for logging.

Encryption Key. Enter up to 40 characters to use as an encryption key. You can also use the 'Generate Random Key' option to have the system generate a 40 character key for you.

Option Path. Path allows you to override the standard default path name that APPX automatically assigns. This is a system-specific value. It should be the physical location of the tree starting-point from which the location of the actual datafile is derived. On a non-Unix system, it could be a disk drive override. On all systems, it can be a subdirectory override. If left blank, APPX uses the combined FMS Group and FMS values provided on the File Specifications screen to retrieve the FMS path name from the File System Groups file. If the FMS Group on the File Specifications screen is blank, APPX uses the standard values for FMS Path.

Optional Path Overlay

Field Overrides. Field overrides are used by the RDBMS interfaces (Oracle, Sybase, ODBC, etc.). With field overrides an administrator can specify field level parameters to be used by the engine in communicating with the RDBMS.

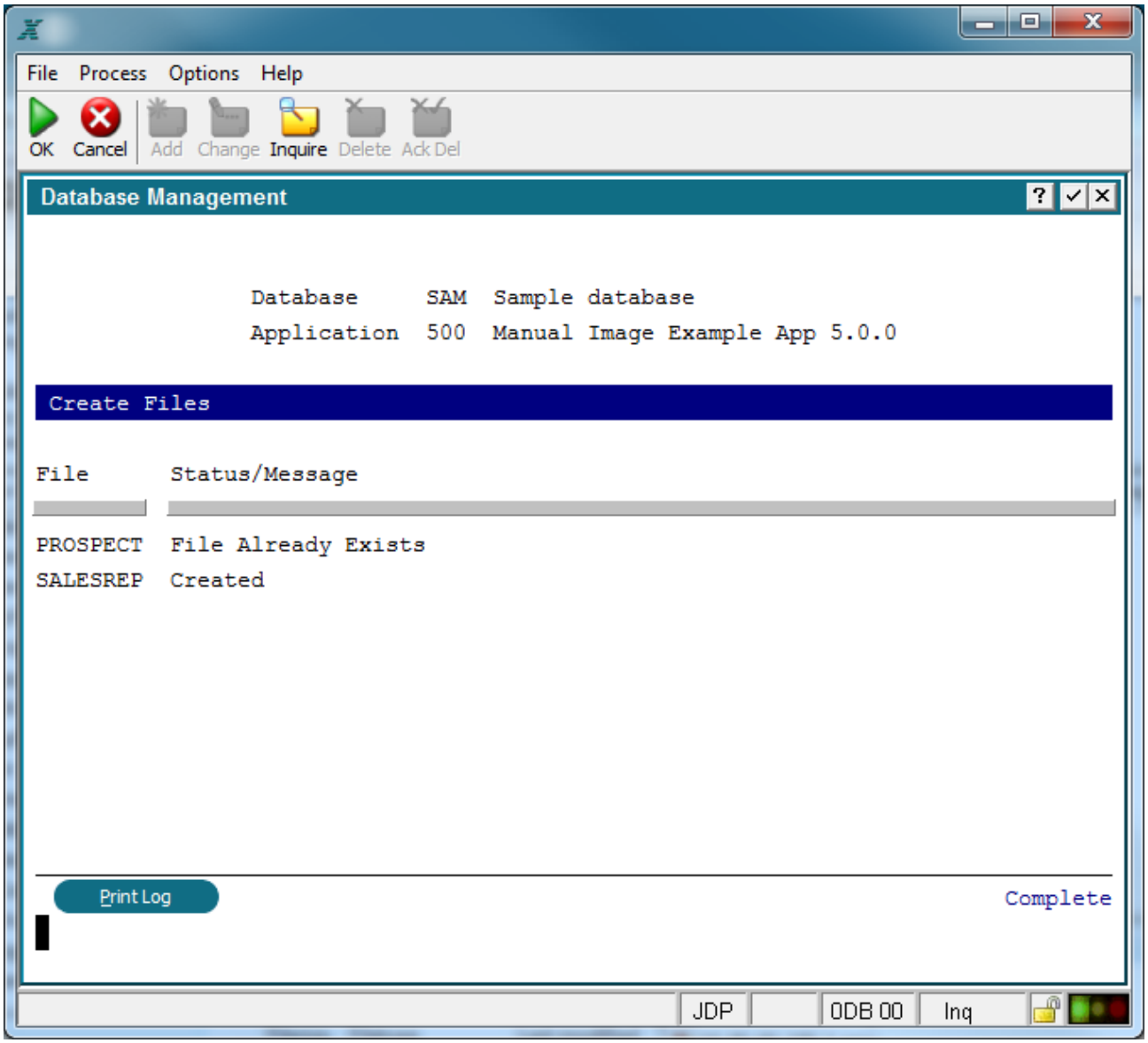


Field Overrides Overlay

Database Management Create Files

Create Files is used to create the initial set of files. Appx does not automatically create files you have defined in your application. After you have developed your file specification using File Structure the file must be created. The physical location of the file will depend on your FMS setting. For example, if you define a File Structure for storing information pertaining to Sales Reps and write an Input process for entry of that information, you must CREATE the file before running the input process for the first time.

The Create Files options does not require any input and will create the selected file(s) when invoked. If a file already exist it will be bypassed. The figure below shows the SALESREP file as being successfully created. The PROSPECT file already existed and was bypassed as indicated by the message. It's pointless to attempt to create a file that already exist however no harm will come to the file.

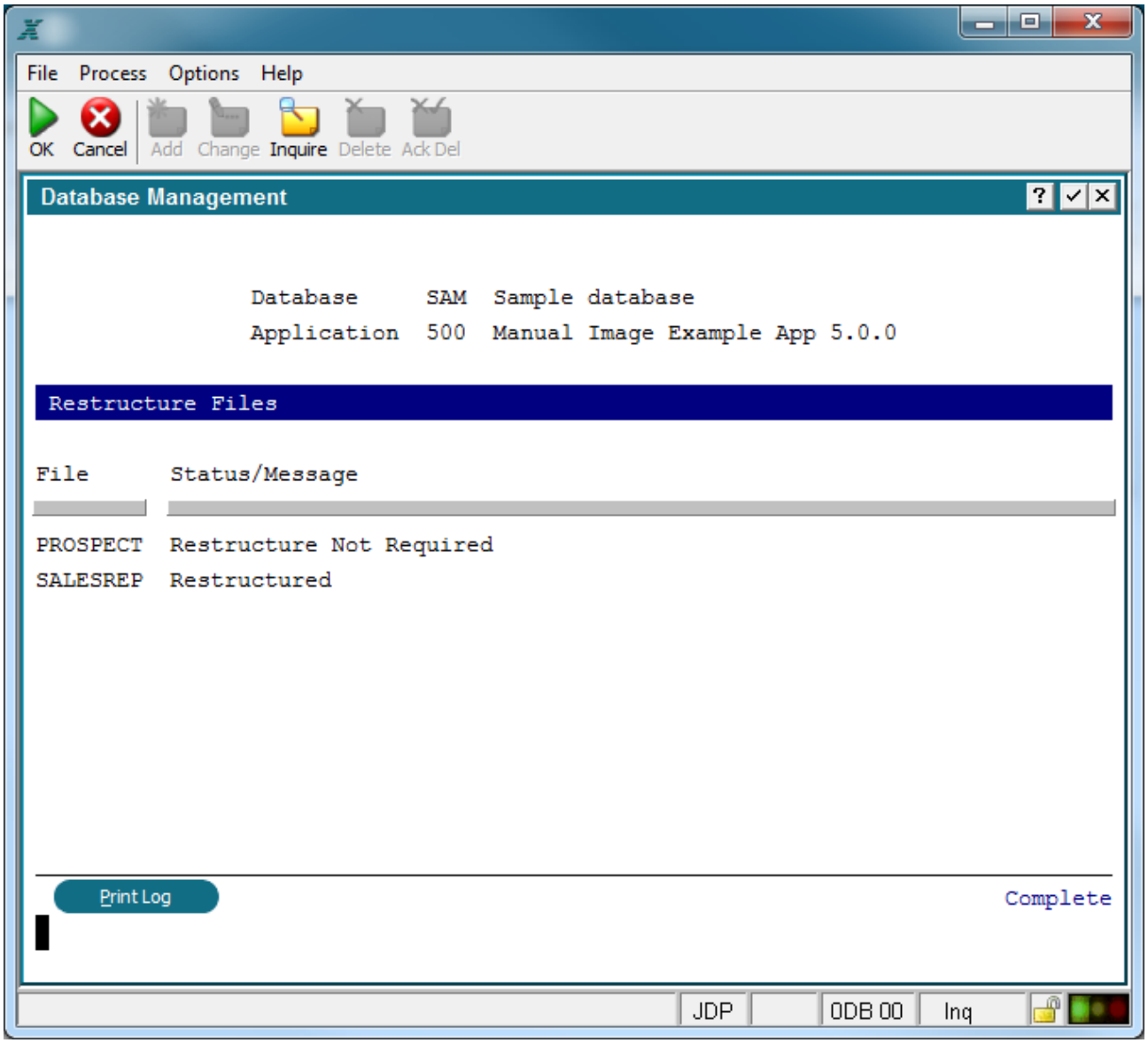


Create File Screen

The Print Log option will simply produce a report (file) showing the results of the CREATE process.

Database Management Restructure Files

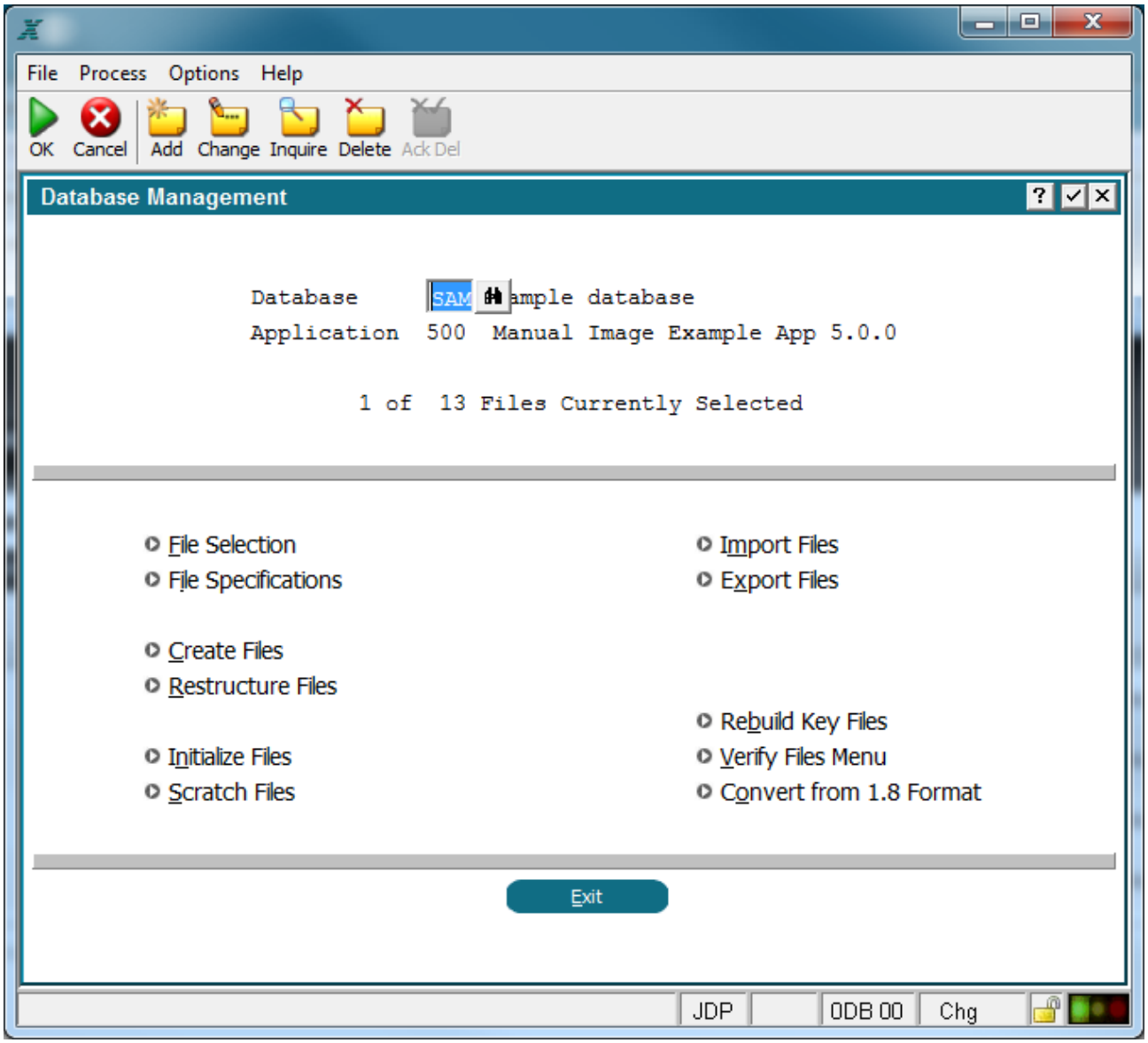
Restructure Files should be run when you make a change in the Data Dictionary that affects the structure of a given file, such as adding a new field or expanding the length of an existing field. Appx does not automatically restructure files. Anyone attempting to access a file that needs restructuring will receive an error message until the file is successfully restructured.



Restructure Files Screen

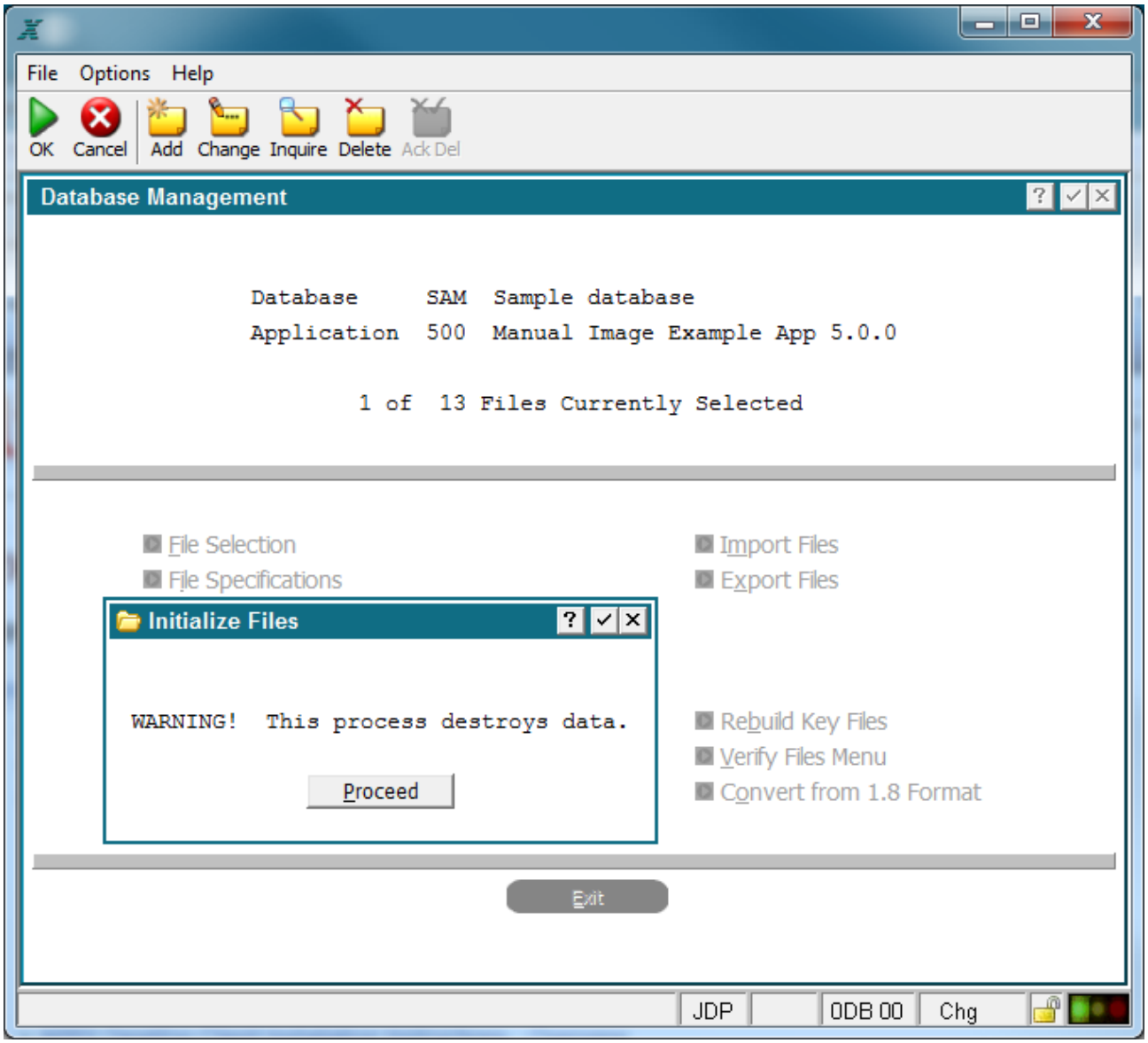
Database Management Initialize Files

Occasionally the need arises to erase the contents of one or more files. The **Initialize Files** option allows you to delete all the records in the selected file at once. It is very important to select only the files you wish to initialize. To assist in this, notice the message "1 of 13 Files Currently Selected" in the figure below. That indicates that of the 13 files in my application database, one is selected to be processed. Note the name of the file is not shown on this screen. If you are not sure which file is selected, click Exit.



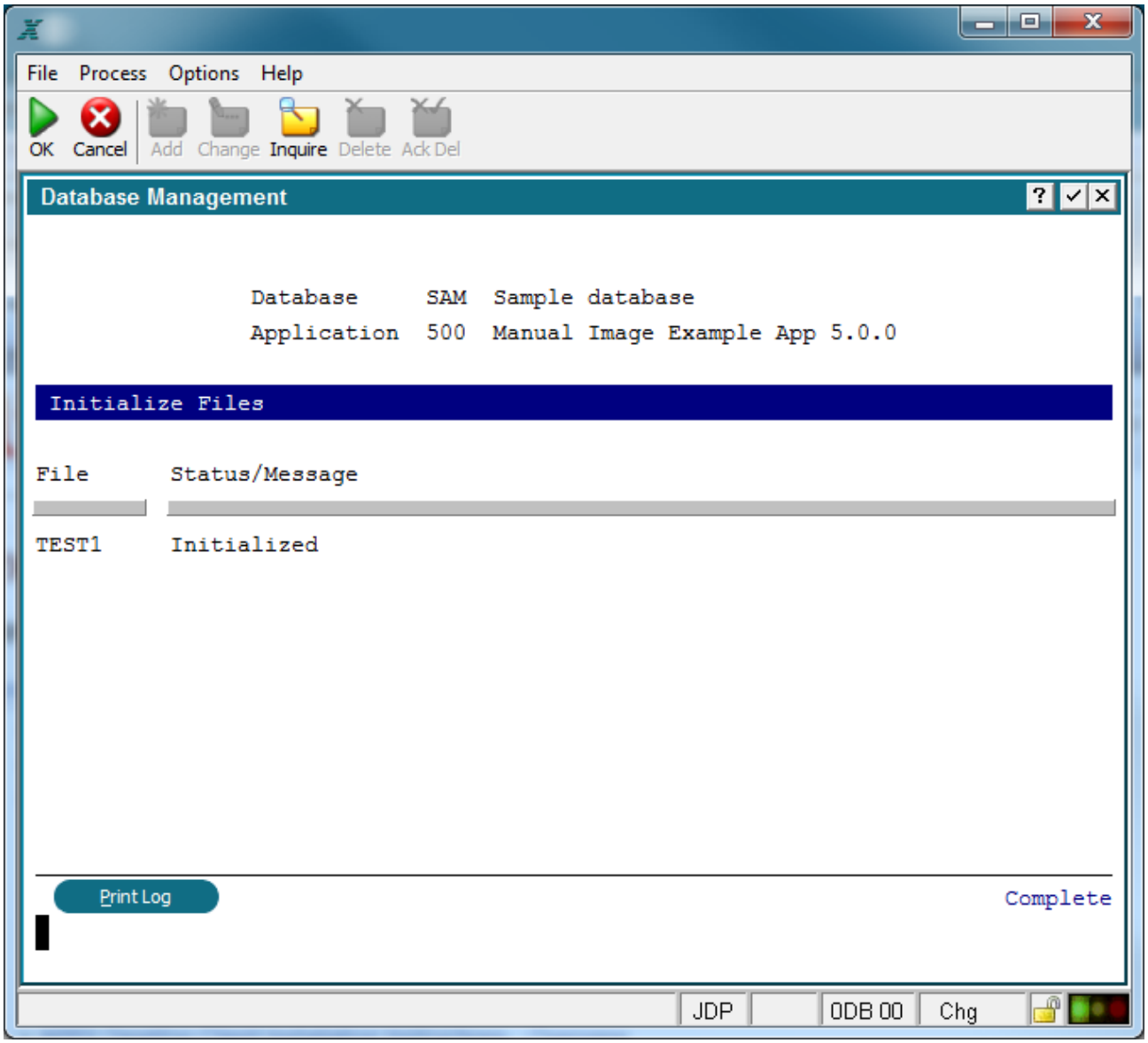
Initialize Files Option

You will receive a warning message when you select the Initialize Files option, advising you that you will destroy data if you continue, See the figure below. You can then choose to return to the menu instead of initializing the file. If you continue, you will see a 'status' screen that shows you each file as it is being initialized. Select proceed to continue.



Warning Message

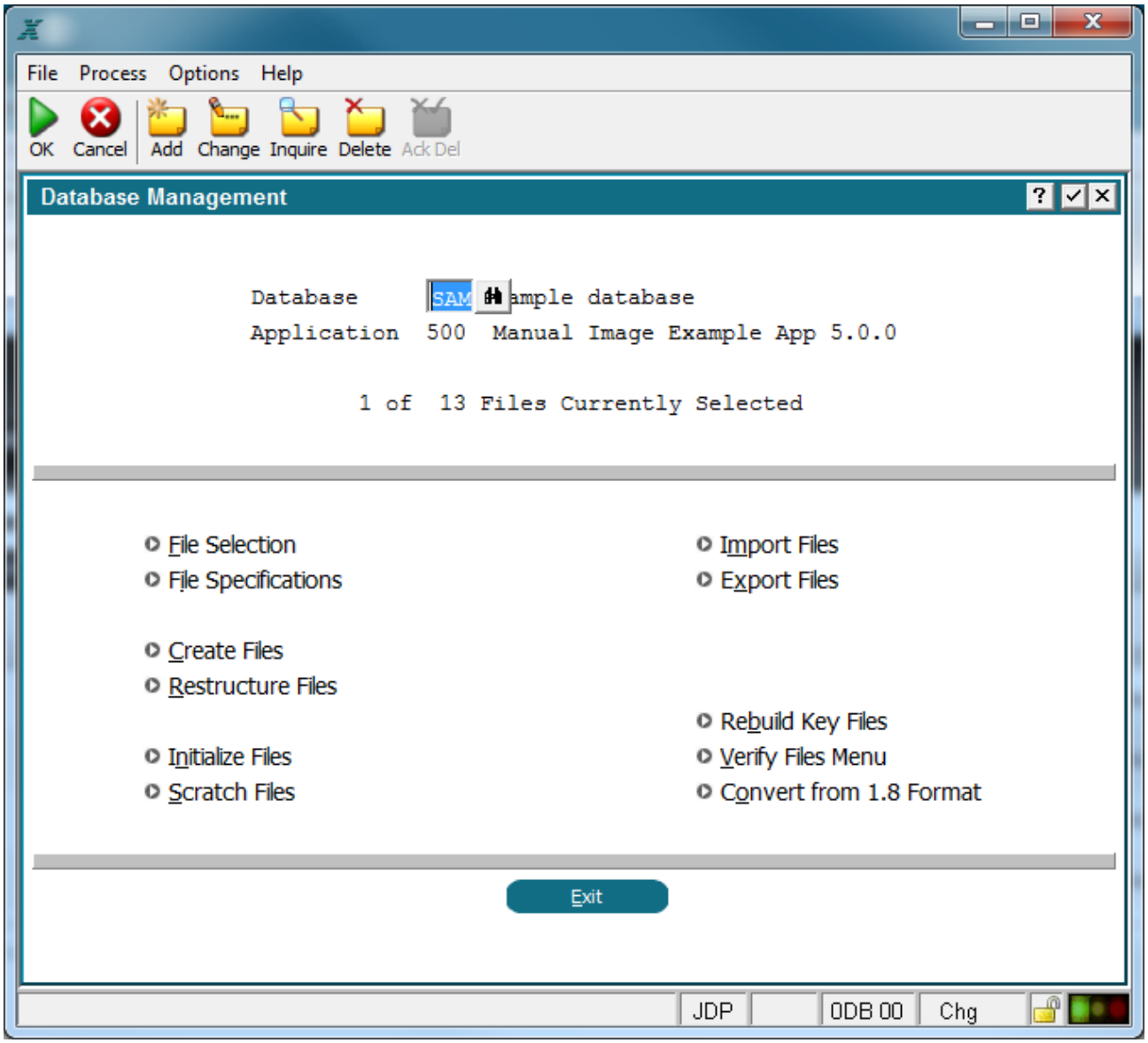
When the Initialize file option runs, each selected file will be listed along with the status of the operation, figure .



Process Results Screen

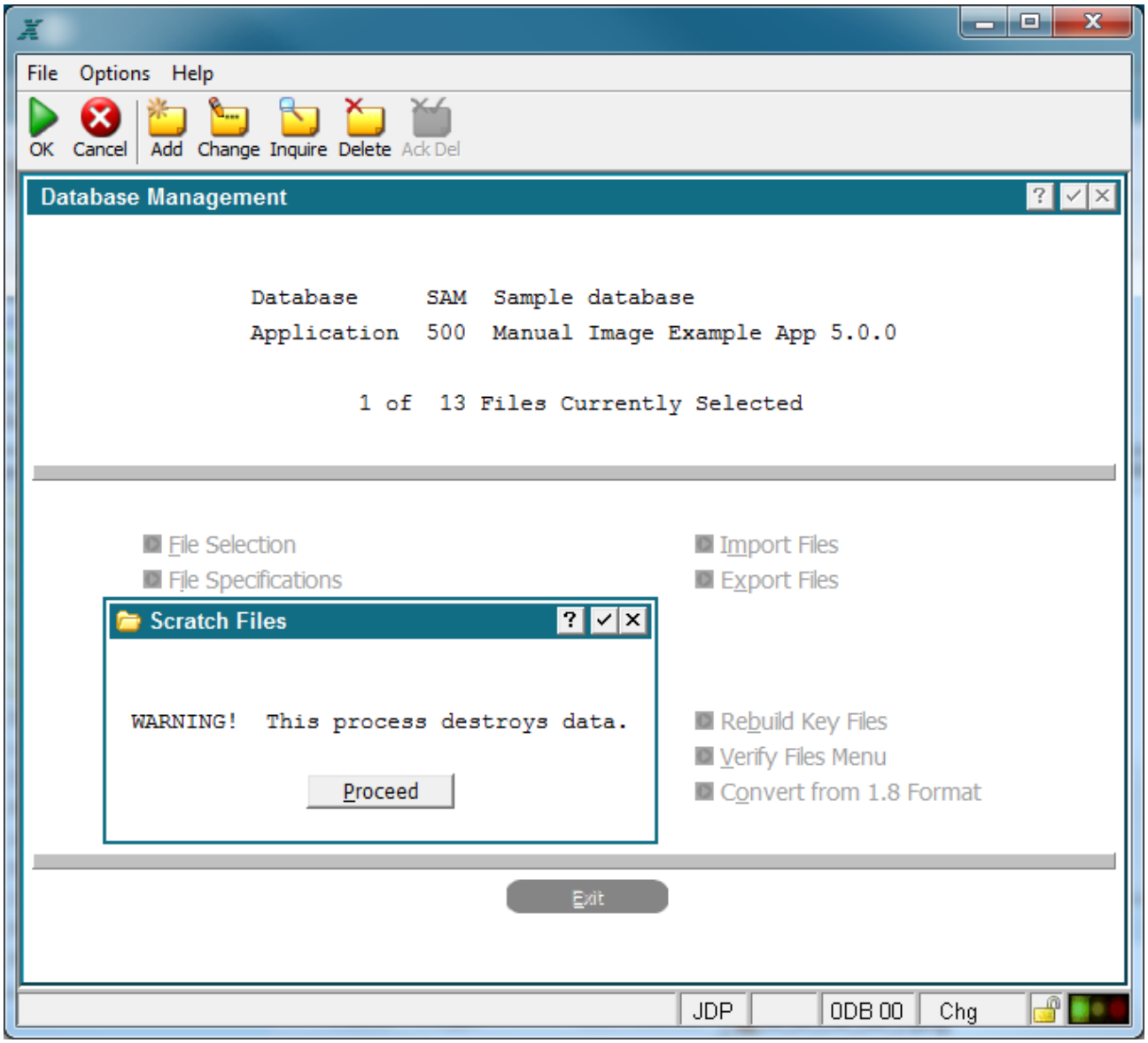
Database Management Scratch Files

Occasionally the need arises to eliminate one or more files completely. This option allows you to remove the selected files from the disk. It is very important to select only the files you wish to scratch. To assist in this, notice the message "1 of 13 Files Currently Selected" in the figure below. That indicates that of the 13 files in my application database, one is selected to be processed. Note the name of the file is not shown on this screen. If you are not sure which file is selected, click Exit.



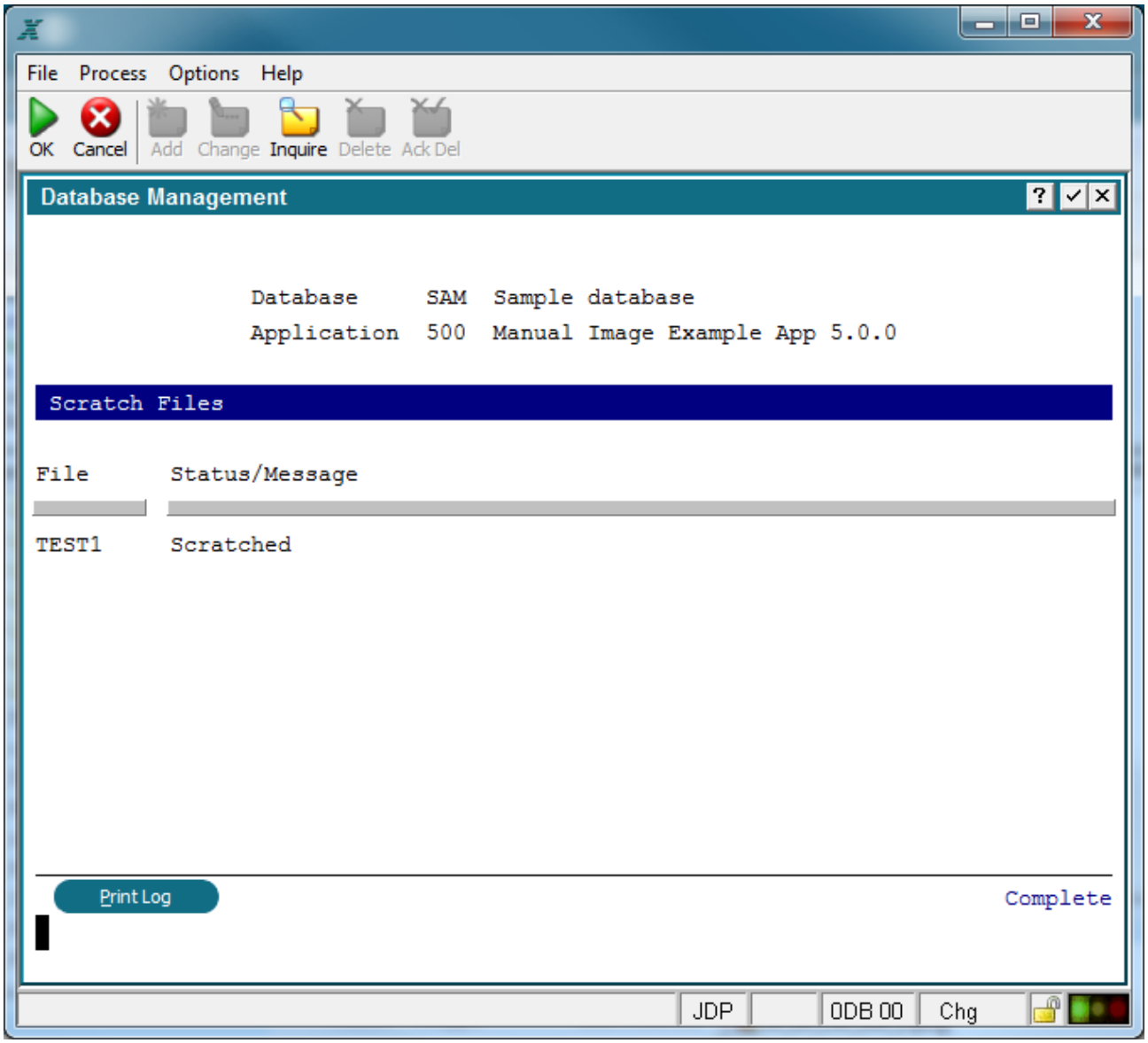
Scratch Files Option

You will receive a warning message when you select the Scratch Files option, advising you that you will destroy data if you continue, see the figure below. You can then choose to return to the menu instead of scratching the file. If you continue, you will see a 'status' screen that shows you each file as it is being scratched. Select proceed to continue.



Warning Message

When the Scratch file option runs, each selected file will be listed along with the status of the operation, See example below.



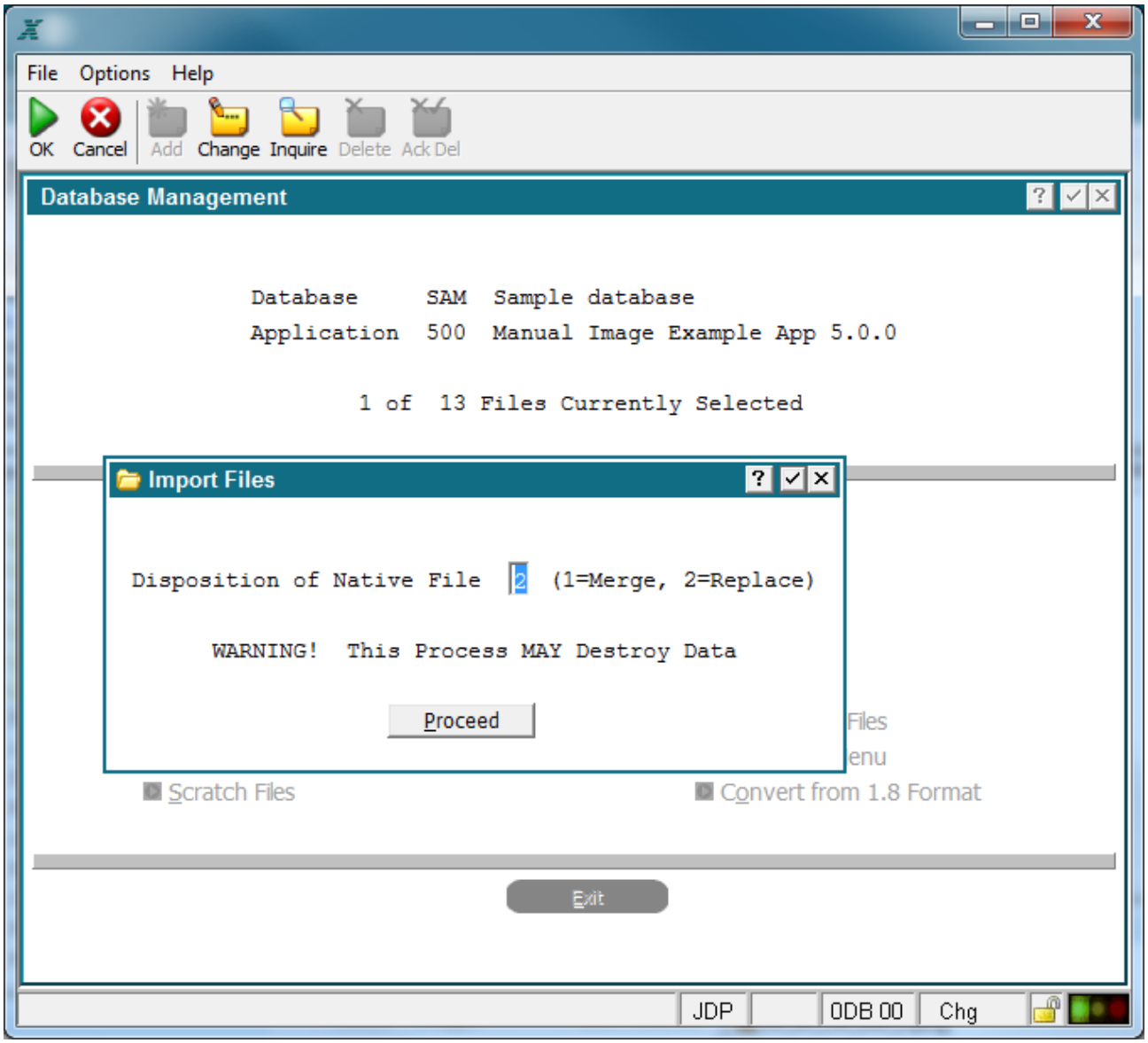
Process Results Screen

Database Management Import Files

Import Files

If you are converting an existing application from an outside design, you can use this option to import the existing data. It must be in the specific format required by the import process.

When you select this option, the overlay shown below appears.



Import Files Overlay

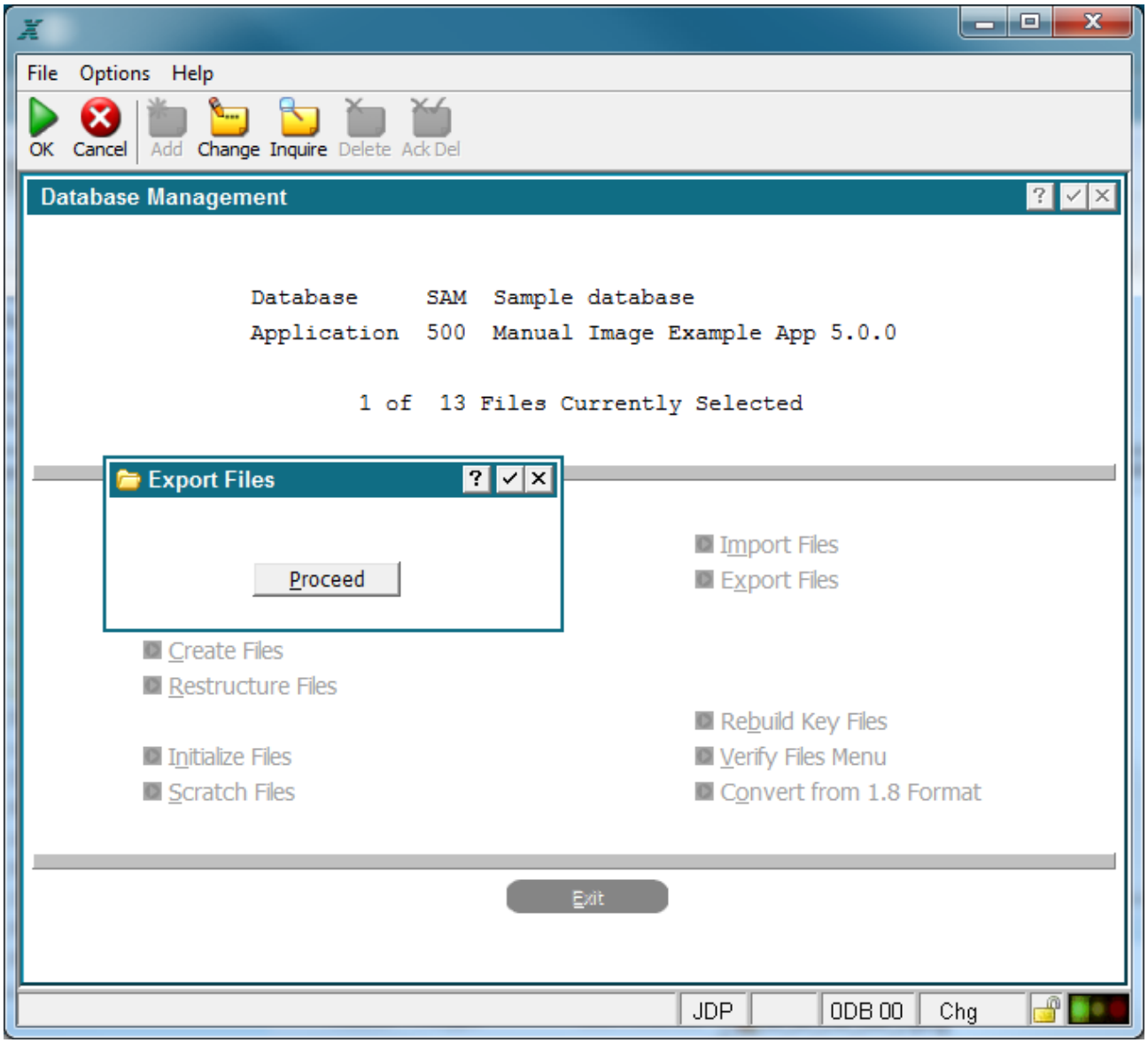
The following fields are available on the Import Files overlay.

Disposition of Native File. Enter 1 if you wish to merge the external file with any data already in the existing design file. Enter 2 if you want the external file to replace the existing design file. If there are no records in the existing design file, enter 2.

Select proceed to begin the import. A 'status' screen will show you each file as it is being imported.

Database Management Export Files

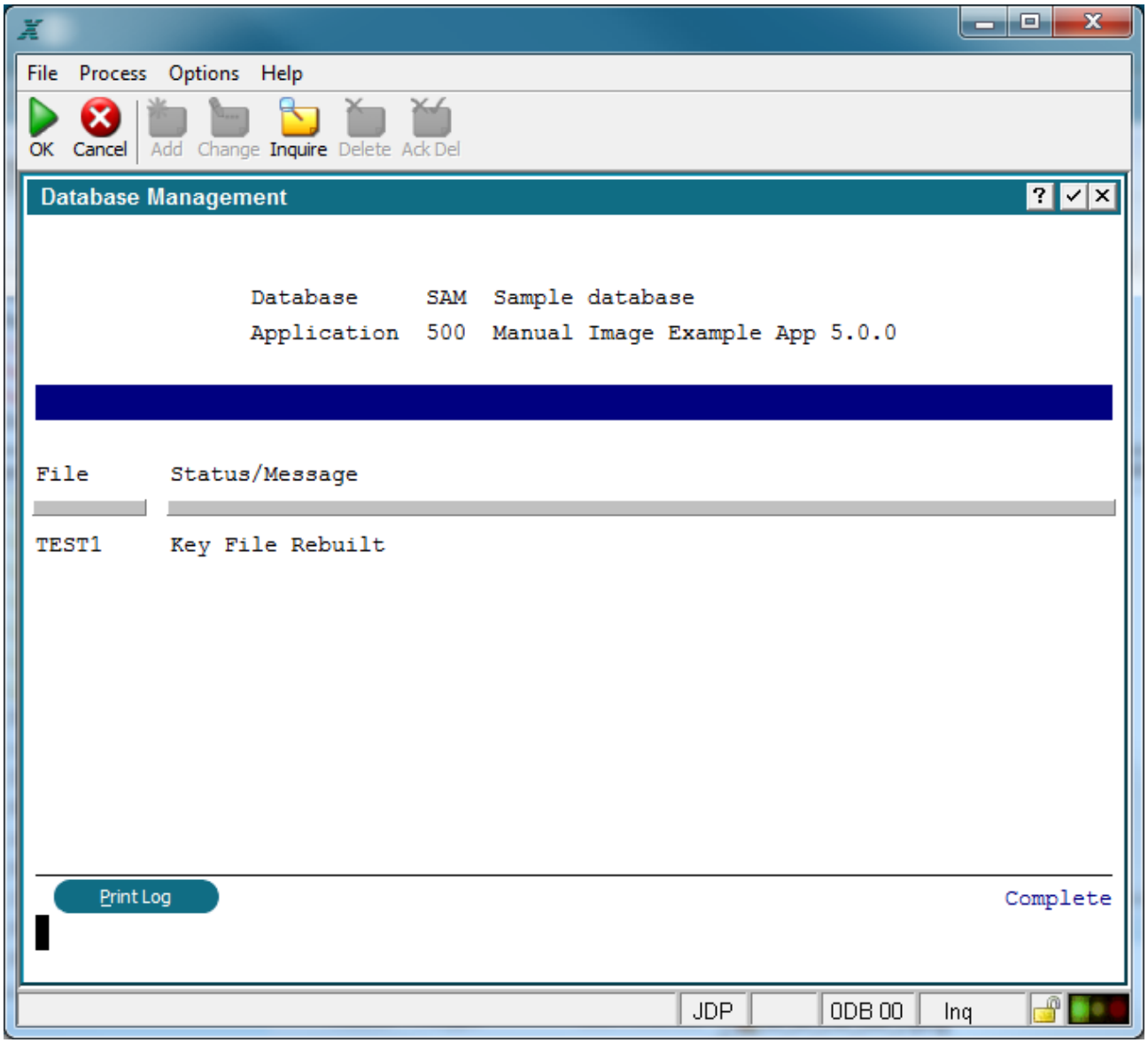
This option allows you to create external files for transporting to other systems. Select proceed to begin the export. A 'status' screen shows you each file as it is being exported.



Export Files Option

Database Management Rebuild Key Files

This option allows you to rebuild the key files (.key extension) for the selected files in the event these key, or index, files become corrupted and need to be recreated. When executed, the key file is deleted and initialized, then the data file (.dat extension) is read. The appropriate keys for each data record read are written to the key file. A 'status' screen, see below, shows you each file as its key file is being rebuilt.

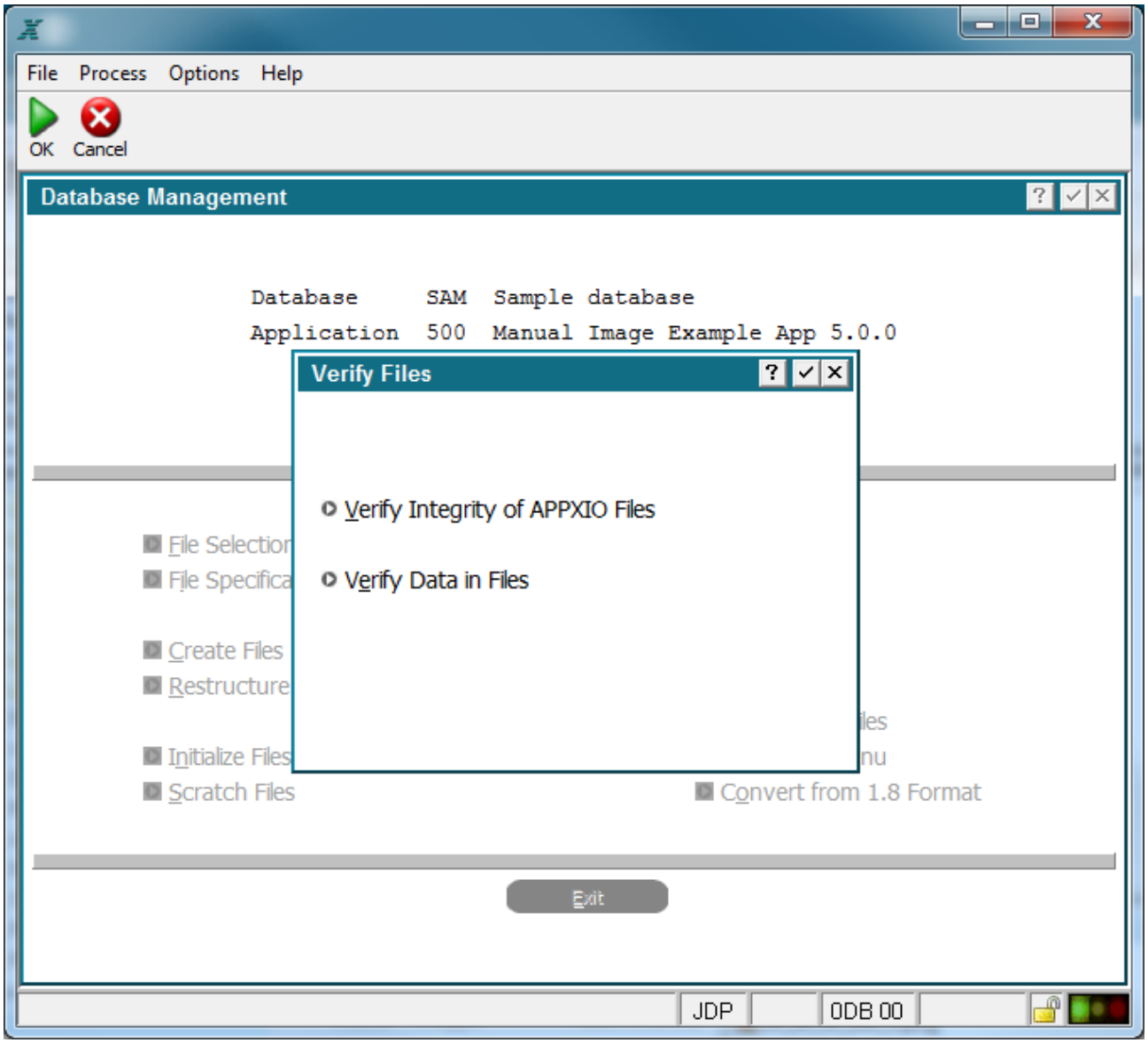


Rebuild Key Files Option

Database Management Verify Files Menu

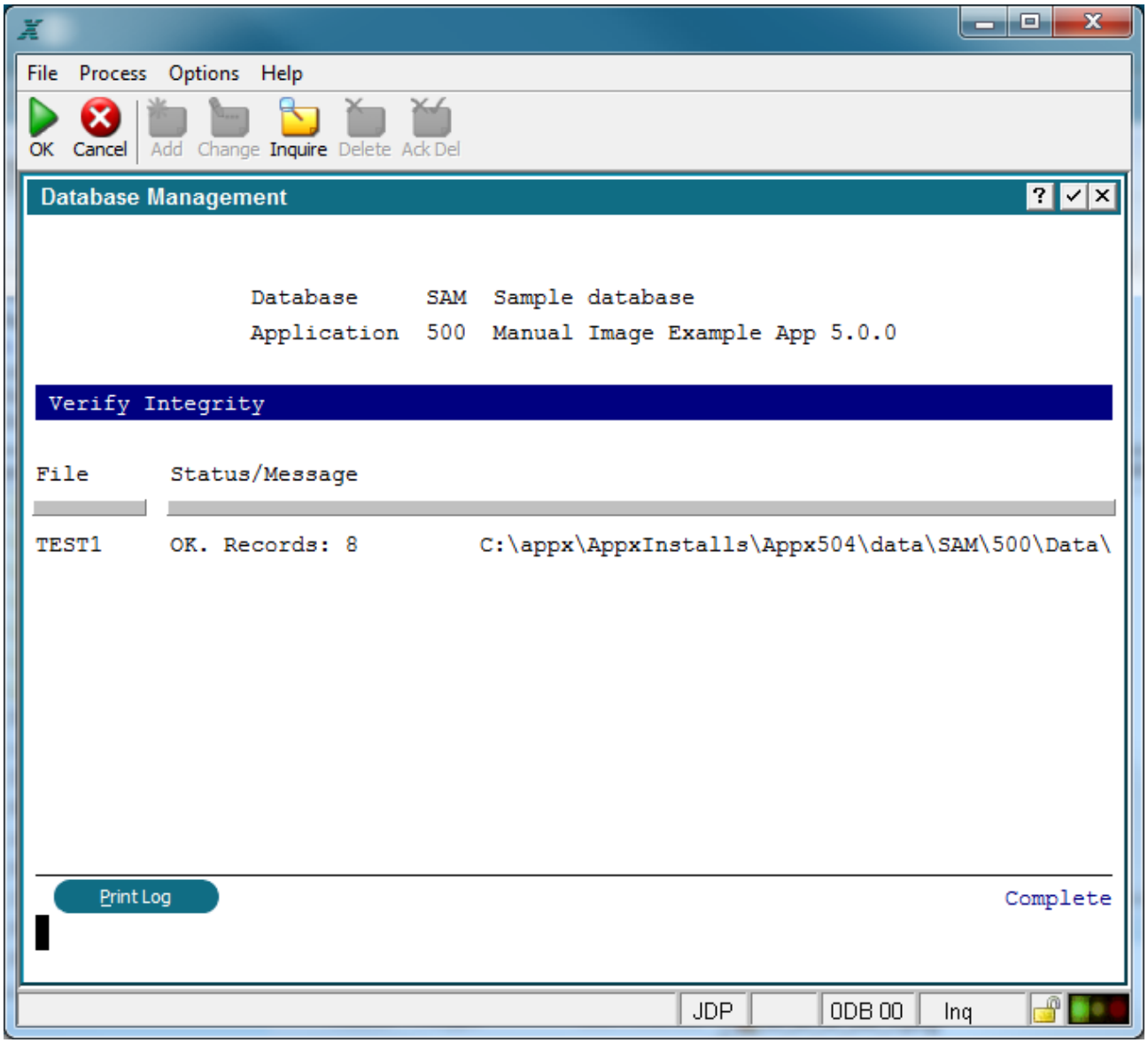
Verify Files Menu

The option contained on this menu, shown below is used to verify the integrity and structure of APPX files. This utility is used in the event an APPX file appears corrupted or otherwise dysfunctional.



Verify Files Menu

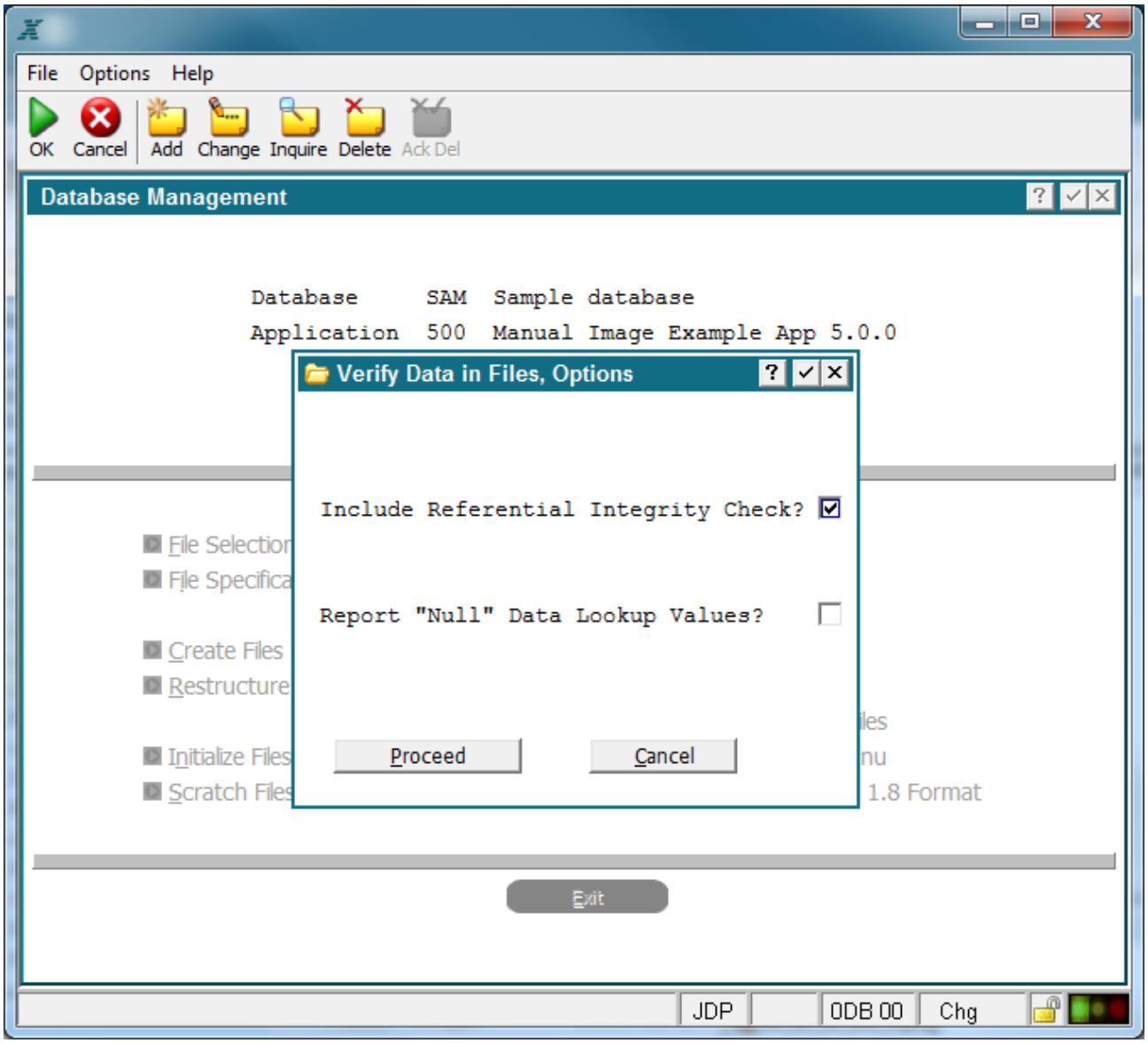
Verify Integrity of APPXIO Files is a utility that checks database integrity of all selected files. A log is created in your default print directory and is displayed on your screen, see figure below. Any error messages contained in this log should be reported immediately to APPX Technical Support. This is also a great place to see the system location of the selected file(s).



Verify Integrity Status Screen

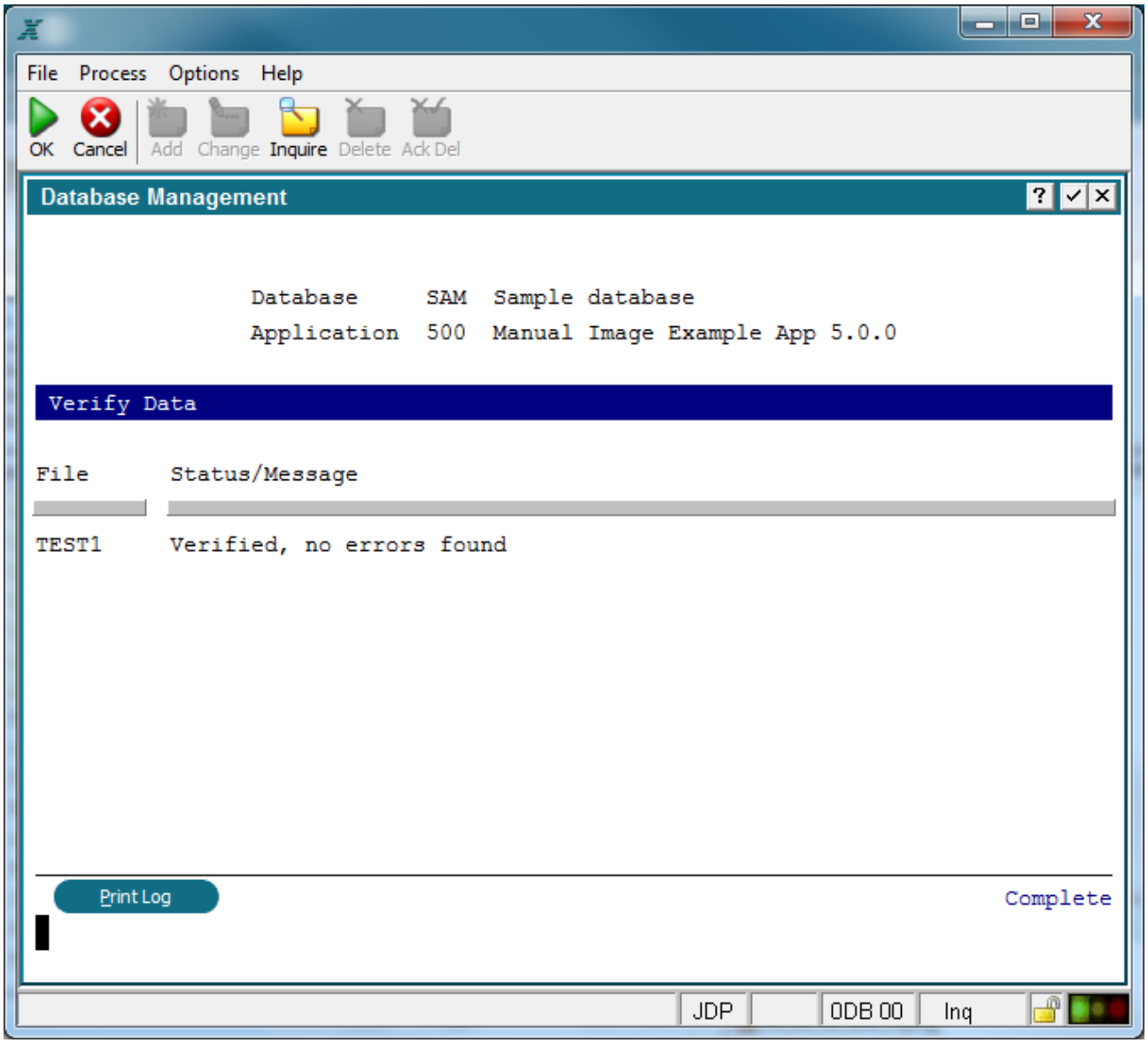
Verify Data in Files Verifies the field contents in each record of each selected file. This is dependent upon the "Field type" as defined in the data dictionary.

Optionally, referential integrity can also be verified. This is dependent upon "Data Lookups" defined in the data dictionary for the file. If a referential integrity check is included, then Report "Null" Data Lookup Values indicates whether null (empty) values will be validated against the parent data lookup file.



Verify Data in Files Option Screen

A log will be created in your print directory and displayed on your screen showing the results of the operation.



Verify Files Status Screen

Database Management Convert from 1.8 Format

Convert From 1.8

Converts APPX applications from a version prior to 2.0 to the 2.0 format. Applications in versions prior to 2.0 are not compatible with APPX versions 2.0 and later.

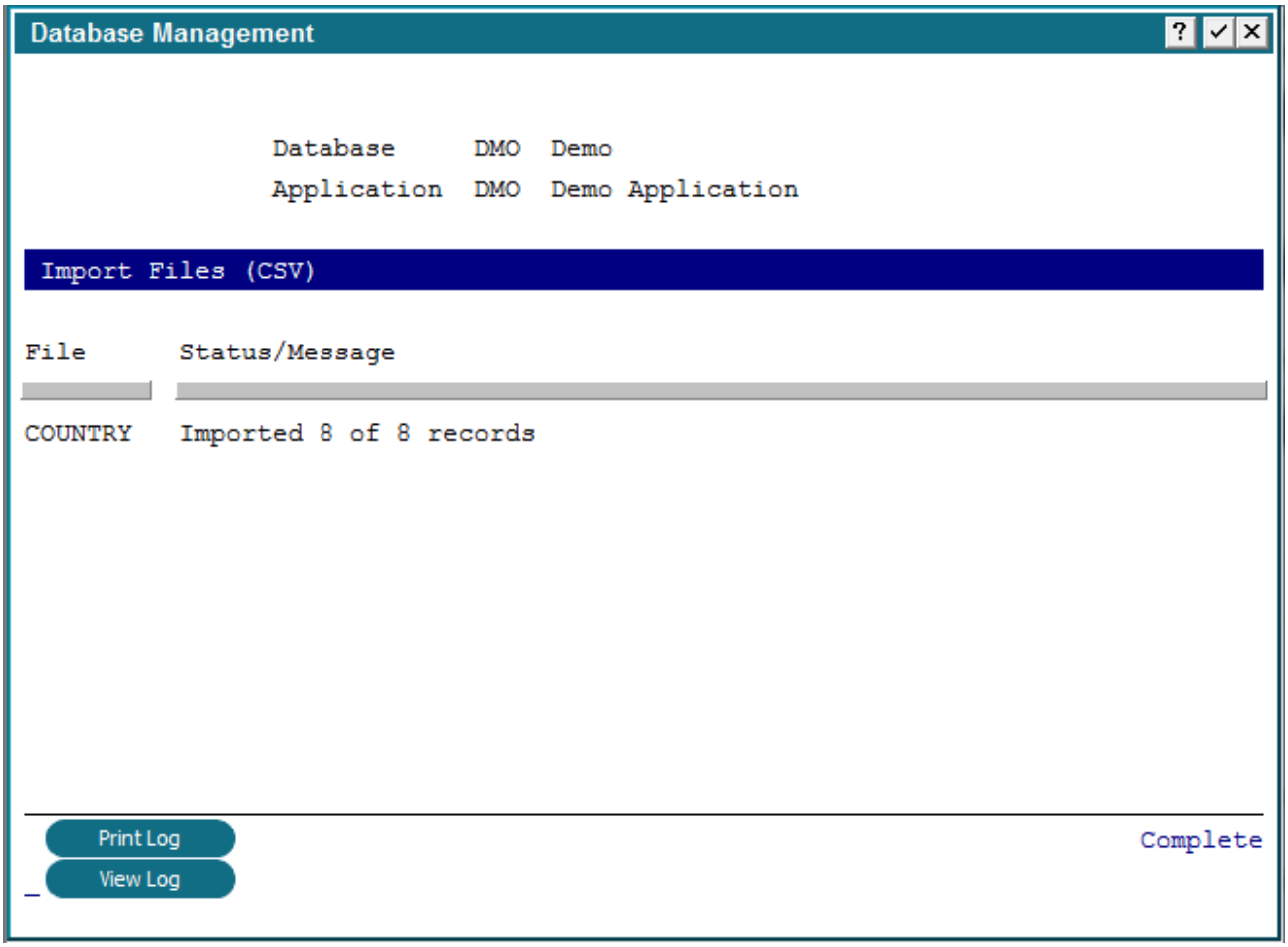
Import Files (CSV)

This new feature will Import the selected file(s) to the corresponding Appx file. The .csv file(s) must reside in the Portdata direcory within the Database for the application. Following is an example of the DMO COUNTRY file in the proper format for the COUNTRY.csv file.

```
Canada,Province,0,+02,AFTER REGION,JPN,20010301,SPF,20010531
France,County,0,+01,SEPARATE LINE,,,JPN,20010301
Ireland,County,0,+00,,JPN,20010307,JPN,20010307
Netherlands,,0,+02,BEFORE CITY,,,JPN,20010302
UK,County,1,+02,SEPARATE LINE,,,LDN,20010308
USA,State,0,+01,AFTER REGION,SPF,20010529,SPF,20010529
United States,State,0,+01,AFTER REGION,,,SPF,20010529
```

> Note that numeric fields must be signed to the left and zero filled. Tip: To see the exact format required add some data to your file then Export it.

After the import has finished the number of imported and the number of total records will be displayed, example;

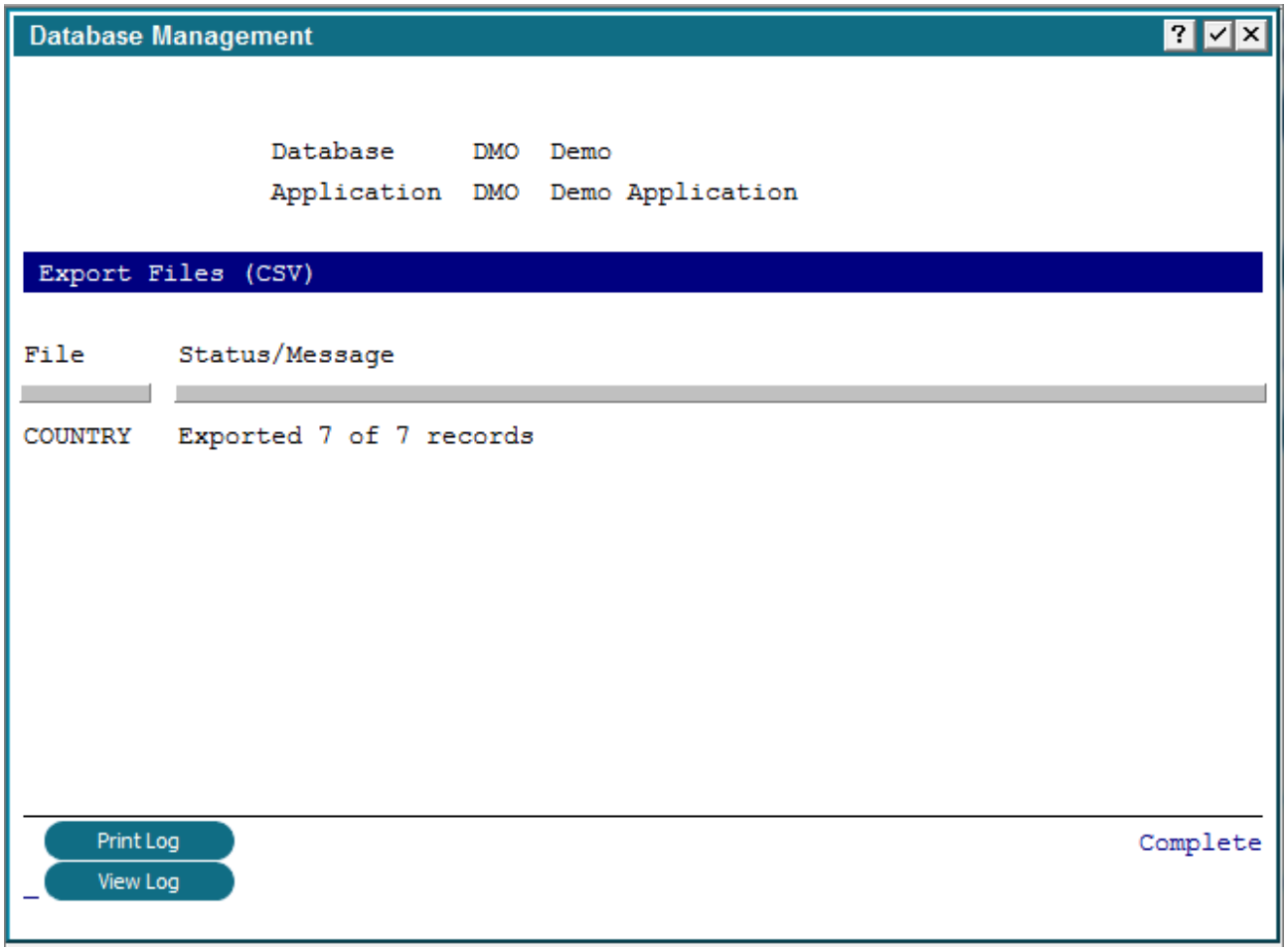


Export Files (CSV)

This new feature will Export the selected file(s) to a comma separated values files. The .csv file(s) will reside in the Portdata direcory within the Database for the application. Following is an example for the DMO COUNTRY file after being exported using the CSV routine.

```
Canada,Province,0,+02,AFTER REGION,JPN,20010301,SPF,20010531
France,County,0,+01,SEPARATE LINE,,,JPN,20010301
Ireland,County,0,+00,,JPN,20010307,JPN,20010307
Netherlands,,0,+02,BEFORE CITY,,,JPN,20010302
UK,County,1,+02,SEPARATE LINE,,,LDN,20010308
USA,State,0,+01,AFTER REGION,SPF,20010529,SPF,20010529
United States,State,0,+01,AFTER REGION,,,SPF,20010529
```

After the export has finished the number of exported and the number of total records will be displayed, example;



Other Design Tools

Other design tools on the Application Design Tools Menu include the following:

Batch Compilation

Process Data Dictionary is used to process selected file names as well as all work fields. Domains are always processed whenever any portion of the data dictionary is processed.

Create Executable Modules will compile executable modules (EMs) for all selected processes in the application. This eliminates the need to wait for a process to compile when it is invoked during testing or at runtime. The default is create EMs for all processes in the application.

Process Generation

Form Input creates an input process for a selected file with one record per screen.

Form Output creates an output process (including Job, Query, and Output) for a selected file. There is one data record per page.

Scrolling Input creates an input process for a select file that scrolls, or contains multiple records per screen.

Standard Output creates a complete output process containing multiple data records per page.

Delimited Exporter creates an update process used to create a comma delimited file for any file within the application.

Key Entry Frames regenerates Key Entry Frames for all Inquiry processes in this application. To regenerate key entry frames for individual inquiry processes use the option provided on the additional attributes popup while editing an inquiry process.

Design Analysis

Verify All References runs a special version of 'Cross Reference All' for the current application. You can select the **referenced but not defined** option to generate a list of all design elements and processes that are referenced by other elements or processes yet do not exist. Or, you can select the **defined but not referenced** option to list all design elements and processes that exist but are not referenced anywhere in the application.

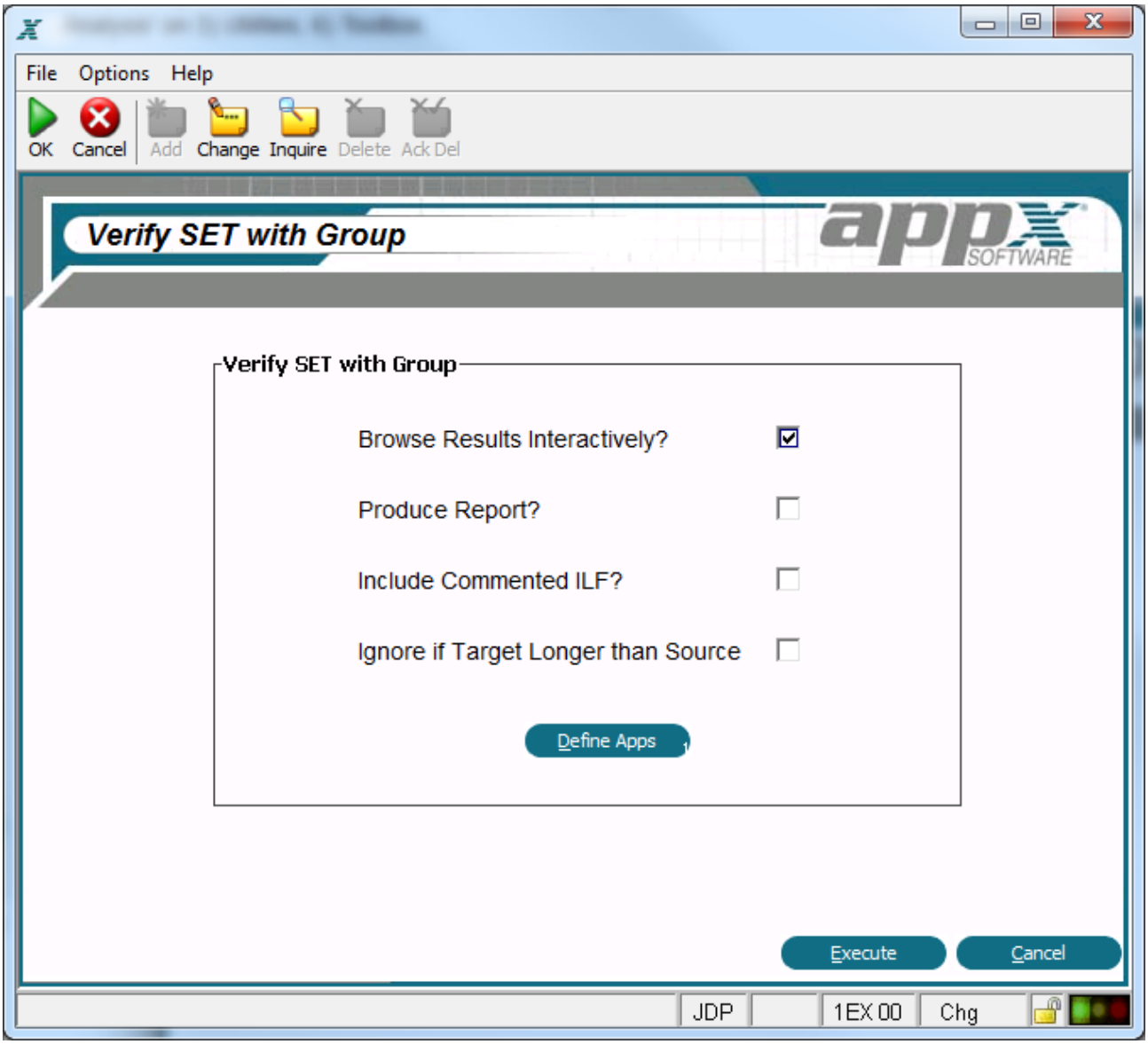
Compare Applications utility will allow you to compare one version of an application to another version, or to another application entirely. You can print a report of differences, browse the differences, or both.

Check for Item Overlap will scan all images in the current application and list the images that contain overlapping items. These images can then be edited directly from this list. Additionally, images may be selected if any item on the image is directly adjacent to another item or to text on the image.

Verify SET with Group Fields utility performs a specialized cross-reference on the SET command, looking for any SET commands with a Group Field on both sides (source and target fields) and where the Group Field lengths are not the same. From the screen above, an option is available to "Ignore if

Target Longer than Source" which will exclude the Set commands where the target Group Field length is longer than the source Group Field length. This utility can be a useful way to track down any Data Dictionary mismatches before they cause problems.

The results will be presented in the usual cross reference hyper-link display (if selected). From there, you will be able to drill down to each occurrence. Note that each use will be reported, even if it is the same group fields as reported in another process. The print option can be used to get a report of all the mismatched field names.



Verify SET With Group Screen

CHAPTER 2-1

Data Dictionary Overview

APPX Data Dictionary

A *data dictionary* is a repository for definitions of an application's data structures. In APPX, these definitions include both specifications (such as a file's *Descriptive Name* or a field's *Length*) and supporting documentation.

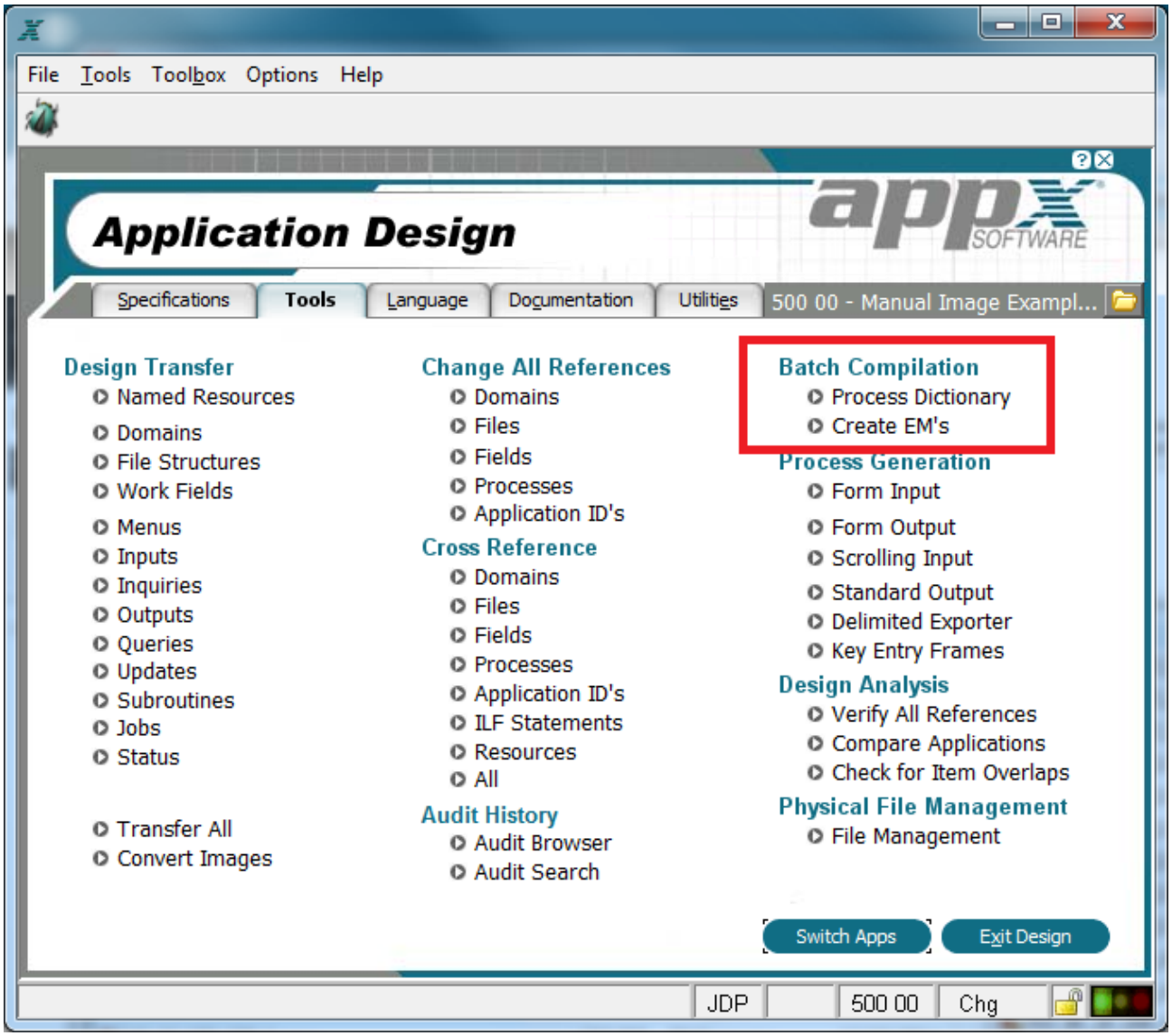
APPX's data dictionary is the cornerstone of application development. All processes operate on the basis of, and are subject to the specifications entered for, elements in the data dictionary. Dictionary specifications provide information and defaults for, or impose restrictions on, the database management facility.

Accessing the Data Dictionary

You access the APPX Data Dictionary, Data Elements and Structures, from the main design menu or from various Toolbox menus includes options to edit each dictionary component, domains, files/fields, and work fields. Each of the Data Dictionary options is described in detail in the chapters that follow. Physical File Management is covered in Database Management, of the *System Management Manual.*

Database Management

If a Data Element is changed the data dictionary must be processed. Appx will automatically process the element you modified or add. Processing will detect and report syntax errors which you can review and correct before proceeding. If you wish to manually process the Data Dictionary you can do so from the Tools tab. See below.



Database Management - Process Files

Characteristics of the Data Dictionary

There are four principal attributes that characterize the APPX data dictionary. The dictionary is:

Active, in that its specifications are used by, and place real time restrictions on, both designers creating applications and users operating them. An active data dictionary maximizes consistency, productivity, and integration. It minimizes the chance for error, both when designing and using applications. For example, assume you have defined a numeric, five-character zip code field. APPX uses the length specification to provide a proper mask for the designer who is painting the field on an input image. APPX also uses data dictionary specifications as a basis for data validation when the image is executed. The system displays an error message if the application user attempts to enter a Canadian postal code (containing letters) into the numeric zip code field.

Processed, to enhance performance. The specifications you enter into the data dictionary are translated into a format more directly usable by APPX during process execution. Processing the data dictionary also searches for logic errors (invalid key definitions or illegal record lengths, for example), constructs default value records for each file, computes field lengths, and establishes the starting position for each field within a record. Refer to Processing the Data Dictionary for more information.

Internally documented. The dictionary provides entry screens for the online help text and printed technical documentation. Documentation is an integral part of APPX development and user interface.

Automatically monitored for structural changes, to ensure integrity.If you make such a change to the dictionary, all processes that reference changed elements are automatically updated, including images and event points. APPX flags existing data files that require restructuring, and permits you to automatically convert them to the new structure with the restructure utility in file management.

Components of the Data Dictionary

The principal components of the data dictionary are an application's:

Domains, which are generic definitions, or patterns, for fields that share a set of common attributes. For example, your application may include a number of different General Ledger account fields, such as an Inventory account, a Sales account, a Cost-of-Goods-Sold account, and so on. Each of these fields is the same length and has the same alpha and numeric components. You can define these common attributes in an Account domain. Refer to Domains for detailed information.

Files, which are data storage structures that consist of a collection of related ***records***. Each record contains one or more fields. The record layout for a file is determined by the fields defined for that file within the data dictionary. Refer to Files and Fields for detailed information.

Fields, which are the most elemental data storage structures of applications. They store the individual items of alphanumeric, numeric, date/time, and logic information that are available to users of APPX applications. The dictionary includes both physical and logical fields. Refer to Files and Fields for detailed information.

Work fields, which are 'temporary' fields that are not stored in a file but can be manipulated by processes in APPX (usually with statements). You cannot save the contents of work fields after a user has logged off, although you can pass work field values to other fields or processes. Refer to Work Fields for detailed information.

Domain Concepts

Domains are generic definitions, or patterns, for fields and work fields that share a set of common attributes. These attributes include such things as the physical space a field occupies, the set of values it can contain, and the way a field is presented to a user.

It is important to distinguish between a domain and a field. A domain is simply a pattern or set of common attributes for one or more fields. It is a design component that stores field specifications, not application data. Fields store data in APPX applications according to the pattern established by the domain the field is based on, if any, in the data dictionary (or according to the individual field specifications if not based on a domain).

Domain Types

There are nine types of domains in the APPX data dictionary*:*

Alpha domains are patterns for fields comprised of letters, numbers, and special characters (-, #, or &, for example), where the primary characteristic is field length.

Format domains are like alpha domains except that an edit mask is the primary characteristic.

System domains are patterns for fields that contain data provided by the system, often referred to as audit fields.

Text domains are patterns for fields comprised of blocks of text.

Token domains are like alpha domains except they have specific values that are stored as corresponding numbers.

Numeric domains are patterns for fields restricted to number, decimal (.), and sign (-) entries.

Date domains are patterns for fields that contain dates and/or times, from a hundredth of a second through a century.

Logic domains are patterns for fields with possible values of yes ☑ or no ☐, or ? to represent an unknown value (Y, N, or blank using Character Mode).

Same As domains are patterns for fields that share the same characteristics as a domain in another application in your database.

Functions of a Domain

Each domain specification provides one or more of the following:

Storage definitions, from which APPX determines the internal storage length and format of any field that references the domain. A domain does not cause storage allocation. It simply defines the storage that APPX allocates when fields are created. Refer to the Fields section in this chapter for more information on physical storage allocation.

Display *characteristics* for items painted on an image, such as display masks or justification options.

Constraints *and restrictions* on a field's valid values, including range checks, validation tables, edit masks, and data lookup.

Other field attributes including column headings, descriptive names, default values, and security codes.

Domains contribute a number of significant benefits to the APPX application design process. They:

Minimize the development effort, by eliminating duplicate entry of common field attributes.

Minimize maintenance efforts, by providing a single location where changes flow through to all related fields in an application.

Ensure consistent database definition throughout the system. The length or edit attributes of a customer number, for example, never vary from Customer file to Invoice file to Cash Receipt file, etc.

It is important to note that the attributes defined for a domain apply to any field referencing that domain and cannot be overridden at the field level. Therefore, only define characteristics that are appropriate for each field subject to the domain. For example, since an employee number should have the same format and edit characteristics wherever it is used in the system, define such common attributes once in an employee number domain. However, if the descriptive name for employee number can vary from one field to another, leave *Descriptive* blank in the domain definition. This would enable, for instance, the Employee master file to contain two fields based on the employee number domain, each with an appropriate descriptive name (i.e., "Employee Number" for the employee's own number and "Supervisor Number" for the number of the employee's supervisor).

Some Examples of Domains

Domains are designer-defined to satisfy the requirements of a specific application or system of applications. A domain can provide a pattern for a specific field in an application, or a category of fields.

A Product Number domain, for example, can describe the attributes of a Product Number field wherever it occurs in an application. You may even assign the same name to a domain and to a field. Zip codes, customer numbers, and vendor numbers are additional examples of domain definitions that relate to specific fields.

An Amount domain, on the other hand, might be linked to a virtually unlimited number of fields and work fields in the system, such as Invoice Amount, Inventory Amount, Order Amount, Requisition Amount, Line Item Amount, Amount to Pay, and so on. Such domains are generically named, and usually do not share a name with a specific field. Accounts and addresses are additional examples of domain definitions that relate to a variety of fields in an application or in the system.

Mask Definition

Masks are symbolic representations of fields. Each character position has a specific meaning with regard to the data it can store or display. Masks represent a visual approach to data definition, or data painting. When appropriately designed, masks enhance the ease of use and operation of an application, and the readability of displays and printed output, and they minimize the space that is required to store and display data.

You establish edit masks for format domains and fields. APPX uses the edit mask as a basis for both allocating a related field's physical storage and for online formatting and data validation. The number of characters in an edit mask define the storage requirements. Constant and placeholder mask characters define format and validation requirements:

A **constant mask character**, such as a '/' or a '-' in a phone number edit mask, automatically displays for any field painted on an image in an APPX process.

Placeholder characters represent data-specific field positions. The individual placeholder character determines the allowable values for that position in an edit mask. For example, a '@' followed by a '#' in an edit mask indicates that the user must enter a letter followed by a number.

In addition, masks for some domains include reserved characters that affect the way APPX treats other mask characters, but do not relate directly to positions in the field value. For example, quotation marks in a date/time mask define mask text, but do not themselves display on an image. For more information, see the section on the date/time display mask.

Display Mask Relationship (Data Dictionary vs. Image)

Both the data dictionary (for a domain or field) and the process facility (for an item on an image) provide display masks for numeric or date/time items. Data dictionary default display masks are assumed at the image item level unless specifically overridden in the item specifications.

You can override the dictionary display mask for either a numeric or date/time item in an input, output, or inquiry process. For a numeric item, you can enter a new display mask to alter the format of a dictionary display mask and, with an optional specification, elect to override the number of characters that display. For a date/time item, your display mask overrides the parts of a date/time field that display and/or the format in which they display. Refer to Numeric Item Specifications and Date/Time Item Specifications in Using the Character Based Image Editor for a discussion of image masks.

External, Internal, and Universal Data Formats

APPX communicates data in any of three formats (distinguishable by the intended recipient), and automatically translates between these formats as appropriate:

External formats communicate data to an application user. They represent the displayable form and include all formatting characters (such as $, :, -, /, and #) called for by display masks, if any.

Internal formats communicate data to the system. They represent the way APPX manages data (binary, packed decimal, or alpha, for example). The internal format is determined by *Storage Type*, *Field Type*, *Edit Mask*, and *Length* specifications.

Universal formats communicate data to a designer. They represent a consistent (alpha) representation of data, which is independent of how information is stored or displayed. Default values, range checks, constants entered in a statement, record selection criteria, and query and child selection criteria are all maintained in Application Design in a universal format. Unlike external formats, universal formats do not include the formatting characters found in display masks. However, note that there is no difference in the external, internal, and universal formats for *format* fields (and domain-type fields based on a *format* domain). *Format* fields are displayed, stored, and coded using the same format.

Universal formats provide several significant advantages. They minimize maintenance overhead; you can change a field's storage or display characteristics without updating those portions of the APPX design facility that reference a field as a constant. They also permit you to reference and operate on a predictable format for the contents of a field, without having to remember exactly how data either displays or is stored in the system. A good example of this is a date field which is typically stored in packed decimal format. By means of appropriate display masks, the date April 15, 2002, may appear as 04/15/2002 to a user on an input or record selection screen and yet print as Apr 15, 2002, on a report. However, the designer would use the universal format of 20020415-------- to code this date wherever needed within Application Design.

The universal format for fields is described as follows:

A date/time field consists of a mandatory 16 digits (or blank). When designing statements, range checks, or query and child selection criteria, paired hyphens for leading or trailing 'parts' in a field are also permitted. These hyphens indicate that a corresponding part is not significant to the comparison or other operation.

A logic field includes 1 or Y for 'yes', 0 or N for 'no', and blank for "unknown". Note that the external format of these values vary by how the logic field is displayed. If displayed as a checkbox, ☑ is 'yes', ☐ is 'no', and ? is "unknown". If displayed as a toggle button, ☐ is 'yes' and ☐ is 'no' or "unknown" (since an unknown value is treated as a 'no' when using a toggle button). If displayed as raw text, Y is 'yes', N is 'no', and blank is "unknown" (Y, N or blank using Character Mode).

A numeric field consists of digits, and an optional decimal point, optional leading or trailing sign (or blank).

An alphanumeric field includes letters, digits, and special characters as well as justification, pad characters, paragraph symbols (for text fields), and constant characters (for format fields).

Fields

Fields represent the smallest unit of data storage in an APPX application. Each field contains an item of alphanumeric, numeric, date/time, or logic information in a database field types are described in detail in the following section). While a domain establishes physical storage requirements and various attributes for a field, it is a field itself that actually stores application data. The data information stored in a field is referred to as a *field value*. For example, a telephone number domain may specify a length of ten alphanumeric characters to store. It is a template for all telephone number fields in the database that reference it. But, it is not until a customer telephone number field is actually created in the File Management facility that APPX allocates storage space. The customer's telephone number would be stored in this field in, say, the customer record.

The relationships between various fields in a database are established in APPX files. The fields defined for a file in the data dictionary determine the record layout of the file.

With a few exceptions, APPX fields are *database-dependent* (unique to a specific database). Work fields and fields that are not stored in permanent, disk-based files are *database-independent*. Refer to Temporary versus Permanent Files in this chapter and Integration with Database Management and System Administration for more information on database dependency.

Field Types

There are thirteen field types in the APPX data dictionary:

Domain fields are fields that directly express the attributes defined in a domain while they define and occupy new physical space in a file.There are nine distinct domain-type fields: Alpha, Format, System, Text, Token, Date, Logic, Numeric, and Same As. Refer to the Domain Types section for additional information. You can choose to set up physical fields to exclusively reference domains, or you can set up individual field types directly.

Alpha fields are comprised of numbers, letters, and special characters (-, #, or &, for example).

Format fields are like alpha fields except that an edit mask is the primary characteristic.

System fields, often referred to as audit fields, display data that is provided by the system.

Text fields allow the user to enter blocks of text on the data entry screen.

Token fields are like alpha fields except that they have specific values that are stored as corresponding numbers.

Numeric fields are restricted to number, decimal (.), and sign (-) entries.

Date fields contain dates and/or times, from a hundredth of a second through a century.

Logic fields are fields with possible values of yes ☑ or no ☐, or ? to represent an unknown value (Y, N, or blank using Character Mode).

Synonym fields provide alternative names for referencing existing APPX fields. They occupy no physical space in a file aside from the fields they reference.

Substring fields represent discrete portions of longer alphanumeric fields. They occupy no physical space in a file aside from the fields they are a part of.

Group header fields are used to group other fields by identifying the beginning and ending fields in a group of fields. The group can then be referenced by the name of the group header field. Group headers occupy no physical space in a file aside from the fields that comprise the group.

Group trailer fields are optional placeholders to allow for terminating a group without referencing a physical field. They provide a streamlined method to allow for additions to the end of groups. Group trailers occupy no physical space in files.

Physical versus Logical Categories

Each of the APPX field types can be classified as *physical* or *logical*. The distinction between the two reflects a field's physical space requirements.

The table below outlines the properties of physical and logical fields. Each is discussed in more detail in the sections that follow. You can also refer to Files and Fields, for more information.

Fields	*Assumes Attributes From*	*Defines New Physical Space*
Physical Fields		Yes
Domain-Type Fields	Domain or Field	Yes
Alpha Fields	Field	Yes
Format Fields	Field	Yes
System Fields	Field	Yes
Text Fields	Field	Yes
Token Fields	Field	Yes
Numeric Fields	Field	Yes
Date Fields	Field	Yes
Logic Fields	Field	Yes
Work Fields	Domain or Work Field	Yes
Logical Fields		No
Substring Fields	Alphanumeric Field	Subset of existing Field
Synonym Fields	Any Field	Redefinition of existing Field
Group Fields	One or More contiguous Fields	Redefinition of existing Field(s)

Properties of Physical and Logical Fields

Physical Fields

Alphanumeric, date/time, logic, and numeric fields, and all work fields are physical fields. They define, or occupy, *new physical space*. They may, however, share this space with logical fields as explained later in this chapter inthe section, *Logical Fields*.

Work Fields

Work fields are fields that are not stored in a record format but can be manipulated by processes in APPX (usually through the use of statements). A work field has no sequence number and no relationship to any files, records, or other work fields.

You use work fields to display values that are not stored, such as a calculated line item amount (quantity multiplied by price) or a constant value like **p** (pi). You can manipulate work fields in much the same fashion as any other field, with a few exceptions:

You cannot save a value in a work field after a process completes. To save a value, it must be copied into a field in a record that is stored in a file.

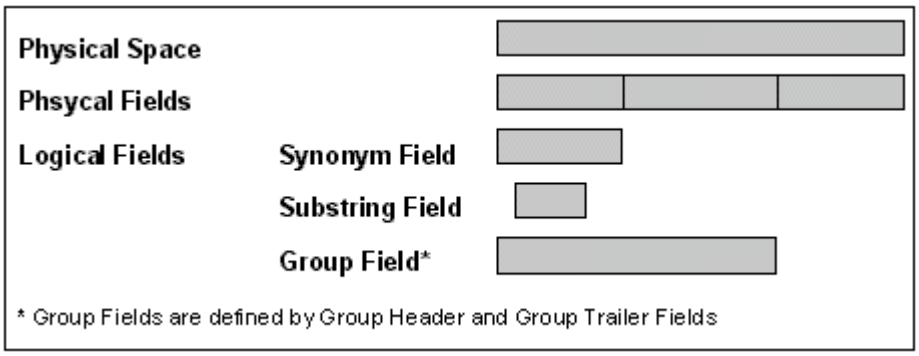
You cannot define a group of work fields because they are not arranged in any particular order or sequence.

Work fields cannot be keys because they are not part of a record structure within a file.

Refer to Work Fields for additional information.

Logical Fields

Substrings, synonyms, and group fields (as defined by group header and optional group trailer fields) are logical fields. They require no separate (new) allocation of physical space. They occupy space, or a portion of space, that is occupied by the field they reference. In other words, logical fields *redefine or share the physical space* that is occupied by a physical field (see the figure below).



Physical Space Requirements

Logical fields draw a subset of basic attributes from one or more physical fields.

The full set of attributes for a logical field is actually a combination of those established by physical fields, APPX defaults, and you. A logical field draws certain attributes from a physical field when the dictionary is processed. At the same time, it assumes additional attributes established by APPX or by specifications you enter for a logical field itself. The specific source of each attribute depends upon the type of logical field.

Substring Fields

A *substring* field represents a discrete portion of an alphanumeric field (specifically, an alpha, format, or text field or a domain-type field based on an alpha, format or text domain). Substrings are defined for those instances where it is beneficial to be able to access both a field in its entirety and a discrete segment of a field, depending uponthe specific requirements of an operation or display.

A substring field occupies a portion of the same physical space as the alphanumeric field it is a part of. For example, if you define a substring to access the three-character area code portion of an alphanumeric telephone number, the substring does not store a separate copy of the data in those referenced three characters. It references the same three characters that are physically stored in the telephone number field. As a result, a change to the data in either the substring or the alphanumeric fields affects both fields.

Because a substring occupies the same physical space as an alphanumeric field, its data is a subset of the data contained in that alphanumeric field. A substring's initial value is also a subset of the alphanumeric field's initial value.

Substrings are discrete segments of the internal formats of physical fields. As such, many of the formatting attributes of a physical field do not flow through to a substring. Those attributes a substring does assume are generally not format-related as, for example, *Descriptive*.

The set of attributes for a substring is essentially equivalent to the attributes of a basic alphanumeric field. (Remember that a basic alphanumeric field is an alpha field that is not specially formatted.) In other words, all alphanumeric domain and field specifications use their default values except for the *Length* specification, which you enter.

Refer to the Substring Fields section for additional information.

Synonym Fields

A *synonym* field provides an alternative reference for an existing field and, by doing so, logically reorders fields in a file. With synonym fields, you can access the *same data* under more than one field name and with more than one field sequence number.

For example, you can use a synonym to create a group field that includes a physically noncontiguous field. (APPX requires that the fields in a group are contiguous, based on sequence number.) You simply define a synonym for the noncontiguous field using a contiguous sequence number.

A synonym field occupies the same physical space as the field it relates to. For example, assume you wish to access three fields together as a group. One of these three fields contains a noncontiguous sequence number, a condition that is not permitted within a group field. To overcome the problem, you define a synonym of the noncontiguous field, and assign the synonym a contiguous sequence number. The synonym produces a logically contiguous series of bytes that, for purposes of group manipulation, APPX treats the same as a physically contiguous series. Because of the synonym definition, the physical spaces are not required to lie in the same order as the logical fields in the group field.

A synonym does not store a separate copy of data in a referenced field. Both a synonym and the field it references access the same physical data. As a result, a change to the data in either a synonym or the field it references affects both fields.

Most of the attributes for a synonym field are identical to the attributes of the physical field that a synonym references. Refer to the Special Uses for Synonym Fields section for additional information.

Group Fields

A *group field* (often referred to simply as a group) is a series of one or more fields with contiguous sequence numbers that can be referenced by a single field name. Groups are defined for those instances where it is of benefit to access fields both individually and as a unit, depending uponthe specific requirements of an operation or display. For example, group fields are often used to define multipart keys.

A group field's primary purpose is to simplify data assignments and comparisons between two sets of fields with matching contents, formats, and storage types. You can only reference a group field in a statement or within selection criteria, or specify it as a key. You cannot, for example, paint a group as an item in an image.

APPX treats all components of a group field as physically contiguous, regardless of how they are stored. This is particularly significant when you use a group in an assignment or a comparison. For example, assume you compare two group fields, both 15-bytes-long. Group A is composed of two noncontiguous components: 10 bytes and five bytes. Group B is composed of three noncontiguous components: three bytes, 10 bytes, and two bytes. APPX does not compare the first component of group A with the first component of group B. Rather, it compares the first three bytes of group A with the first three bytes of group B, the next seven bytes of group A with the next seven bytes of group B, and so on. The same is true for an assignment. APPX treats groups as a contiguous string of bytes for purposes of both comparison and assignment.

You create a group by defining a group header and, optionally, group trailer field.

A *group header* is a field that serves simply to mark the beginning and end of a series of contiguous (physically adjacent) fields in a concatenation or group. This group of fields can be referenced by the name assigned to the group header field.

A *group trailer* field is an optional placeholder to mark the position of the final field in a group. It simplifies group maintenance by providing a streamlined mechanism to allow for future additions to the end of a group. As with a group header field, a group trailer occupies no physical space in a file.

Group header and group trailer fields occupy no separate physical space in a file and serve only as placeholders to mark the beginning and end of a series of contiguous fields which you can access as a unit.

A group field itself, bounded by a group header and trailer, references one or more contiguous fields through a single field name. A group does not store a separate copy of data contained in component fields. Both a group field and the component fields it references access the same physical data. In fact, more than one group field can access the same component fields (nested group fields), as long as one group is completely contained within another group. Groups with partially overlapping physical storage are not permitted; in other words, any two groups cannot share a component field unless they share all the component fields in one of the groups. Refer to the Group Fields section for additional rules and restrictions.

The attributes of a group field are *not* simply equal to the sum of the attributes of component fields. The content of a group is actually based on the *internal* format of all of its components. The only exception is the sort function of a query process, for which a group field reflects the attributes of its component fields. For example, for the purpose of the sort only, there is no difference between the numeric value in a group field and the numeric field itself.

APPX considers a group to be a *basic alpha field* (a single string of alphanumeric characters that are not specially formatted), regardless of how component fields are defined. If all components are not basic alpha fields, APPX performs no special translation when a group is used in a comparison or an assignment. Refer to the Field Types section for the definition of a basic alpha field.

The distinctions between the attributes of a group and its component fields have several important ramifications:

By manipulating a group, rather than the component fields, you run the risk of placing invalid data into a component field. For example, if your group includes a packed decimal field and you set it to AAAA, you replace the data in the field with data that is not valid for a packed decimal number.

APPXcompares two strings of bytes with no translation or error checking. It does not warn you that a comparison is not based upon like component fields in a group. For example, assume you are using two groups (A and B) in the statement, IF A EQ B. A is composed of a customer number and a transaction number, and B is a transaction number and date. APPX compares these two group fields and returns a false, not an error, condition.

Comparing two group fields does not always yield the same result as comparing the individual components of two groups.Assume the A and B group fields in the previous example are both comprised of customer number and transaction number, but the customer number in one is an alphanumeric and, in the other, a numeric field. If APPX compares a customer number of 100 in A to a customer number of 100 in B, it is capable of converting the values in these two fields to an intermediate format for comparison and returning a true condition. The same comparison, if based upon the groups rather than the component fields, returns a false condition.

These differences in attributes are particularly significant if you manipulate group data with statements. Refer to ILF Integration for a discussion of APPX statements.

Designating Keys

In general terms, a *key field* is a field that you can use to identify and retrieve a record in an indexed file. Key fields in APPX include a single primary and up to 16 alternate keys.

Primary keys provide the assumed key path to access and retrieve specific records in an indexed file. They also establish the linkage between files.For example, you might include a Customer Number field (the primary key to a Customer file) in a Sales Order file to link an order with additional information about the customer placing it. Unless otherwise specified by a user or designer, APPX always uses the primary key path. The field that is designated as the primary key should generally be short and unique, and representative of how data is most frequently accessed in the file. Examples of primary keys include a customer number in a Customer file, a product number in a Product file, and a date/time stamp in a Purchases History file.

Alternate keys provide optional key paths to access and retrieve specific records in an indexed file. A user or designer may optionally choose to change from a primary key path to any alternate key path for record access and retrieval. Examples of alternate keys to a customer file might include customer name, phone number, contact name, and/or address.

By using a primary key rather than an alternate key, you gain two *referential integrity* advantages.

Delete protection fields govern whether or not a user can delete a record while executing an input process. When used properly, these fields prevent the creation of orphan records because they prohibit deletion of records that are referenced by other records anywhere in the database.

Key protection fields control whether or not a user can modify the primary key to a record while executing an input process. The proper use of these fields also helps to maintain the integrity of a database because they prohibit modification of keys that are referenced by other records in the database.

Three significant restrictions apply to the definition of primary and alternate key fields in APPX:

Group trailers cannot be defined as key fields.

Each indexed file must contain one (and only one) primary key.

A maximum of 16 alternate keys can be defined for any file.

To maximize performance, you should minimize the number of key fields in each file. Unless you use a field for one of the following purposes, it should not be defined as a key:

Online data retrieval. For example, you may define a customer number as a primary key so that your application users can retrieve specific customer records for display. Or perhaps, you might create a duplicate alternate key based on the customer number in a Sales Invoices file to display invoices online in customer number sequence.

To relate data in one record to data in another, either within the same file or among files. Remember that primary keys are the only fields that can be used to automatically maintain referential integrity with the *Delete Protection* and *Key Protection* options.

Data lookups for items in a process. If you include a customer number field on a sales order record, your users can automatically scan customer information when entering an order, if the customer number is a key to the customer file. In addition, APPX uses a key field to access related information when generating a standard subheading image in an output process.

A *unique key* prohibits an application user from entering more than one record with the same value in a key field. The term *duplicate keys* refers to a user's ability to define two or more records with the same value in a key field.

Unique key fields provide key paths that you can use as record identifiers. To be able to identify a specific record in a file, you must define at least one key as unique. The primary key is generally designated as the unique key in a file.

Unique keys are also used for online edit checking. If a user attempts to add a record with a value in a unique key field that corresponds to a record already in a file, APPX does not permit the user to save the entry. APPX considers this an error condition and prohibits the user from adding the record.

Duplicate key fields are used for online record retrieval in a predetermined order. For example, to display sales orders on the screen in customer number sequence, Customer Number is defined as a duplicate alternate key to the Sales Orders file. The trade-off for this capability is that duplicate keys decrease performance and increase storage requirements.

Key Order versus Sort Order

The *key order* for a group of records refers to the sequence APPX uses to retrieve records along a key path in an indexed file. For example, if you scan through customer records within an APPX Customer input process, the customer records are presented in key order. Key order can be defined in ascending or descending sequence.

The *sort order* refers to the sequence an APPX query process arranges records in for use by a subsequent output, input, or update process. Sort order, also known as APPX's collating sequence, can be defined in ascending or descending sequence as well.

The principal differences between the key order and sort order sequences are as follows:

Sort order is language-dependent.

Sort order combines uppercase and lowercase alpha characters (i.e., AaBbCcDd...). Key order treats uppercase and lowercase separately (i.e., ABCD...abcd...).

Sort order always presents numeric field values in sequence (negative to positive, if ascending, or positive to negative, if descending). Key order may not be sequential if there are both positive and negative values.

Sort order uses the the alphanumeric value of token fields. Key order uses the numeric token ID.

For date and logic fields, APPX's sort order is identical to its key order (assuming both are defined as ascending or both descending). For other fields, however, the two sequences are not always identical. The distinction is important because an identical group of records can be sequenced differently by two APPX processes if one process uses a key path and the other uses the sort order established by a query process.

It is also important to understand that sort fields are not restricted to key fields. In other words, a field does not have to be a key to be used as a sort field in a query process. (Sort fields are a common example of the overuse of key fields.) An APPX sort creates the equivalent of a temporary key path (for example, it is only available during the production of a report), which is based on the sort field. If a sort field is defined as a key, APPX must constantly maintain the key path online. If a field is not a key, APPX only builds a key path when it is required by a sort.

While APPX's sort order combines upper and lowercase alpha characters, the key order retrieval for alphanumeric fields separates the series of uppercase alpha characters from the series of lowercase alpha characters.

Whereas numeric fields are always sorted in numeric sequence (say, -2, -1, 0, 1, 2, for ascending), the numeric key order can vary depending upon storage type. For instance, the key order for the same sample values in a packed decimal numeric field would be 0, 1, -1, 2, -2.

If a field is defined as a token, the key order retrieval is always in numeric sequence by token ID. Keys always operate on the actual data stored in a file which, in this case, is the token ID. The sort order established by a query process, however, is based on the corresponding alphanumeric value of the token field, not the token ID.

Files

The APPX dictionary establishes the *logical structure* of your database. The physical structure of a database and how it is stored on disk varies from system to system.

The data dictionary's file formats represent permanent data storage in an APPX application. *Files* consist of a collection of related records, each containing one or more *fields,* the most elemental data storage structures of an application.

APPXsupports one-record, consecutive, and indexed organization. You can designate either fixed- or variable-length records and, optionally, whether you want a file stored on disk or in memory.

File Storage Options

For each file you define in the data dictionary, APPX requests storage information. You determine whether each record format is stored in a file and, if so, whether the file is maintained on disk or in memory. The attributes of each of these file storage options are summarized in *Table 2-1-3*, and discussed in more detail in the following sections.

Table 2-1-3. A Comparison of File Storage Types

Characteristic	Physical File	Disk File	Memory File
Permanent	Yes	Yes If So Specified	No
Capacity Limitation	Not Applicable	Amount of Disk	Paging Space
Shared Among Users	Yes	Yes (If Permanent)	No
Relative Performance	Not Applicable	Slower	Faster
Database Dependent	Yes	Yes (If Permanent)	No

An unstored record format is essentially a pseudo file that you can use to enter data, perform edit checks and computations, and execute statements without actually storing data. APPX does not read data into a record area before executing a process, and it does not store data after executing a process. In all other respects, record area operations are the same for unstored records as for records stored on disk or in memory.

There are two primary differences between unstored records and records stored in files (temporary or permanent). Unstored records:

Can only communicate data from one process to another by implicit or explicit interprocess communication, passing and receiving definitions. Unstored records communicate only through areas in memory. Records stored in temporary and permanent files are less restrictive. One process can write a record to a temporary file, and a separate process can read the record from the temporary file. Unlike information in unstored records, this information can be saved and retrieved at will.

Contain only the information that is in the current area in memory, which is the equivalent of a single record. Temporary and permanent files can contain more than a single record.

Unstored record formats are similar to work fields. You can think of a work field as an unstored record with a single field. Unlike work fields, however, unstored record formats:

Establish relationships between one field and another. As a result, they eliminate a number of the limitations that are inherent in work fields. You cannot include a work field in an APPX group field. You can define a group field that consists of fields from an unstored file, simplifying field manipulation and comparison in many instances. Without an unstored option, you could only compare records by

reading a record from disk, loading each field on the record into a work field and, then, comparing each work field to a field in a second record. With the unstored option you can create a work record, containing all of the fields in a disk-based record and, using a group of the entire record, set the contents of the disk record into a work record with a single statement.

Can serve as process control files (PCFs) for APPX processes. If the record format includes a one-record organization specification, APPX completes one process cycle during process execution; in other words, APPX sequentially executes the frames for a process once and then ends. If the record format is other than one-record, the process continues to execute until the application user chooses to end it. For example, imagine a calculator utility that allows a user to enter principle and interest rate data and, then, computes and displays a monthly payment amount. If the unstored record format is one-record, the calculation is executed once and the program ends without saving the entered or calculated information. If the format is other than one-record, an application user can change the entered values as often as desired and APPX will continue to update the computation and the display until the user chooses to end.

Disk files are generally permanent files that are shareable among users and stored on a disk surface defined in *file management*. You can, however, define temporary files that are stored on disk.

The system always takes longer to retrieve data from files stored on disk than to retrieve data from files stored in memory. Disk files have an advantage over memory files because they have more capacity.

Permanent disk files are database-dependent, or stored as part of a specific database. As a result, APPX's database management utilities reference data dictionary specifications when operating on a disk file. Temporary disk files are database-independent.

Memory files are temporary files that are unique to a task. The contents of a memory file are lost when the task ends. Because files are maintained in memory and memory is relatively more expensive than disk space, the quantity of data in a memory file is generally limited. Excessive or improper use of memory files can result in memory overflow conditions.

The principle reason to use a memory file is to increase performance. The system always takes less time to retrieve data from files that are maintained in memory than to retrieve data from files that are stored on disk. By using memory files in strategic locations in a process, you enhance performance while maintaining your application as simply as possible. For example, assume you generate a report based on a 10,000-record customer file. For every customer record processed, APPX must also read a referenced record in a 10-record customer-type file. If the customer-type file is a disk-based file, APPX reads 20,000 records from disk, or a customer-type record for every one of the 10,000 customer records read. If, on the other hand, you read each of the 10 customer-type records into a memory file, your total number of physical I/Os is reduced from 20,000 to 10,001, which is a reduction of almost 50 percent.

File Organization

APPX supports three types of file organization: one-record, consecutive, and indexed. The type of file organization you select affects performance, space requirements, and the procedures you can perform with regard to a file.

If a file is used as a process control file (PCF), this specification affects the operation of a related process. If a file is one-record, APPX completes one process cycle during process execution; in other words, APPX sequentially executes the frames for a process once and then ends. If the file is other than one-record, the process continues to execute until the application user chooses to end it. Refer to Overview of APPX Processes for additional information on PCFs and process cycles.

File organization is the only specification that affects record formats that are not stored in a file. If an unstored record is used as a PCF, the value you enter determines whether or not a process executes a single process cycle.

The following material is intended to help you choose the best type of organization for each file. The attributes of each type of organization are summarized in the following table.

Attribute	One-Record	Consecutive	Indexed
Can Delete Records?	No	No	Yes
Retrieval Method	Not Applicable	Position in File	Key Path
Relative Performance	Faster	Faster	Slower
Process Control File	One Process Cycle	Multiple Cycles	Multiple Cycles

A Comparison of File Organization

A one-record file is stored sequentially and therefore is subject to all the restrictions that apply to consecutive files. Unlike other consecutive files, however, a one-record file communicates a significant piece of information to an APPX input process; a process can expect at most one record. Based upon this information, the process simplifies development and maintenance requirements. APPX automatically checks for the existence of a record in the file. If there is no record, APPX places the user in add mode. If there is a record in the file, APPX places the user in change mode.

A parameters file is an example of a one-record file. Use of a one-record file to hold specifications that are referenced by more than one process in an application avoids unnecessary duplication, and simplifies design and maintenance.

Consecutive files organize records according to the sequence in which they are added to a file; each new record is added to the end of a file. The system retrieves records based upon their relative position in a sequence, or record number. A consecutive file does not contain keys, so its records cannot be retrieved by key path. To select a record based upon field value, APPX must process all records, ignoring those that do not satisfy selection requirements.

Because file processing is generally based on the value contained in a specific field (such as the last name of a customer or the number assigned to a vendor), APPX must use a query process to *resequence* consecutive records by the order they should be processed in. A query maintains the generated sequence in a *pointer file*. Forexample, the pointer file for an Orders file that is sorted alphabetically by customer includes the following record sequence for the customers (Anderson?s record is number 8, Jones? is 4, Smith?s is 1, and Williams? record is 22). To print an alphabetically sorted list of outstanding orders, the system consults the pointer file, and the records are processed in the following order: 8 (Anderson), 4 (Jones), 1 (Smith), and 22 (Williams). Refer to the Query Files section and the Child Use Query Option for more information about pointer files in a query process.

On most systems, APPX retrieves records from consecutive files faster than from indexed files.

A consecutive file can contain an unlimited number of records, subject only to operating system limitations and available storage space. You cannot, however, delete specific records in this type of file. To eliminate specific records, you must first transfer all records that you want retained to another file, and then scratch the original file.

For an indexed file, the system retrieves records based on the content of specified fields, or primary and alternate keys. APPX requires one primary key field for each file, and permits up to 16 alternate keys. These key fields are identified in the field specifications screens in the data dictionary.

Key fields, when used by the system to retrieve records, are referred to as *key paths*. This method of record retrieval is inherently slower than the method employed for consecutive files, but is more flexible and allows you to perform complicated operations more efficiently. Performance is enhanced when records are retrieved by primary (as opposed to alternate) key paths, although indexed file retrieval is still slower than consecutive file retrieval.

An indexed file can contain an unlimited number of records, subject only to the operating system?s limitations, the restrictions that are imposed by the length of a key field, and the available storage space. Unlike records in a consecutive or one-record file, records in indexed files can be deleted.

Temporary versus Permanent Files

For every disk-based or memory-based file you define in the APPX dictionary, you must designate whether the file is temporary or permanent. This distinction affects how and/or when a file is created, opened, and scratched (see the table below).

Temporary files provide working space that is unique to a task and automatically managed by APPX during processing. At its maximum, the existence of a temporary file is limited to a single APPX session. If, based upon a file's specifications, it is not shared between processes, the existence of a file may be considerably less than the length of a session. Temporary files are database-independent; there is only one copy of a file for all databases that access it. Temporary files are never shared between users.

Permanent files, on the other hand, are always shareable between processes, and are managed by APPX's File Management. APPX never automatically scratches permanent files. If a file is disk-based, each database has its own copy of it; permanent, disk-based files are database-dependent. They are always shared between processes, regardless of file specifications.

Permanent files are created by APPX's File Management. See the *System Management Manual* for more information.

Attribute	Permanent File	Temporary File
Shared Between databases	No, except with statements	Yes
Shared between processes	Always	Dependent upon file specs
Shared between users	Yes	No
Outlasts a single session	Yes	No
Requires File Management specifications	Yes	Yes, if disk-based. No, if memory-based

A Comparison between Temporary and Permanent Files

Record Protection

APPX allows you to restrict the use of certain records by designating record protection fields at the file level. These fields are available when you select the record protection option from the Files/Fields screen.

The **Delete Protection** field governs whether or not a record can be deleted by a user within an input process. This field can be used to prevent the creation of orphan records by prohibiting the deletion of records referenced by other records anywhere in a database. You must explicitly maintain the value in this field.

The **Key Protection** field governs whether or not the *primary key* to the record can be modified by a user within an input process. This field can be used to maintain the integrity of a database by prohibiting the modification of keys referenced by other records anywhere in the database. You must explicitly maintain the value in this field.

The **Record Access** field contains a designer-designated security code that automatically restricts retrieval of a record (and by implication any field on a record) to those users with security profiles that include this code. If a user does not have access to a record, APPX responds as if the record is not on file. The value in this field must be maintained by the designer.

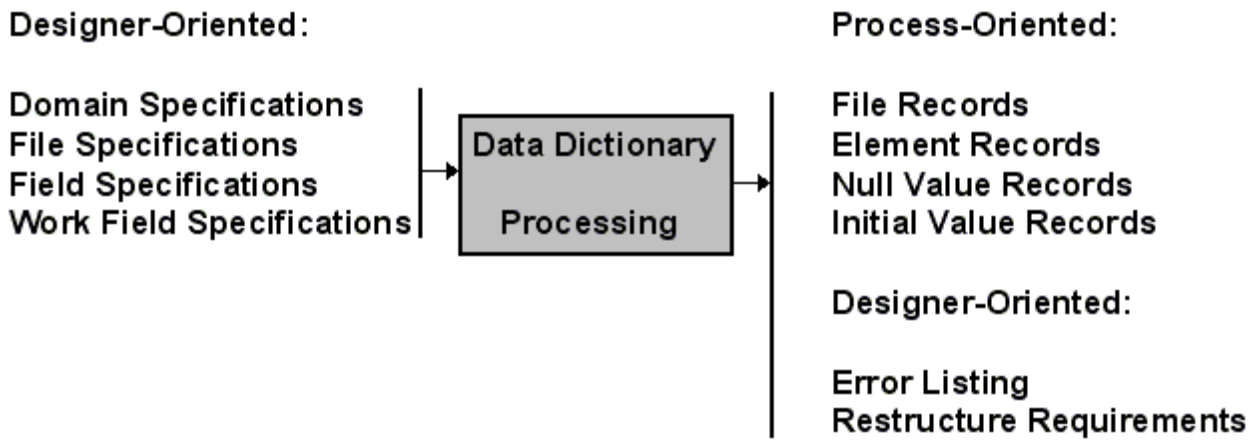
CHAPTER 2-2

Data Dictionary Concepts

Processing the Data Dictionary

Processing the dictionary analyzes its specifications and translates them into a format that is more directly usable by APPX during process execution. It does not generate machine or object code.

As diagrammed in the following figure, processing the data dictionary creates an *element* record from domain and/or field specifications, searches for logic errors (invalid key definitions or illegal record lengths, for example), constructs a default value record for each file, computes field lengths, establishes the starting position for each field within the record, and determines whether or not changes affect the structure of a file.



Components of Data Dictionary Processing

The data dictionary for each new application must be processed before its domains, files, fields, and work fields are referenced by processes. It is automatically processed any time you change the specifications for a domain, file, field, or work field. If the data dictionary requires processing, the processes that reference it cannot be executed. Normally, processing occurs automatically each time you exit a process that changed an element in the data dictionary. However, the *Process Dictionary* option on the Tools tab of the Application Design Menu allows you to initiate data dictionary processing yourself. This option is used most often to find and correct errors in your data dictionary.

Tracking Processing Requirements

The data dictionary input processes track specific types of modifications that, when they occur, require processing of the dictionary (or selected parts of it). They do so by maintaining various date/time stamps, and by comparing the date/time of unprocessed specifications with the corresponding processed formats.

By tracking those situations that require processing of a dictionary or dictionary component, APPX can:

Enhance performance by limiting the magnitude of data dictionary processing.

Eliminate error by removing the possibility that other components within APPX will access obsolete data specifications.

In general, the situations that give rise to a processing requirement are the following:

Domains require processing after they are added to the dictionary and whenever their specifications are modified, including modification of an associated validation or token table. If a domain requires processing, all fields that reference it also require processing. If a domain is deleted from the dictionary, any remaining fields that reference the domain must be modified and processed.

Files require processing after they are added to the dictionary, and whenever their specifications are modified. In addition, a file must be processed whenever fields are added or deleted, or a field specification is modified. If a file is deleted from the dictionary, its fields and element records are automatically deleted. The dictionary does not have to be processed.

Fields are processed based upon a requirement maintained at the file level.If the specifications for any field change, the file and all its fields must be processed. If one or more fields are deleted from the dictionary, the file must be processed.

Work fields must be processed whenever a work field is added or deleted, and whenever a specification for any work field is modified. For this purpose, work fields are considered to reside in a single work fields file, with the processing requirement maintained at the file *and* field level. If any work field requires processing, all work fields are processed. To improve performance, however, individual work fields that do not require processing on their own merit are simply verified against the current element record.

Summary of a Data Dictionary Process

Components of the data dictionary are only processed *when necessary*. Refer to the Tracking Processing Requirements section later in this chapter for additional information.

For those domains, files, fields, and work fields that *do* need processing, the following actions occur:

Domains are processed before any fields in the dictionary.

Fields are converted (in sequence number order) to a format more directly executable by processes within APPX. Attributes defined at the domain level are incorporated into the new format, and all overrides are resolved. Storage lengths for fields are calculated. The resulting processed fields are called *elements.*

Files are processed to reflect changes to file specifications or to field specifications that affect a processed file, such as the various primary and alternate key specifications.

Default value specifications are converted to an internal format and stored in an initial value record for each file. A null value record for each file is also created.

Data is subjected to a limited validation. This validation is required because specifications may have been imported (either through the migration utility or a user-designed process), thus bypassing the error checks incorporated in APPX's data dictionary input processes.

If modifications result in structural changes, a date/time field is updated, indicating the point where the structure changed.

A list of all the errors APPX encounters is generated at the end.

Relationships of the Processed Dictionary to Other APPX Components

Because the APPX data dictionary is active, various components within APPX depend upon an appropriately processed data dictionary. The components that are affected by processing are the following:

The *process compiler* cannot generate an executable module if any of the data dictionary definitions that it references require processing.

Before loading an executable module, the *process loader* performs a verification to ensure that the module is current. A new executable module must be created if any of the data dictionary definitions that the module references require processing.

The *file management* utilities, including *Create Files* and *Restructure Files,* can only be used with data dictionary components that do not require processing. They will not, for example, create a file if the file or any of its fields require processing.

Throughout the *application design facility*, whenever a field or file is referenced, APPX verifies its processing status. Some examples are the image editor, ILF editor, and specifications entry screens.

Application Integration Issues

APPX applications operate as part of an integrated system of applications or stand alone, depending upon the specific requirements of each installation and application. You *design* integrated applications as if they will always be installed as a system.

When you first process a dictionary that includes one or more fields which reference domains in outside applications, your system *must* include the applications that contain the domains referenced. During processing, the field stores an internal copy of the specifications entered for the domain it references. Validation and token tables are also copied at this time.

After processing the data dictionary, the application can be installed as a stand-alone. When this stand-alone application is executed, the internal copy of the referenced domain's attributes are used, not the attributes in the referenced application. You can process a stand-alone application without reinstalling the referenced applications; APPX assumes the referencing fields do not require processing.

If the domain that is referenced by a field changes, and it is necessary to incorporate those changes in the field, you must reinstall the referenced domain's application. Processing the data dictionary then updates the internal copy of the specifications for that field.

Integrity

Integrity represents the accuracy, consistency, and completeness of a database. *Referential integrity* refers to the condition whereby all references between interconnected items of information in a database remain sound. It ensures that customer number 200 is not deleted when there are existing sales orders that reference customer 200, for example.

APPX includes features that, when properly implemented, ensure the integrity of a database. For example, the dictionary can be used to:

Prevent orphan records by providing *Delete Protect* and *Key Protect* options.

Prohibit duplication of primary keys.

Prevent referencing nonexistent data by providing the basis for online data validation throughout APPX and all APPX-based applications.

Other APPX components work with the dictionary to ensure database integrity. The process facility, for example, includes specifications that tell APPX to automatically update fields in a child process if equivalent fields are updated in its parent process. Other specifications require APPX to automatically delete records in a child process based upon deletion of related records in its parent process.

Database Security

Security refers to the function that protects programs and data from unauthorized access and/or modification. Within the APPX environment, security is optional and can be designed, implemented, or modified at any time during the life of an application.

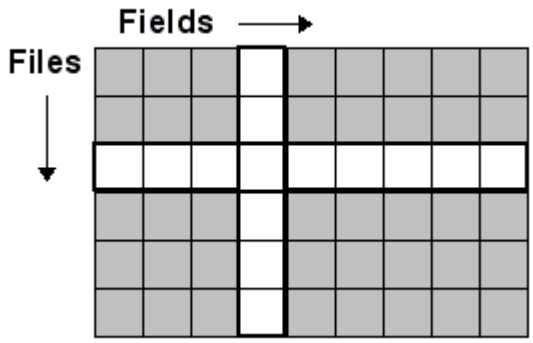
Security in the Data Dictionary

Within the APPX data dictionary, you use field and file security specifications to control which users can view and modify data presented in images in applications. The figure below illustrates the effect of each of these security definitions within a sample file containing six records of 13 fields each.

To secure fields in images in input and output processes, you assign two separate security codes in the dictionary:

Read rights govern whether or not a user can see the contents of a field as defined in an image, either input (transaction entry, maintenance, or inquiry screens, for example) or output (journals, lists, or reports). If a user does not have read rights to a secured field, the contents of the field are invisible and not modifiable.

Modify rights govern whether or not a user can change the contents of a field. A user with modify rights is automatically granted read rights, regardless of the value in the read security specification. If the user does not have modify rights but does have read rights, the contents of the field are visible but not modifiable.



Field- and File-Level Security in the Data Dictionary

The APPX dictionary includes read and modify security specifications for domains, files, fields, and work fields, and records.

Domain specifications function as defaults for all fields and work fields that reference them.

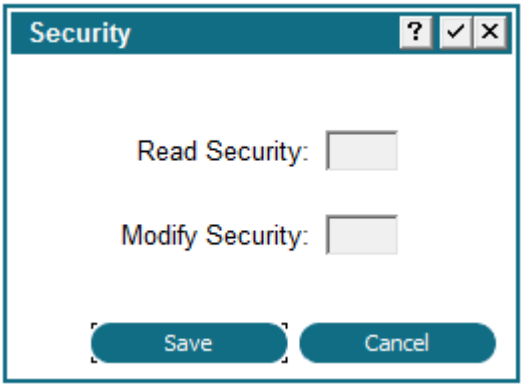
File specifications control read and write access to the file.

Field security specifications can be defined if the domain specification is blank. If security specifications are blank at all levels, access to the field is unrestricted.

Work field *security* specifications can be defined if the domain specification is blank. If security specifications are blank at all levels, access to the field is unrestricted.

Record security is discussed in the Record Protection section of this manual.

You define security in the data dictionary by selecting the Security Button from the Domains, Files/Fields, Fields, and Work Fields screens, which accesses the Security overlay shown in the figure below. From this overlay, you can select the security option. Upon completion, you are returned to the screen from which you selected the Security option.



Security Overlay

APPX does not permit you to secure a specific field or group of fields on a specific record. Field-level security applies equally to all records in a file, and file-level security applies to every field in a file.

Field security specifications, unlike the file security specifications, do not restrict access to fields from the application design facility. For example, a user with design rights could define statements to modify values in secured fields, or to load the contents of secured fields into unsecured work fields. The contents of a secured file, however, cannot be accessed with statements.

Assigning Security Codes

APPX's security facility was designed to provide maximum flexibility. As a result, there are no incorrect methods of assigning security codes. There are, however, methodologies that are more efficient or easier to establish and maintain than others.

Documentation

APPX provides screens to document each design component in the data dictionary as an integral part of its definition. When you create a data dictionary, you define:

User documentation for domains, files, fields, and work fields. The text you enter on these screens is the basis for APPX's online help facility. (User documentation can also be directly maintained using the Documentation Management option from the APPX Main Menu, as described in the *System Management Manual*.)

Technical documentation for domains, files, fields, and work fields. The text you enter in these screens is the basis for APPX's hard-copy technical documentation.

Each user and technical documentation screen includes specifications that identify the domain, file, field, or work field you are documenting, and provides 18 lines of up to 78 characters to explain the component. The external copy feature lets you access other documentation records and copy them into User and Technical Documentation screens.

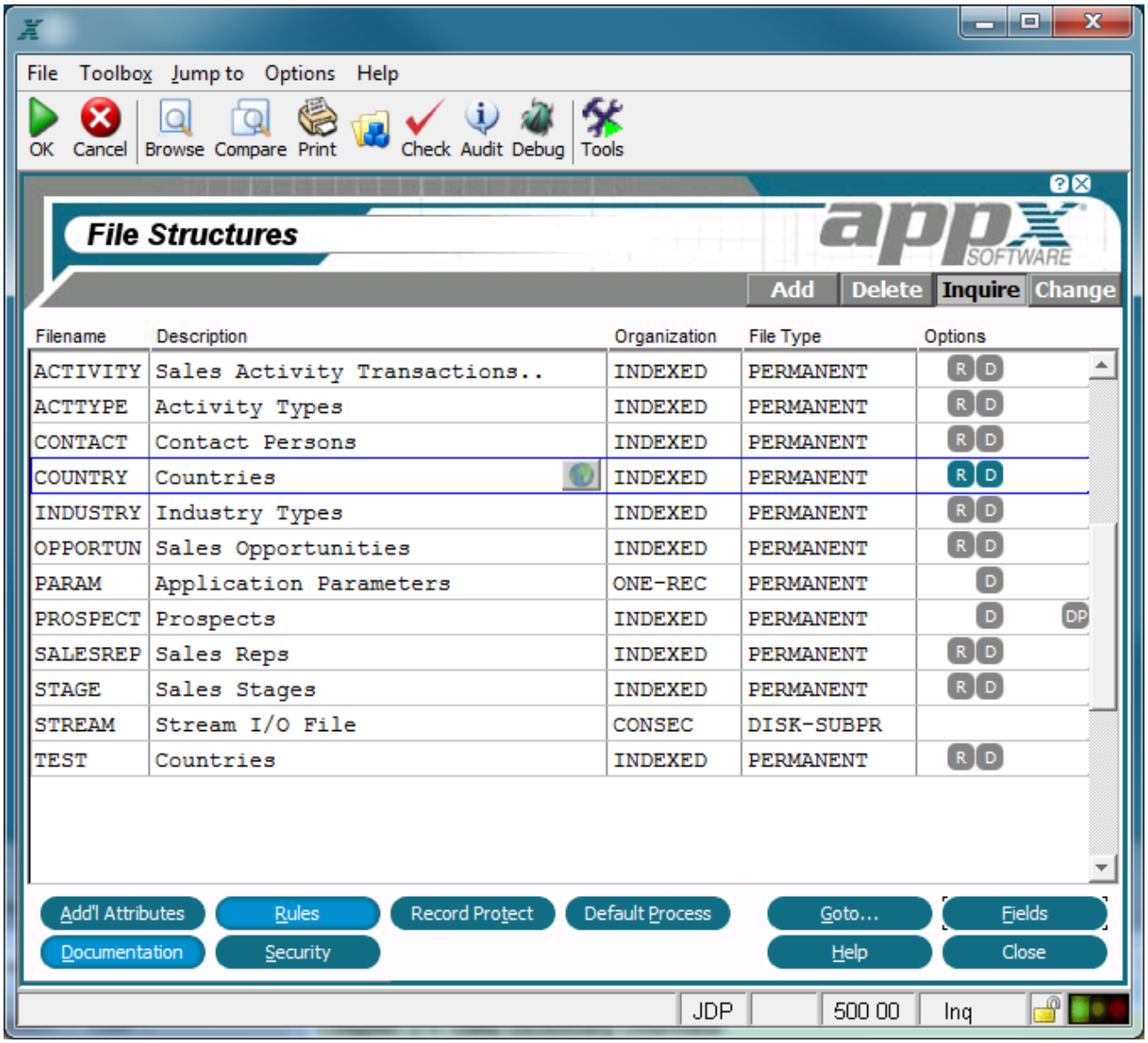
When you enter text on any of the documentation screens, APPX provides a number of editing functions, including word-wrap, text insertion, text redisplay, and end paragraph control. Refer to the *User Manual* fora discussion of text editing capabilities.

Accessing the Data Dictionary Documentation Screens

Documentation is an integral part of the APPX data dictionary. You access:

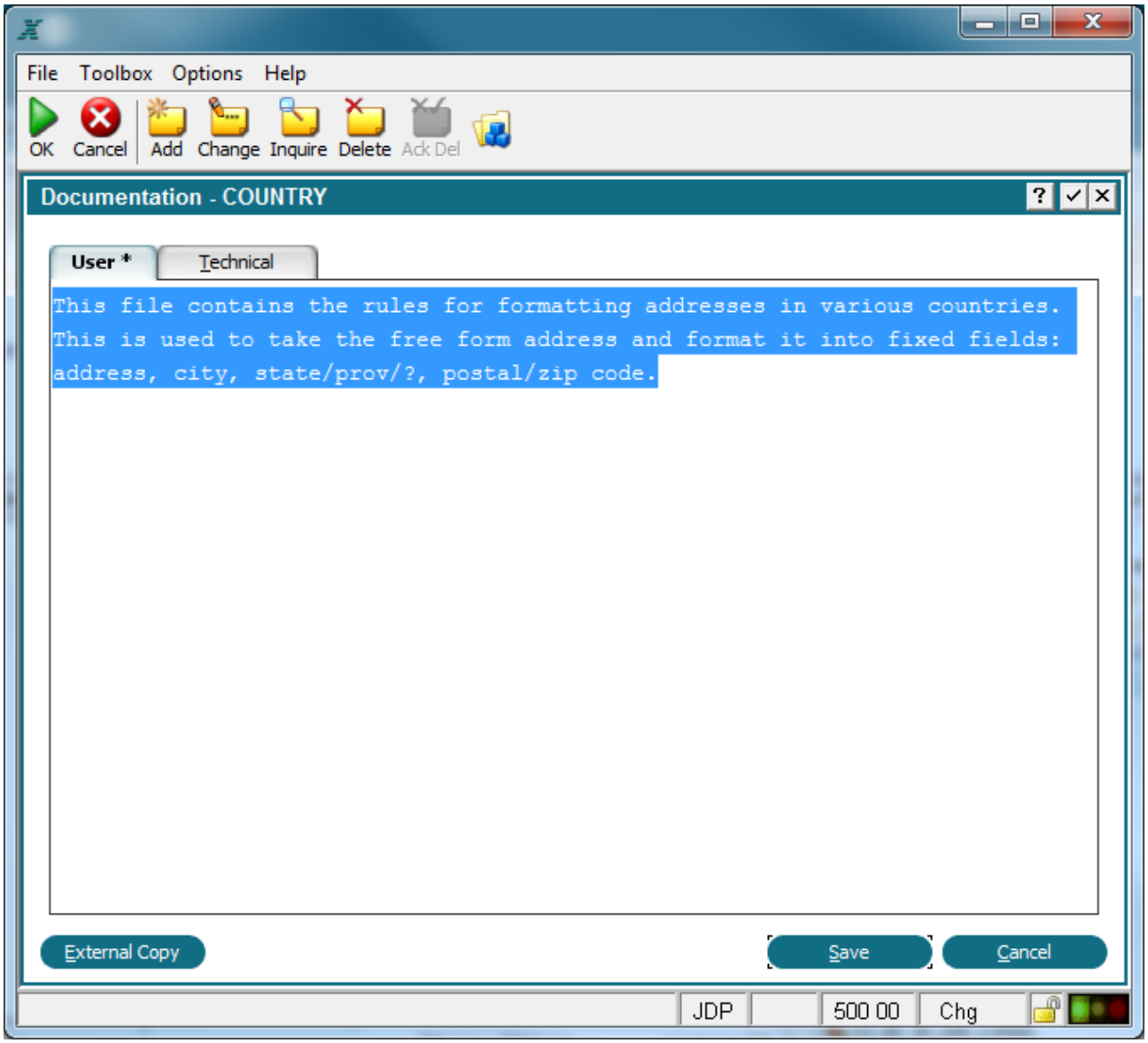
User and technical documentation for any domain, file, field, or work field in the dictionary by selecting the design element, the Country file in this example) and then clicking the Documentation button, see below.

In addition, if you are set up as an application designer or documentation designer in system administration, you can modify the user help text from the *Help* facility by selecting change (*CHG*) mode.



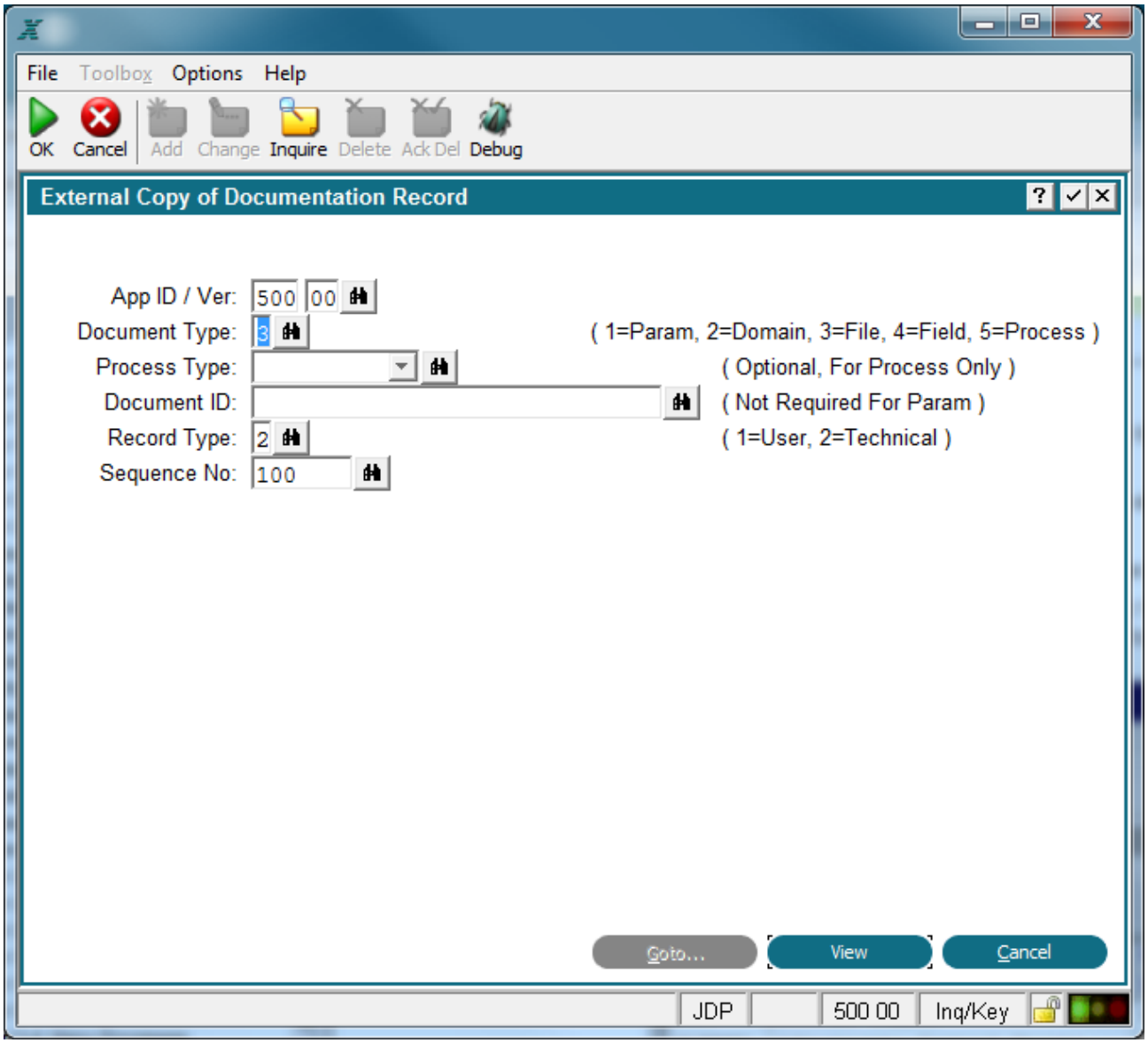
Documentation Input Screen

After clicking the Documentation button on the Element screen the Documentation screen is displayed, see below. There are two tabs, one for User Documentation and the other for Technical Documentation. User documentation is presented to users running a process and clicking the help button for an item. Technical documentation is shown only in Application Design.



User Documentation Screen

You can copy documentation from another design element using the **External Copy** function. After pressing the External Copy button the External Copy of Documentation Record screen is displayed. Enter your parameter from where the documentation will be copied from. See below for an example of the External Copy of Documentation Record screen.



External Copy Screen

Integration with Database Management and System Administration

Integration with File Management and System Administration

APPX's file management and system administration facilities are both integrated with the data dictionary. File management uses many of the dictionary's specifications to create and manage APPX files. System administration establishes the security codes and profiles referenced by the dictionary.

Database Management and the Data Dictionary

File Management and the Data Dictionary

Some of the file management facility is system- or platform-specific, while application design is system-independent. From the integration of the two facilities, you can develop an APPX application without regard to the target platform, yet operate the application to take maximum advantage of the system it operates on.

The file management facility is most tightly integrated with those dictionary components that are database-dependent. The term *database-dependent,* or database-related, refers to what is unique to a specific database (as defined by file management).

In the APPX dictionary, permanent disk-based files are database-dependent. Each database that accesses a permanent, disk-based file actually accesses a separate copy of the file. Unstored files, temporary files, work fields, and memory files aredatabase-independent. In this case, APPX maintains a single file that is accessed by all databases.

For database-dependent files, a number of dictionary specifications provide information and defaults for, or impose restrictions on, the file creation utility in file management. These specifications include *File Name, Organization, Variable Length?, Compress Records?,* and *Create by File Management?* For disk-based temporary files (database-independent), file management refers to the dictionary specifications for file size information.

The dictionary is also integrated with file management's restructure utility. APPX uses this utility to automatically restructure files to reflect such changes as the length of a field or a change in storage type. The flag that indicates a file requires restructuring is maintained by the data dictionary when it is compiled or recompiled. Refer to the *System Management Manual* for a discussion of the restructure utility.

System Administration and the Data Dictionary

The principal interface between the system administration facility and the data dictionary is security. Security profiles are established in system administration, and serve to restrict access to database-dependent components of APPX, such as the permanent, disk-based files in the dictionary. These profiles are identified by a profile name and a database ID. They are therefore linked to a specific database, permitting you to assign different restrictions to test, development, and production databases, for example.

As indicated in the Database Security section, you implement security in the dictionary by assigning security codes to domains, files, fields, and work fields, which act to restrict users? rights based upon their system administration security profiles.

CHAPTER 2-3

Domains

Introduction to Domains

Domains are generic definitions, or patterns, for fields and work fields that share a set of common attributes. These attributes include such things as the physical space a field occupies, the set of values it contains, and the way the field is presented to a user.

APPX recognizes the following nine types of domains, with variations in the screen specifications presented once domain type has been established on the Domains screen.

Alpha domains are patterns for fields comprised of letters, numbers, and special characters (-, #, or &, for example), where the primary characteristic is field length.

Format domains are like alpha domains except that an edit mask is the primary characteristic.

System domains are patterns for fields that contain data provided by the system, often referred to as audit fields.

Text domains are patterns for fields comprised of blocks of text.

Token domains are like alpha domains except they have specific values that are stored as corresponding numbers.

Numeric domains are patterns for fields restricted to number, decimal (.), and sign (-) entries.

Date domains are patterns for fields that contain dates and/or times, from a hundredth of a second through a century.

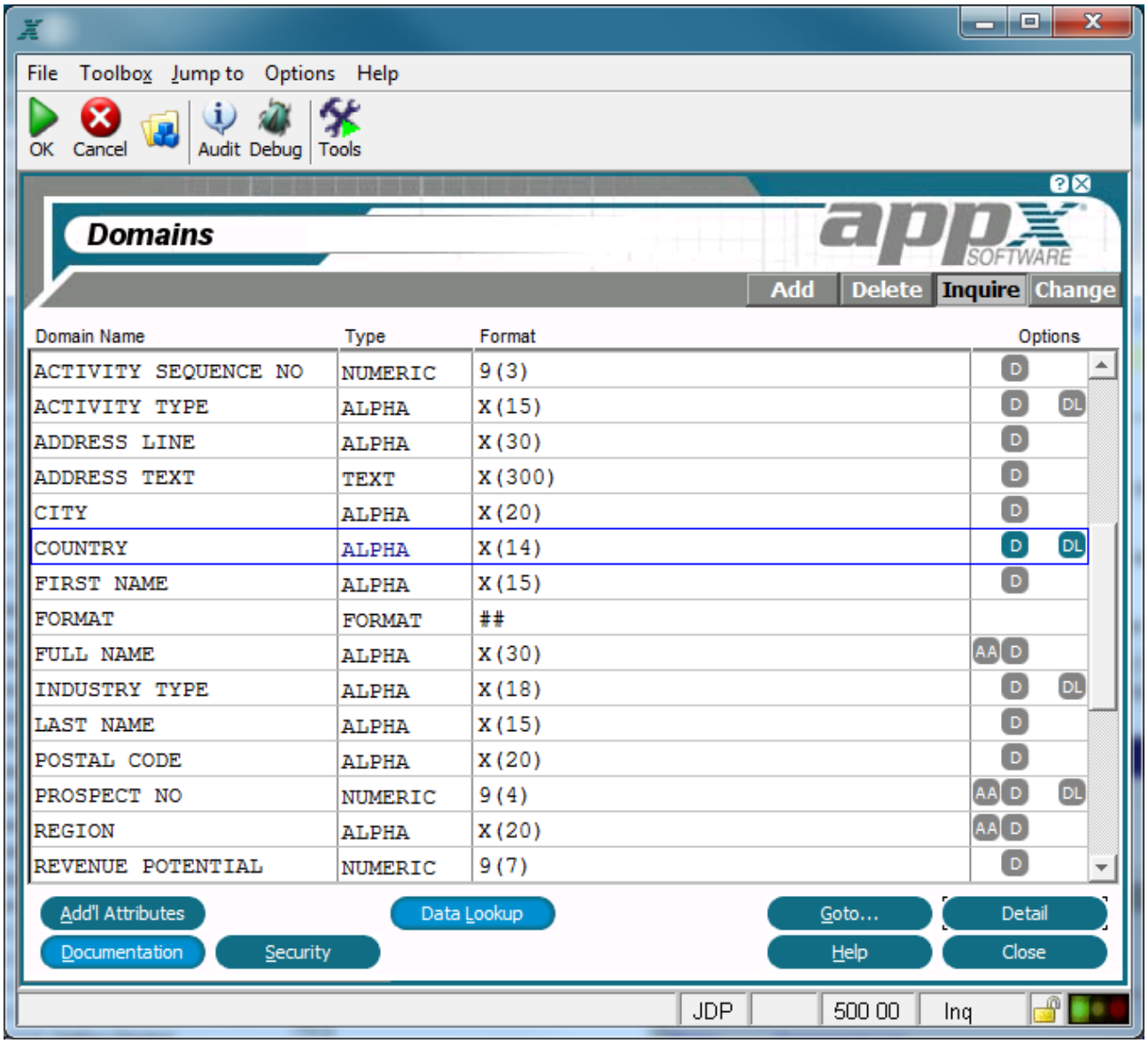
Logic domains are patterns for fields with possible values of yes ☑ or no ☐, or ? to represent an unknown value (Y, N, or blank using Character Mode).

Same As domains are patterns for fields that share the same characteristics as a domain in another application in your database.

Domains Screen

The Domains screen contains general attributes that are common to all domains. The *Type* you enter on this screen for a domain governs the subsequent screens that APPX displays to further define the domain. Domain specifications establish values for all fields that reference the domain and cannot be overridden. Therefore, it may be desirable to leave some attributes blank (such as descriptive name or column headings) to allow for making individual entries at the field level.

You access the Domains screen, shown below, by selecting domains from the Application Design menu overlay.



FDomains Screen

The Domains screen contains the following fields:

Domain Name uniquely identifies the domain within an APPX application. Fields assume the attributes of a domain by referencing the domain?s *Domain Name*. (22 uppercase alphanumeric characters, restricted to numbers, letters, and spaces).

The name may represent a specific field that references the domain, such as an Account Number domain, or a category of fields, such as an Amount domain that is referenced by a number of different fields, including AP Invoice Amount, Sales, AR Invoice Amount, Total Purchases, and Order Amount.

Type categorizes the domain according to its specific content or function in APPX. The specifications presented on subsequent screen overlays depend on the *Type* entered here, although most types share some common specifications.The domain *Type* options are:

Alpha domains are patterns for fields comprised of letters, numbers, and special characters (-, #, or &, for example), where the primary characteristic is field length.

Format domains are like alpha domains except that an edit mask is the primary characteristic.

System domains are patterns for fields that contain data provided by the system, often referred to as audit fields.

Text domains are patterns for fields comprised of blocks of text.

Token domains are like alpha domains except they have specific values that are stored as corresponding numbers.

Numeric domains are patterns for fields restricted to number, decimal (.), and sign (-) entries.

Date domains are patterns for fields that contain dates and/or times, from a hundredth of a second through a century.

Logic domains are patterns for fields with possible values of yes ☑ or no ☐, or ? to represent an unknown value (Y, N or blank using Character Mode).

Same As domains are patterns for fields that share the same characteristics as a domain in another application in your database.

If you enter a partial value, APPX selects the option with the next highest value. For example, an entry of *ALPHA* or *A* is equivalent to entering *ALPHA*. An entry of *C* references the next highest value: *DATE*. Each option is discussed in detail in the corresponding section.

Format displays a symbolic representation of the domain for ease of reference. It is generated by APPX according to the detail specifications entered for the domain and cannot be edited.

Options are indicators that display whenever documentation (T), data lookup (DL), or additional attributes (AA) have been defined for this domain.

Additional Attributes. The additional attributes option from the Domains screen accesses an Additional Attributes overlay, from which you can enter additional parameters for the domain. The specific overlay varies by domain type. Each overlay is presented later in this chapter according to the respective type of domain. Upon completion, you are returned to the Domains screen.

Data Lookup. The data lookup option from the Domains screen accesses the Data Lookup overlay, shown in above, where you can identify an application, file, and key field that can be accessed by using the value in any field referencing this domain. The key field must be a primary or alternate key to the file. This entry establishes the Data Lookup specifications for all fields that reference the domain. Upon completion, you are returned to the Domains screen.

Goto... The Goto presents a "key entry" screen for the domains within the selected application preserving the mode. Goto is not available in Add mode.

Toolbox

Data Lookup

Additional Attributes

Security

Domains Toolbox Option

The toolbox overlay appears on the screen when you invoke the Toolbox option from the Domains screen. The overlay contains a number of features such as documentation management and security management that will assist you when creating domains. The options listed in the Toolbox overlay are described briefly below. See *Process Definition* for a more detailed explanation of the these options.

Documentation

When you select the documentation option from the Toolbox overlay, you will first see the Documentation overlay which allows you to select between user or technical documentation. Once you have entered your documentation, you are returned to the Domains screen.

Security

The security option allows you to identify the APPX security code to which a user must have rights in order to access the domain. The security code must be four numeric characters. If blank, there are no restrictions.

Fields/Domains Cross Reference

The Fields/Domains cross-reference option enables you to determine the location and frequency of a selected domain, file, field, application ID, process or ILF statement within a specific database.

Change ALL References

This feature tells APPX to find and replace all references to a certain domain in an application.

View Audit Info

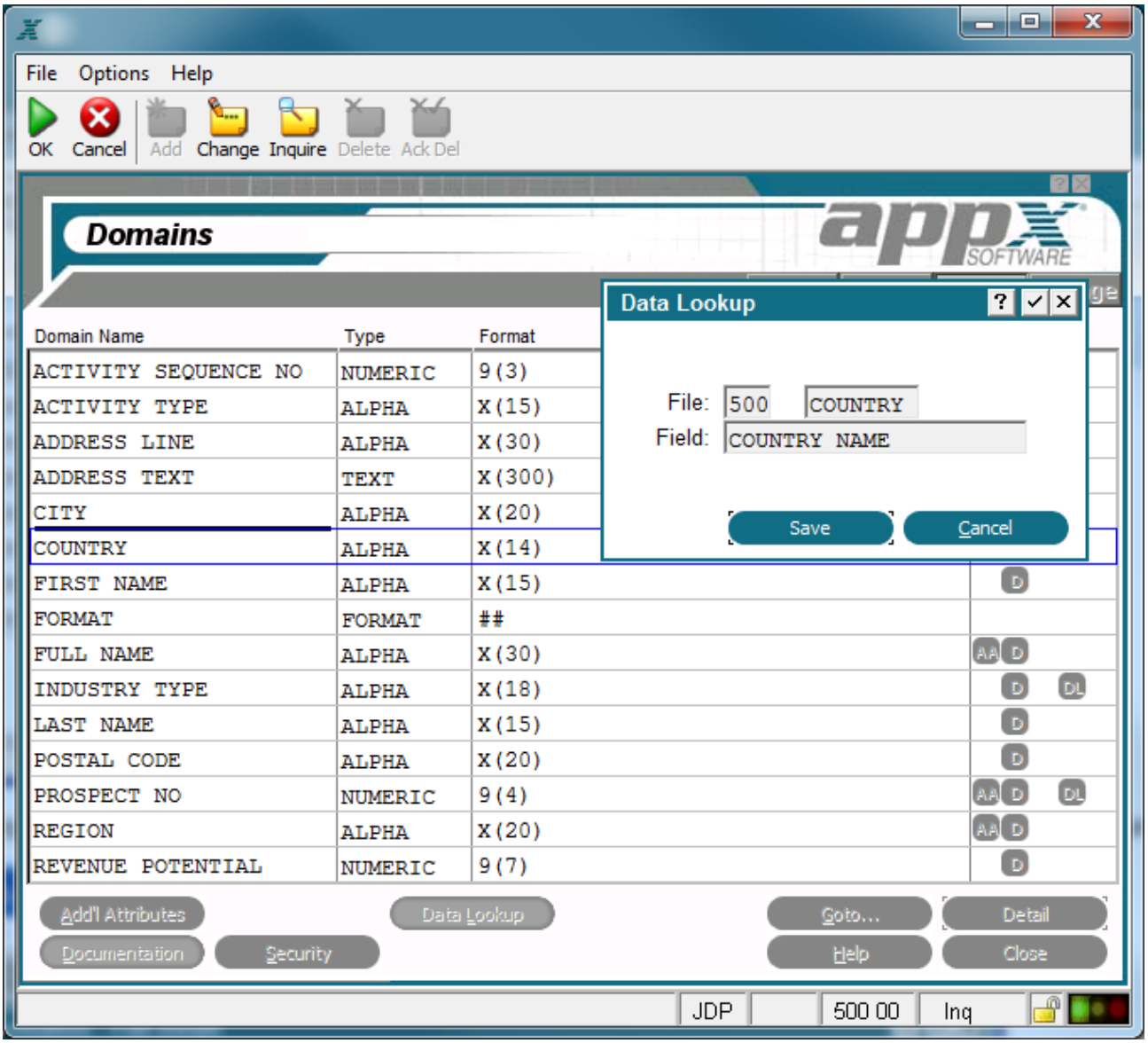
This feature allows you to see who created the currently selected inquiry process and who changed the currently selected inquiry process most recently. It also gives the date of creation and the date it was last changed. Note that this option (Option 98), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

Invoke a Process

This feature is available to facilitate testing. It allows you to invoke any process; the currently selected inquiry process using the Test Database defined in system administration is the default. Note that this option (Option 99), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

Domains Data Lookup

The data lookup option from the Domains screen accesses the Data Lookup overlay, shown below, where you can identify an application, file, and key field that can be accessed by using the value in any field referencing this domain. The key field must be a primary or alternate key to the file. This entry establishes the *Data Lookup* specifications for all fields that reference the domain. Upon completion, you are returned to the Domains screen.



Domains Data Lookup Overlay

Domains Additional Attributes

The Additional Attributes option from the Domains screen accesses an Additional Attributes overlay, from which you can enter additional parameters for the domain. The specific overlay varies by domain type. Each overlay is presented later in this chapter according to the respective type of domain. Upon completion, you are returned to the Domains screen.

Common Domain Specifications

When you select Enter ☑ from the Domains screen title bar, the Domains specifications overlay displays. The following two entries, *Descriptive* and *Column Hdgs*, are common to the specifications overlay for all types of domains other than *Same As* domains:

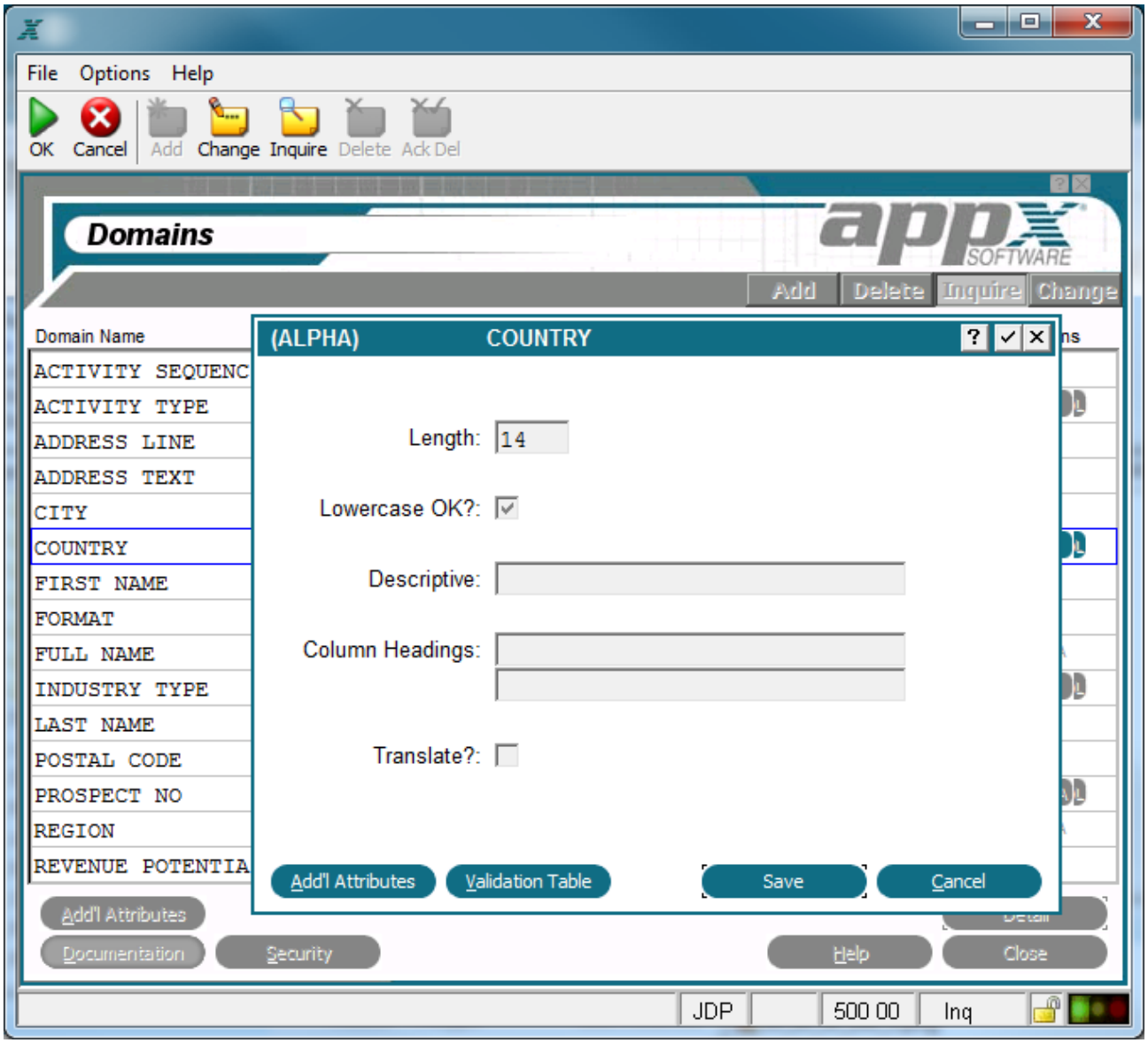
Descriptive, if entered, establishes the *Descriptive* for all fields referencing the domain. However, since domain attributes cannot be overridden, you may wish to leave *Descriptive* blank here to allow for individual entry at the field level. Because *Descriptive* is longer and can be more flexibly formatted, itis less cryptic and easier to understand than *Field Name*. The system uses *Descriptive* when communicating with users wherever possible. It is used, for example, when the value of a field displays to a user on a standard image, such as the *Select Access Path* display or an APPX-generated subheading.

Column Hdgs, if entered,establishes up to two lines of column heading text for all fields referencing this domain. However, since domain attributes cannot be overridden, you may wish to leave *Column Hdgs* blank here to allow for individual entry at the field level. For cosmetic reasons, the length of a heading should not exceed the length of the field itself. The APPX output process uses column heading text to generate standard column heading images for *Start of Page* and *Start of Range* class frames.Refer to Output Process Specifications, Output Standard Column Heading Image, and Output Frame Specifications for more information on automatically generated column headings and frame classes in output functions.

Alpha Domains

An alpha domain can contain letters, numbers, and special characters, such as *#, $,* and *&*. Examples include names, addresses, descriptions, and certain account numbers or serial numbers.

The Alpha Domains overlay, shown below, allows you to add Alpha specific attributes to those already defined for domains. The alpha domain overlay displays after you complete the entries on the domains screen if the domain *Type* you select is *ALPHA*.



Alpha Domains Overlay

The Alpha Domains overlay contains the following fields:

Length designates the number of character positions, or length, of this domain.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect ILF statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries. The default is 'yes' ☑.

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used. Because *Descriptive* is less cryptic and can be more flexibly formatted than *Domain Name*, it is easier to

understand. As a result, the system uses *Descriptive* when communicating with users. *Descriptive* is used, for example, when the value of a domain displays to a user on a standard image, such as the *Select Access Path* display or an APPX-generated subheading.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Translate? Indicates if this domain or field is eligible for language translation. Currently the following field types may be translated (others will have the field protected) Token fields Alpha & Format fields that have a validation table Work fields that are Token, Alpha, Format, or Text It's currently the designer's responsibility to insure that translatable work fields without a validation table are read only.

For Alpha domain type, the following options are available as described in the corresponding sections:

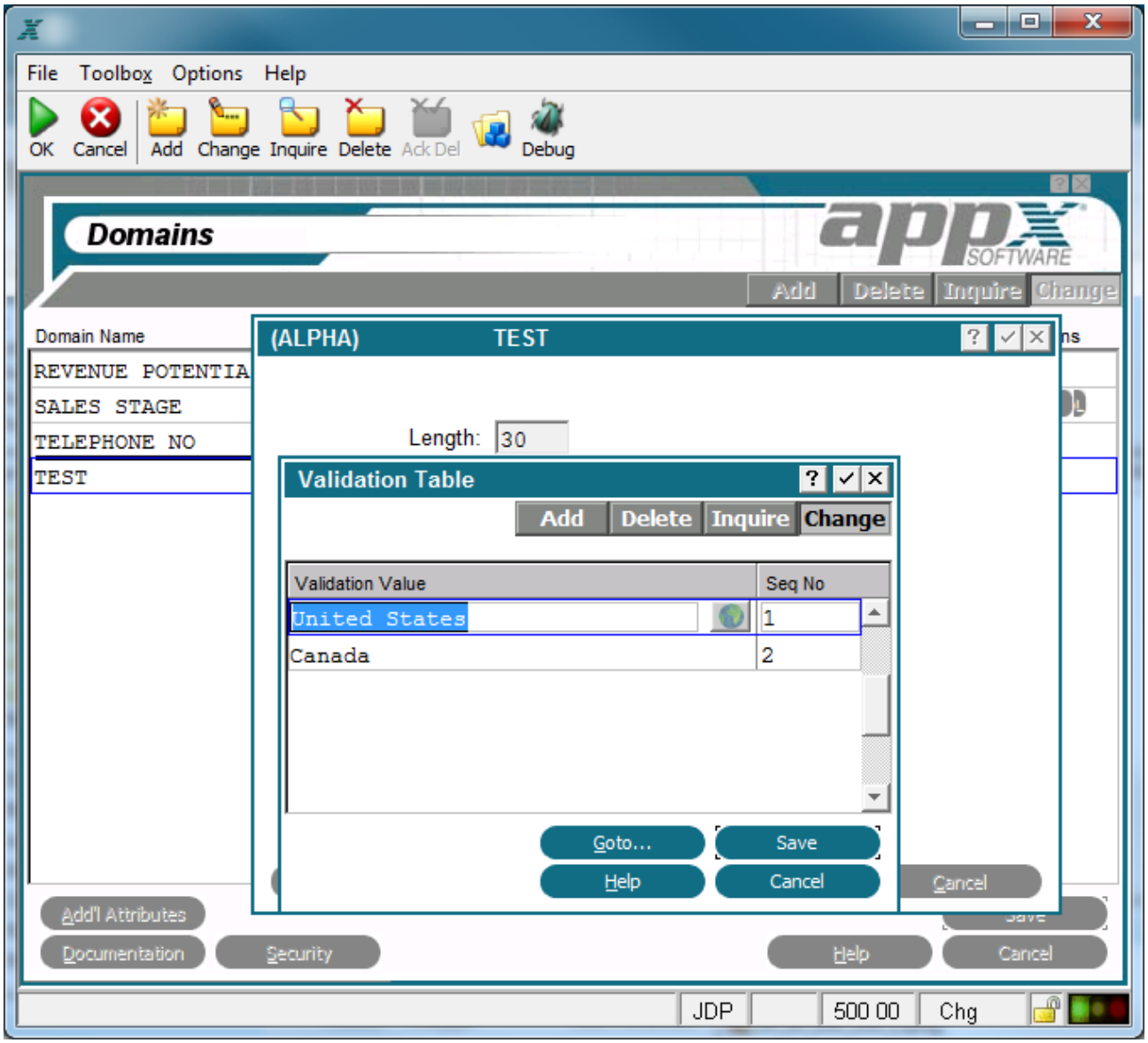
Validation Table

Additional Attributes

Alpha Domain Validation Table

The Validation Table option from the Alpha Domains overlay accesses the Validation Table overlay, shown below. A validation table provides a more powerful alternative to the use of range checks for data validation when there is a known set of values. Through the list feature, it provides the user with visibility of all the possible field values as well as the ability to select the desired value.

If defined for the domain, it establishes the validation table for all fields that reference the domain and cannot be modified at the field level. Conversely, if not defined for the domain, a validation table cannot be defined for any field that references the domain.



Alpha Domain Validation Table Overlay

You can establish a validation table for any Alpha domain in the data dictionary. The entries in the table are case-sensitive. If you enter a validation value in all capital letters, an application user must enter the value in all capital letters.

Validation table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, validation does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application. All validation values are available for review and selection by the end user through the list ▼ feature.

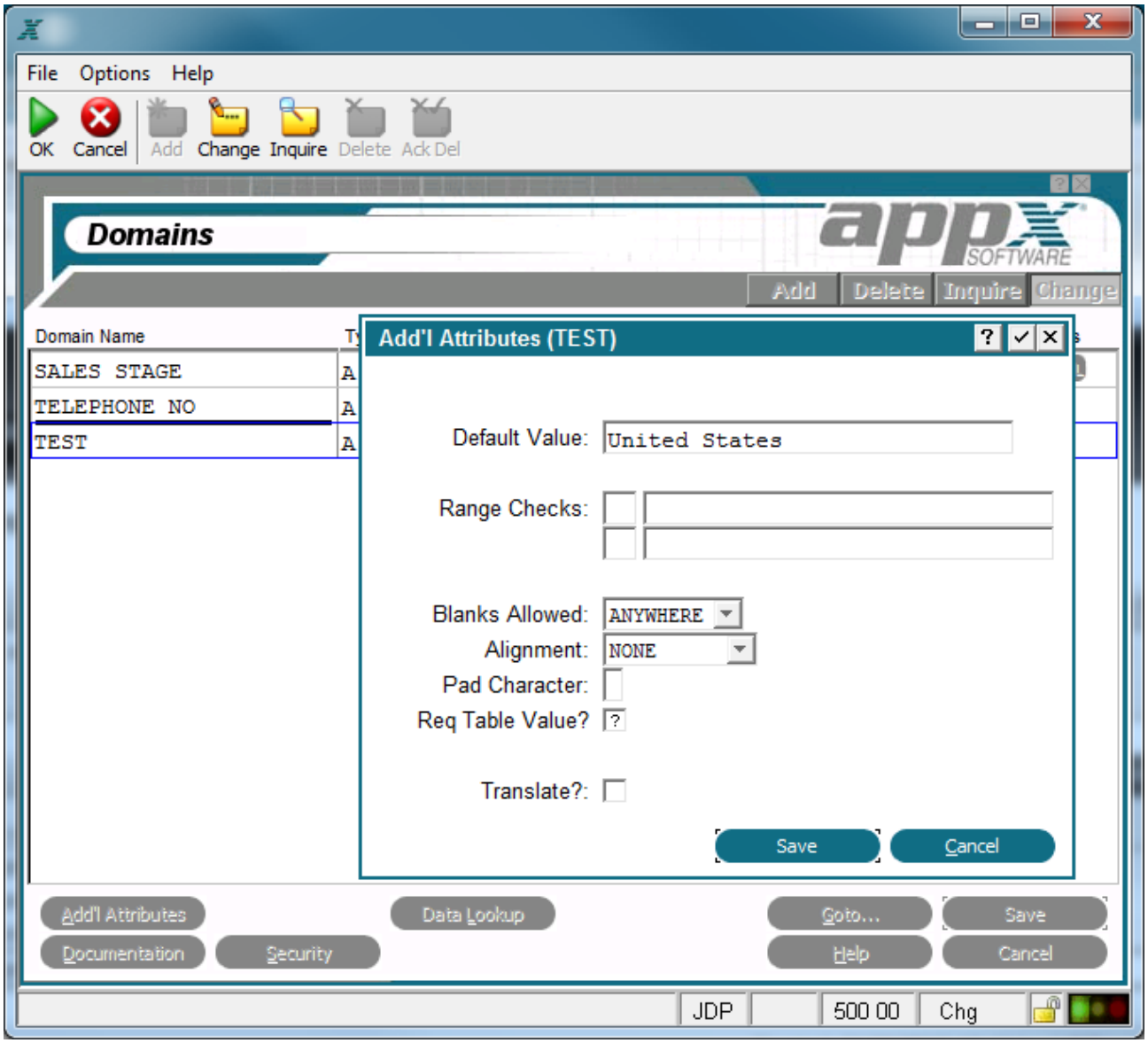
The Validation Table overlay contains the following fields:

Validation Value provides a valid field value. It is case-sensitive and is used for online review, selection, and validation. Note that validation values newly added to the data dictionary are not available to a current APPX user until the user exits and re-enters APPX.

Seq No provides an identifying number for the associated validation value. It is defaulted by APPX and can be overridden, but it must be unique within a table.. It determines the order in which validation values are presented, both for selection by the user and for editing in application design. APPX assigns the first validation value a number of *1*, with additional values assigned a number that is equal to the highest existing sequence number plus *1*. APPX does not require that sequence numbers be contiguous within a table.

Alpha Domain Additional Attributes

From the Alpha Domains overlay, you have an Additional Attributesoption. The Alpha domain Additional Attributes overlay is shown below.



Alpha Domain Additional Attributes Overlay

The Alpha Domain Additional Attributes Overlay contains the following fields:

Default Value establishes a modifiable starting value for all image items whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are:

EQ (equal to)

NE (not equal to)

GT (greater than)

LT (less than)

GE (greater than or equal to)

LE (less than or equal to)

IN (includes)

The second component represents the value assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Blanks Allowed indicates whether or not blanks are permitted and, if so, where they can be placed. The Blanks Allowed options are:

NONE, The field cannot contain blanks.

TRAILING, Blanks are permitted only when positioned to the right of the far right-hand (non-constant) character in a field. Trailing constant characters are treated as trailing blanks for the purpose of applying this restriction.

ANYWHERE, Blanks can be entered in any position within a field.

The default is ANYWHERE.

Alignment, determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are:

NONE, Data is not aligned for either storage or display purposes.

LEFT, Data is aligned with the far left-hand character position in a field.

RIGHT, Data is aligned with the far right-hand character position in a field.

CENTERED, Data displays in the center of a field.

JUSTIFIED, Data is aligned with both the far left-and right-hand character positions in a field, and distributed to occupy the entire field. Where necessary, data is padded with spaces.

The default is NONE. The figure below shows the different alignment options.

This type is aligned flush with the left margin.	This type is aligned flush with the right margin.	This type is centered within the left and right margins.	This type is aligned flush with both margins.
Left	Right	Centered	Justified

Alignment Options

Pad Character indicates the character to be used instead of leading and trailing spaces in a field.

Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑ (Y using

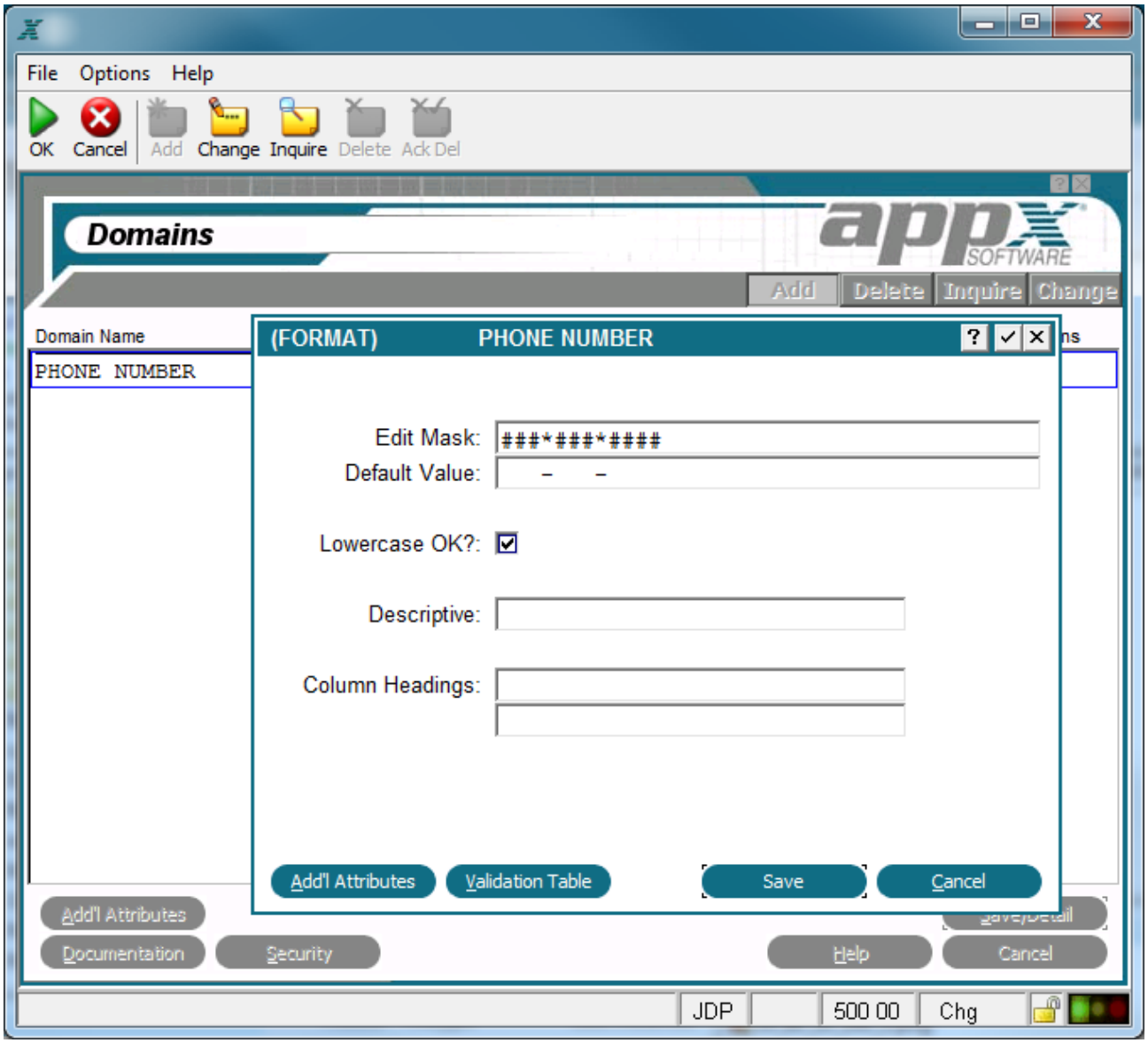
Character Mode), 'no' ☐ (N using Character Mode), and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Require Table Value? indicates if fields based on this domain require one of the validation table values to be entered. To force the user to enter one of the defined values, click the checkbox to toggle it to 'yes' ☑ (Y using Character Mode). If a 'no' ☐ (N using Character Mode) value is selected, the validation table shown when the user selects the list feature, is advisory only and the user can enter a value not listed in the table. If there is no validation table defined, this option does not apply and cannot be selected. If Translate? is ☑, this option should also be ☑ (Y using Character Mode).

Format Domains

A format domain is like an alpha domain, except that its primary characteristic is an edit mask.

The Format Domain overlay, shown below, displays after you complete the entries on the Domains screen if the domain *Type* you select is *FORMAT*.



Format Domain Overlay

The Format Domain overlay contains the following fields:

Edit Mask establishes format requirements for data validation and also determines how the field is stored and displayed. A mask character representing the allowable values is entered for each position in the field. The mask characters are:

numbers only)

letters only)

numbers and letters only)

any characters)

use default value character) ? The valid character for this position in a mask is defined by referencing the same position in the default value.

For example, you can mask a phone number field with the following entry: ###*###*####.

Default Value establishes a starting value for all referenced fields whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image. The positioning of constant characters in the default value must correspond to the positions of *s, if any,in the edit mask. For example, a possible default value for the phone number mask indicated in *Edit Mask* earlier is: _ _ _ - _ _ _ - _ _ _ _ (the underlines represent blanks).

Lowercase OK' indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regard-less of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries. The default is 'yes' ☑.

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a domain itself. Refer to Standard Column Heading Image for additional information.

For Format domain type, the following options are available as described in the corresponding sections:

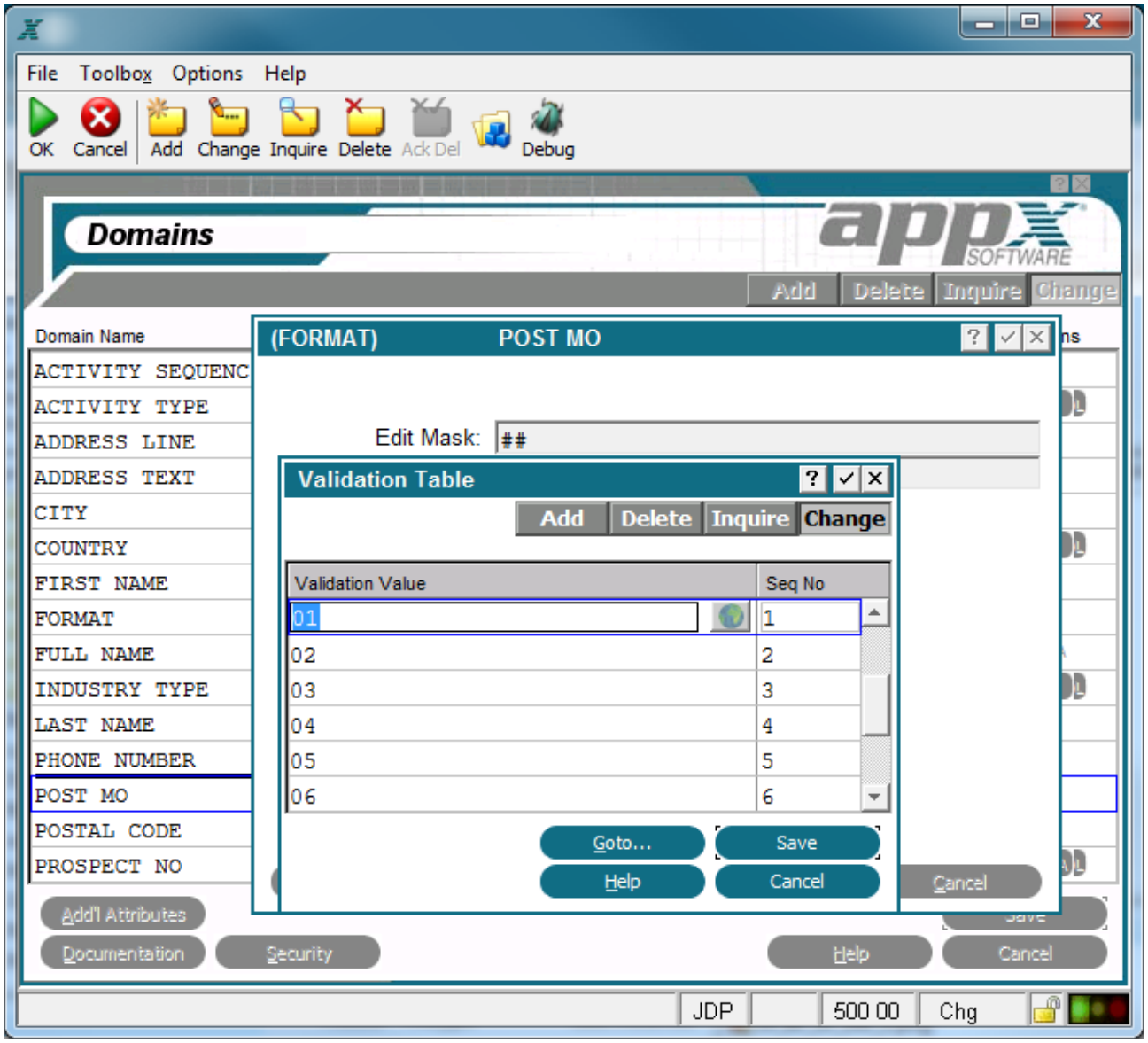
Validation Table

Additional Attributes

Format Domain Validation Table

The Validation Table option from the Format Domains overlay accesses the Validation Table overlay, shown below. A validation table provides a more powerful alternative to the use of range checks for data validation when there is a known set of values. Through the list ▼ feature, it provides the user with visibility of all the possible field values as well as the ability to select the desired value.

If defined for the domain, it establishes the validation table for all fields that reference the domain and cannot be modified at the field level. Conversely, if not defined for the domain, a validation table cannot be defined for any field that references the domain.



Format Domain Validation Table Overlay

You can establish a validation table for any Format domain in the data dictionary. The entries in the table are case-sensitive. If you enter a validation value in all capital letters, an application user must enter the value in all capital letters.

Validation table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, validation does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application. All validation values are available for review and selection by the end user through the list ▼ feature.

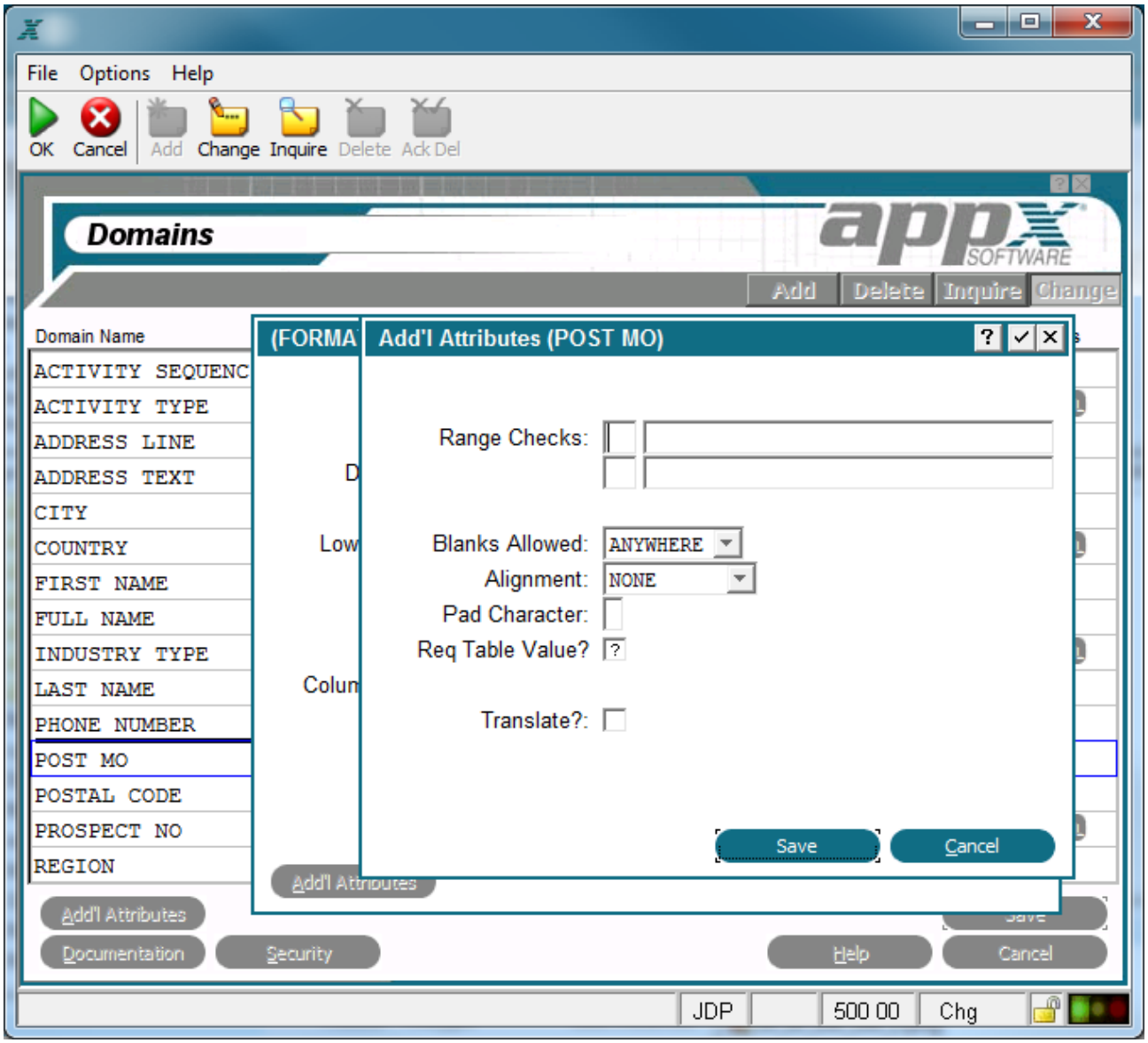
The Validation Table overlay contains the following fields:

Validation Value provides a valid field value. It is case-sensitive and is used for online review, selection, and validation. Note that validation values newly added to the data dictionary are not available to a current APPX user until the user exits and re-enters APPX.

Seq No provides an identifying number for the associated validation value. It is defaulted by APPX and can be overridden, but it must be unique within a table.. It determines the order in which validation values are presented, both for selection by the user and or editing in application design. APPX assigns the first validation value a number of *1*, with additional values assigned a number that is equal to the highest existing sequence number plus *1*. APPX does not require that sequence numbers be contiguous within a table.

Format Domain Additional Attributes

From the Format domain overlay, you have an Additional Attributesoption. The Format domain Additional Attributes overlay is shown below.



Format Domain Additional Attributes Overlay

The Format Domain Additional Attributes Overlay contains the following fields:

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), ***LE*** (less than or equal to), ***IN*** (includes).

The second component represents the value assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Blanks Allowed indicates whether or not blanks are permitted and, if so, where they can be placed. The *Blanks Allowed* options are ***NONE, TRAILING,*** and ***ANYWHERE***. The default is *ANYWHERE*.

Alignment determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are ***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** The default is *NONE*.

Pad Character indicates the character to be used instead of leading and trailing spaces in a field.

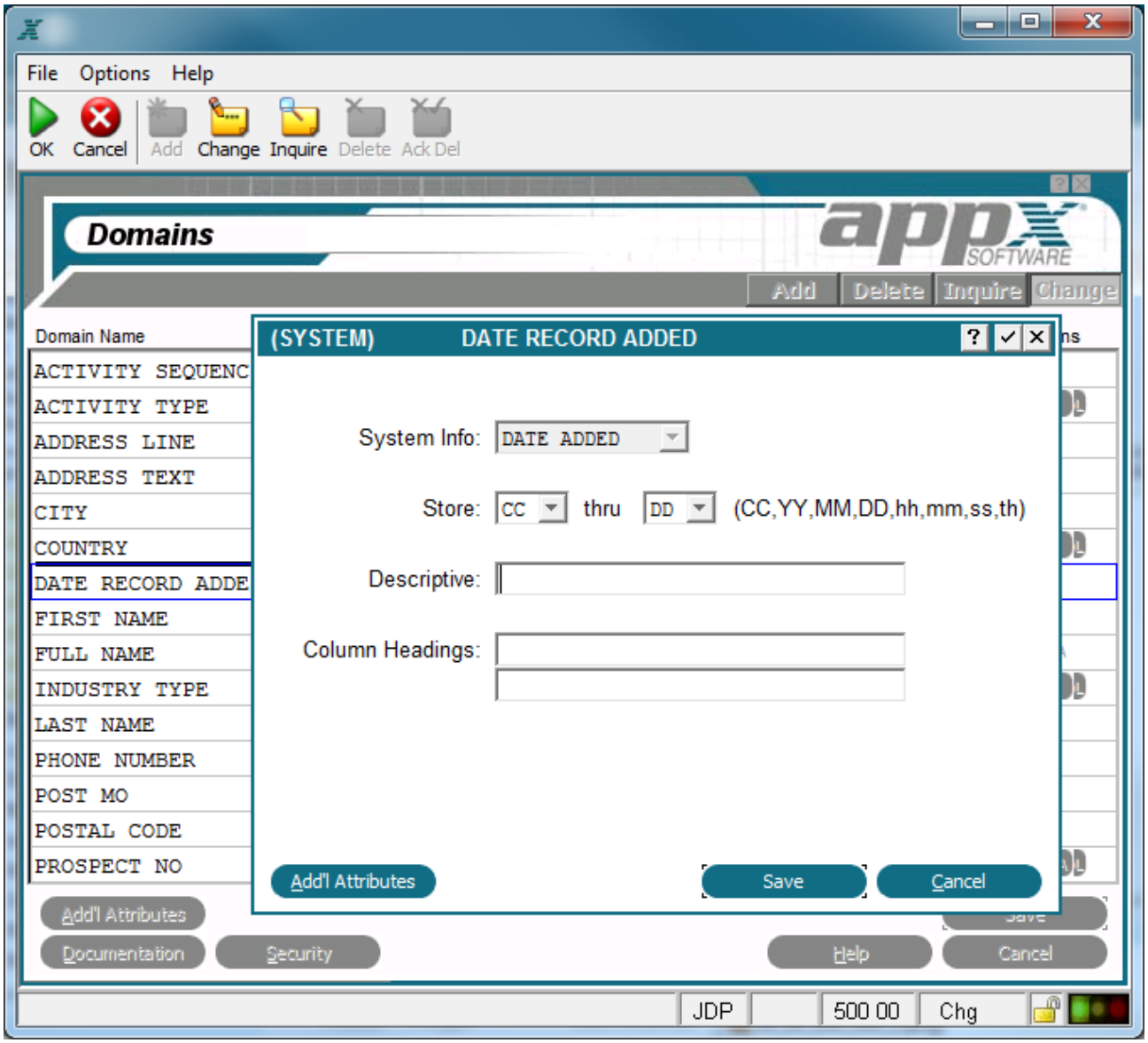
Require Table Value? indicates whether or not to require one of the validation table values to be entered. To force the user to enter one of the defined values, click the checkbox to toggle it to 'yes' ☑ (Y using Character Mode). If a 'no' ☐ (N using Character Mode) value is selected, the validation table shown when the user selects the list feature, is advisory only and the user can enter a value not listed in the table. If there is no validation table defined, this option does not apply and cannot be selected. If there is a validation table and *Translate?* is ☑, this option should also be ☑ (Y using Character Mode).

Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

System Domains

A system domain, often referred to as an audit domain, displays data that is provided by the system.

The system domain overlay for dates, shown below, allows you to add system specific attributes to those already defined for domains. The system domain specifications overlay displays after you complete the entries on the domains screen if the domain type you enter is *system*.



System Domain Overlay

The System Domain Specifications overlay contains the following fields:

System Info determines the option that is to be displayed on the field specifications screen when defining a system field. The *System Info* options are ***USER ADDED***, which identifies the user ID of the operator who added the record; ***USER CHANGED***, which identifies the user ID of the operator who modified the record. ***DATE ADDED***, which identifies the date that the record was added; and ***DATE CHANGED***, which identifies the date the record was last modified.

Select Enter ☑ to display the remaining fields:

Store thru is displayed for System Date fields only. Select the upper and lower limits for this date/time field.

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a domain itself. Refer to Standard Column Heading Image for additional information.

System Domain Additional Attributes

The Additional Attributes option is only available if the DATE ADDED or DATE CHANGED type is selected. There is only one field on this overlay:

Storage type denotes how the system date field should be stored. Your choices are:

BINARY The date is stored in binary format.

PACKED DECIMAL stores two decimal digits for each byte.

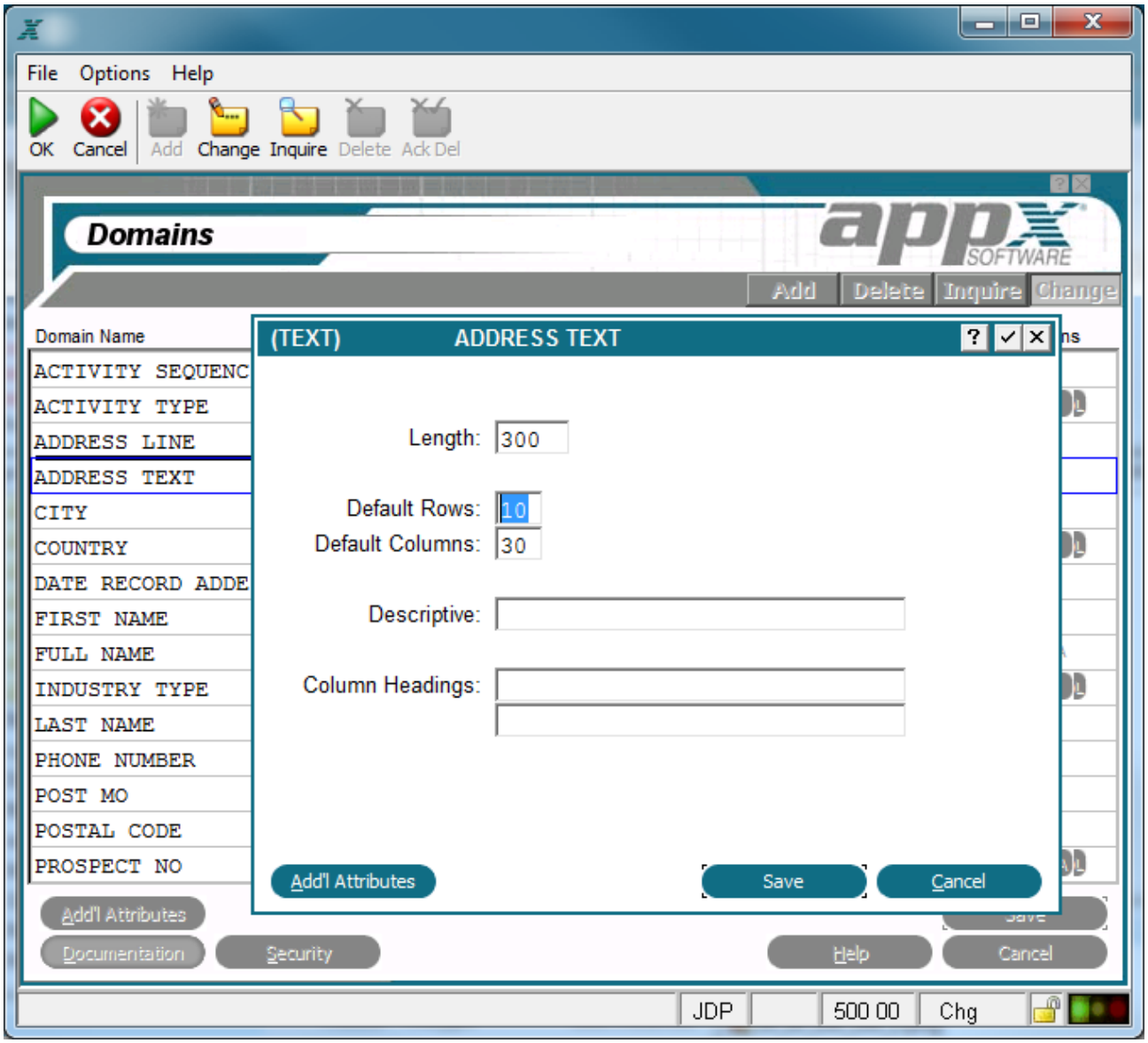
ALPHA stores the external representation of date.

The default is PACKED DECIMAL.

Text Domains

A text domain allows a user to enter a block of text on the data entry screen.

The text domain overlay, shown below, allows you to add text specific attributes to those already defined for domains. The text domain specifications overlay displays after you complete the entries on the domains screen if the domain *Type* you select is *TEXT*.



Text Domain Overlay

The Text Domain Specifications overlay contains the following fields:

Length designates the number of character positions, or length, of this field.

Default Rows/Cols determines the default number of rows and columns to be used when specifying a field on an image.

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used.

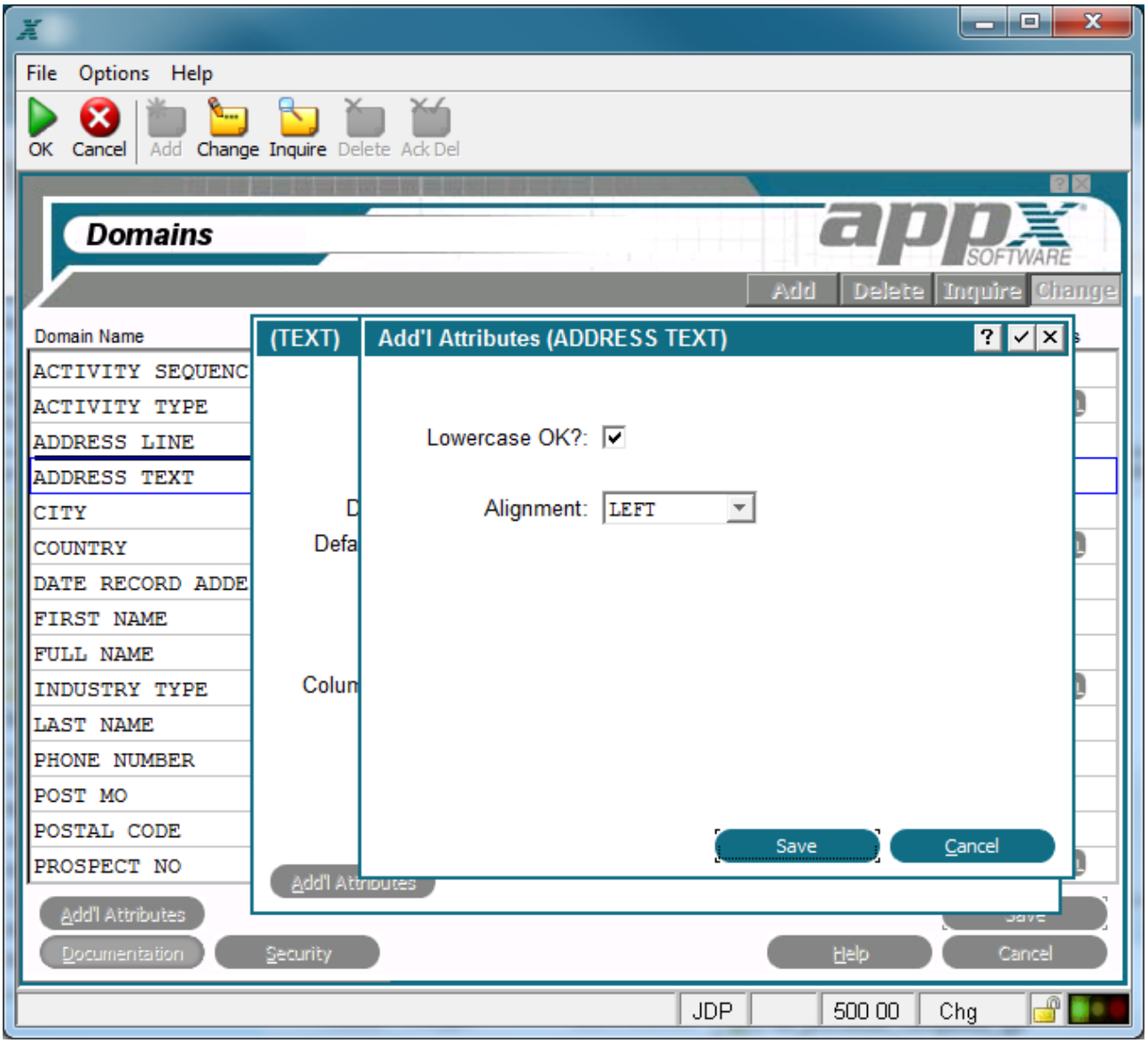
Col Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a domain itself. Refer to Standard Column Heading Image for additional information.

For Text domain type, the following option is available as described in the corresponding section:

Additional Attributes

Text Domain Additional Attributes

From the Text domain overlay, you have an Additional Attributesoption. The Text domain Additional Attributes overlay is shown below.



The Text Domain Additional Attributes Overlay

The Text Domain Additional Attributes Overlay contains the following fields:

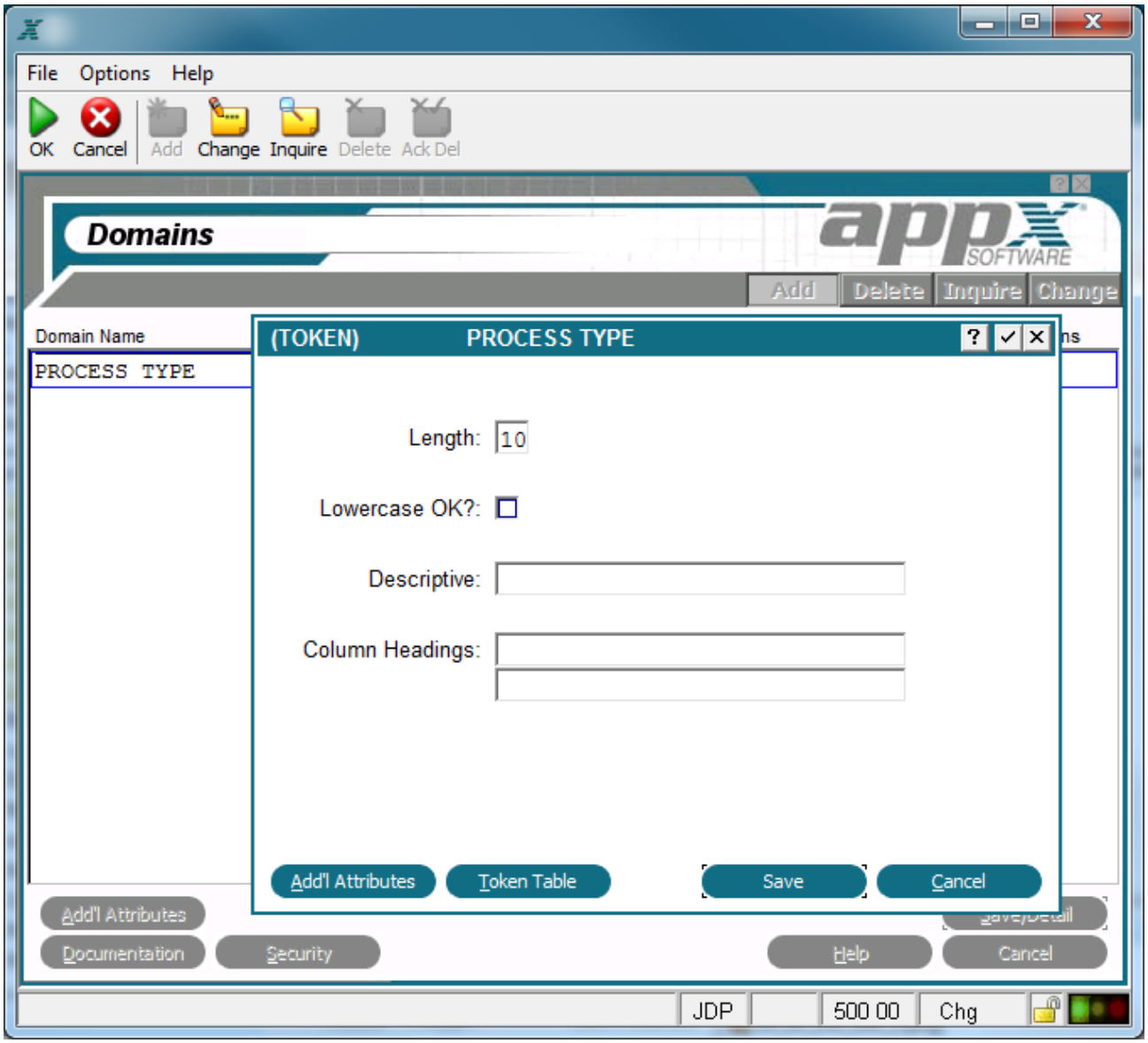
Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. A lowercase value established with a statement displays as lowercase, even if this specification prohibits it. The default is 'yes' ☑.

Alignment determines the alignment of data in a field. The *Alignment* options are ***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** This effects the display and storage. The default is *NONE*.

Token Domains

A token domain is like an alpha domain but has specific values that are stored as corresponding numbers.

The token domain overlay, shown below, allows you to add token specific attributes to those already defined for domains. The token domains specification overlay displays after you complete the entries on the domains screen if the domain *Type* you select is *TOKEN*.



Token Domain Overlay

The Token Domain Specifications overlay contains the following fields:

Length designates the number of character positions, or length, of this domain.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries. The default is 'yes' ☑.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

For Token domain type, the following options are available as described in the corresponding sections:

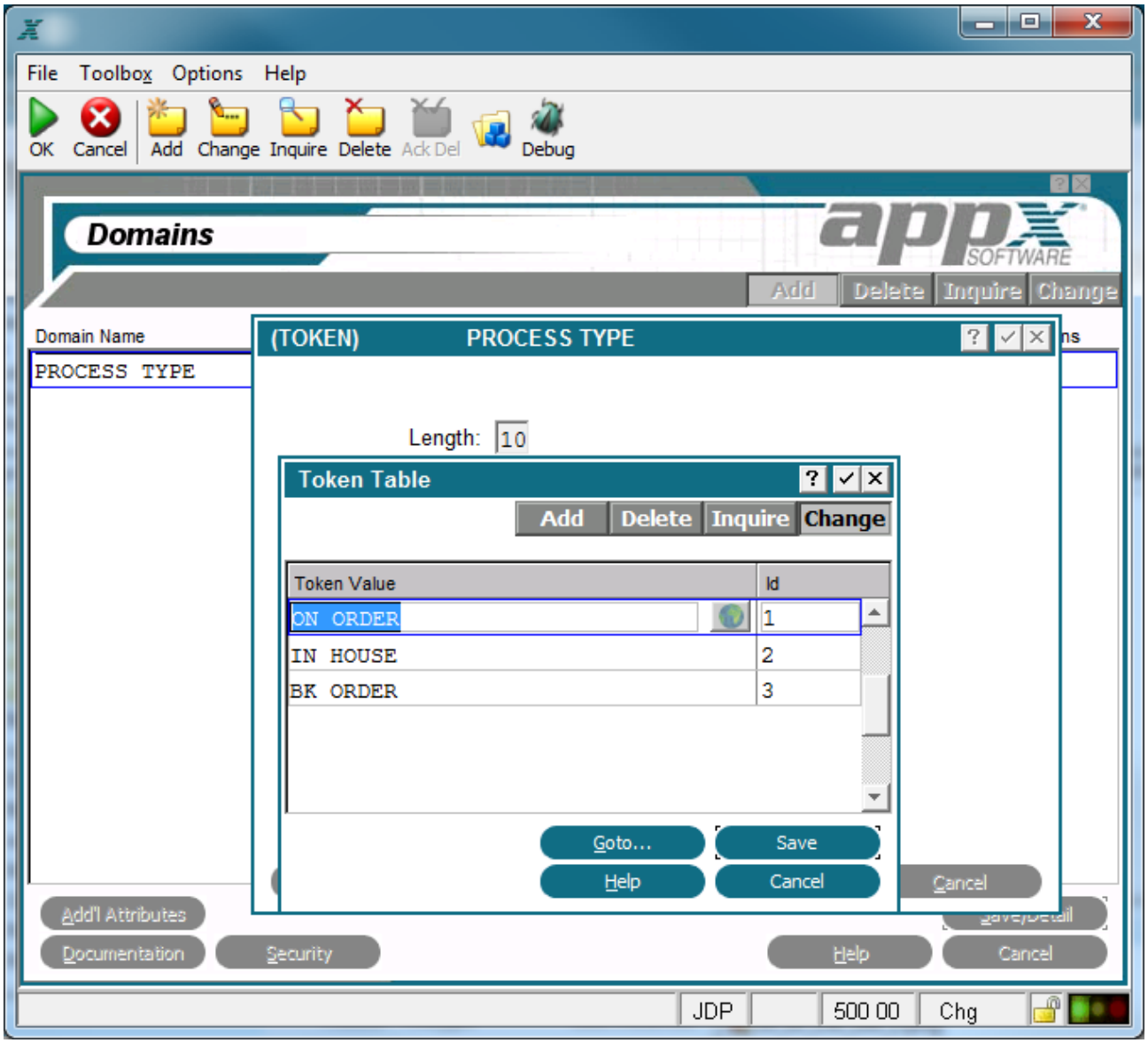
Token Table

Additional Attributes

Token Domain Token Table

From the Token Domain overlay, the token table option accesses the Token Table overlay shown below. A token table provides an alternative to the use of range checks for data token.

You can establish a token table for any Token domain in the data dictionary. The entries in the table are case-sensitive. If you enter a token value in all capital letters, an application user must enter the value in all capitals.



Token Domain Token Table Overlay

Token table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, a token does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application.

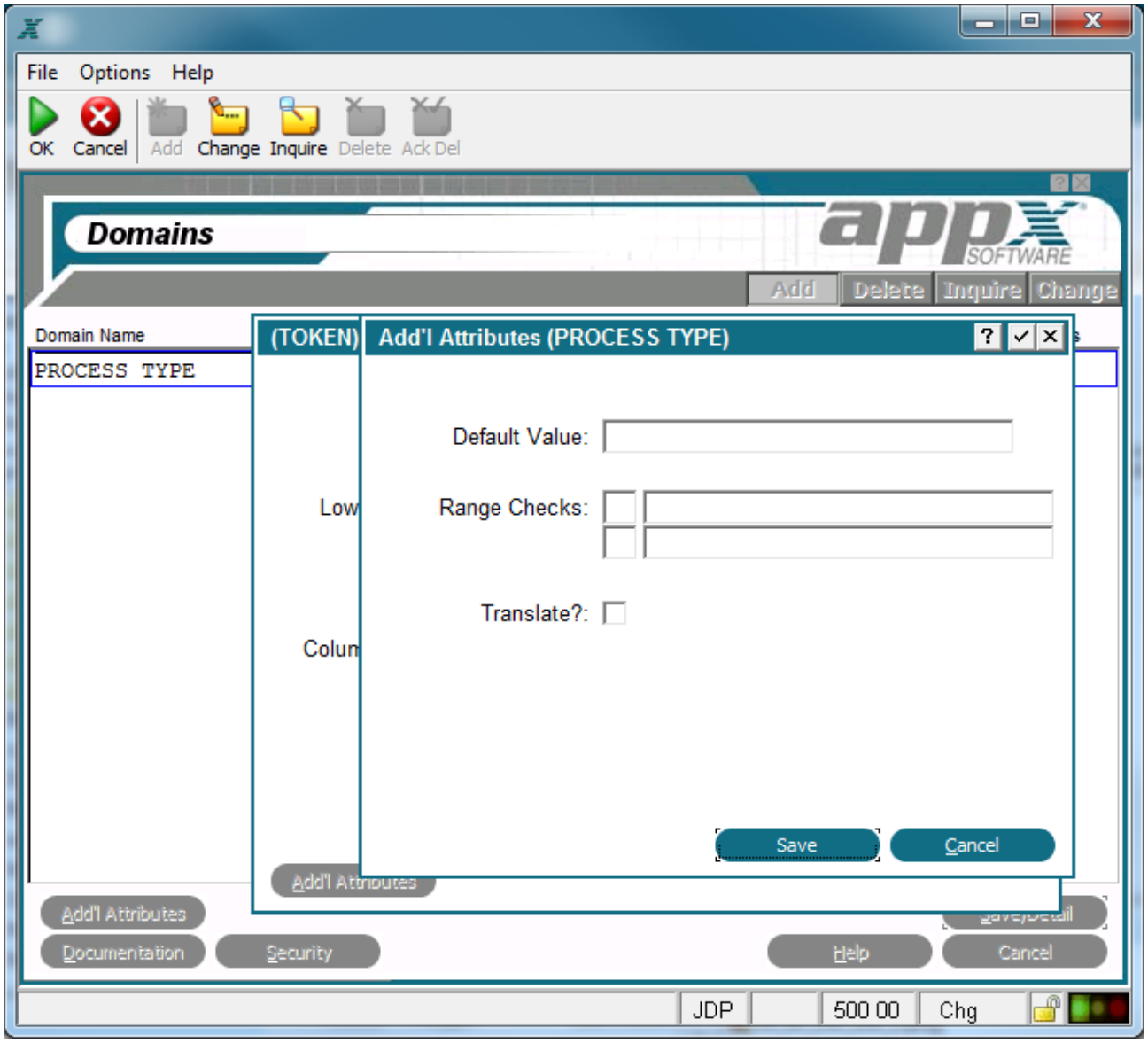
The Token Table overlay contains the following fields:

Token Value is the alphanumeric value associated with a token ID. APPX automatically translates between token values and ID's whenever necessary. This entry is case-sensitive. If entered in capital letters, an application user must also enter the value in capital letters. Also, token values newly added to the data dictionary are not available to a current APPX user until the user exits and re-enters APPX.

ID displays a unique number that is defaulted by APPX. This specification establishes the binary value that APPX stores in place of the associated token value. APPX assigns the first token value an ID of *1*, with additional values assigned an ID that is equal to the highest existing ID plus *1*. The default can be overridden, but must be unique within a table. APPX does not require that ID's be contiguous within a table.

Token Domain Additional Attributes

From the Token domain overlay, the Additional Attributesoption accesses the Token domain Additional Attributes overlay shown below.



Token Domain Additional Attributes Overlay

The Token Domain Additional Attributes Overlay contains the following fields:

Default Value establishes a modifiable starting value for all image items whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

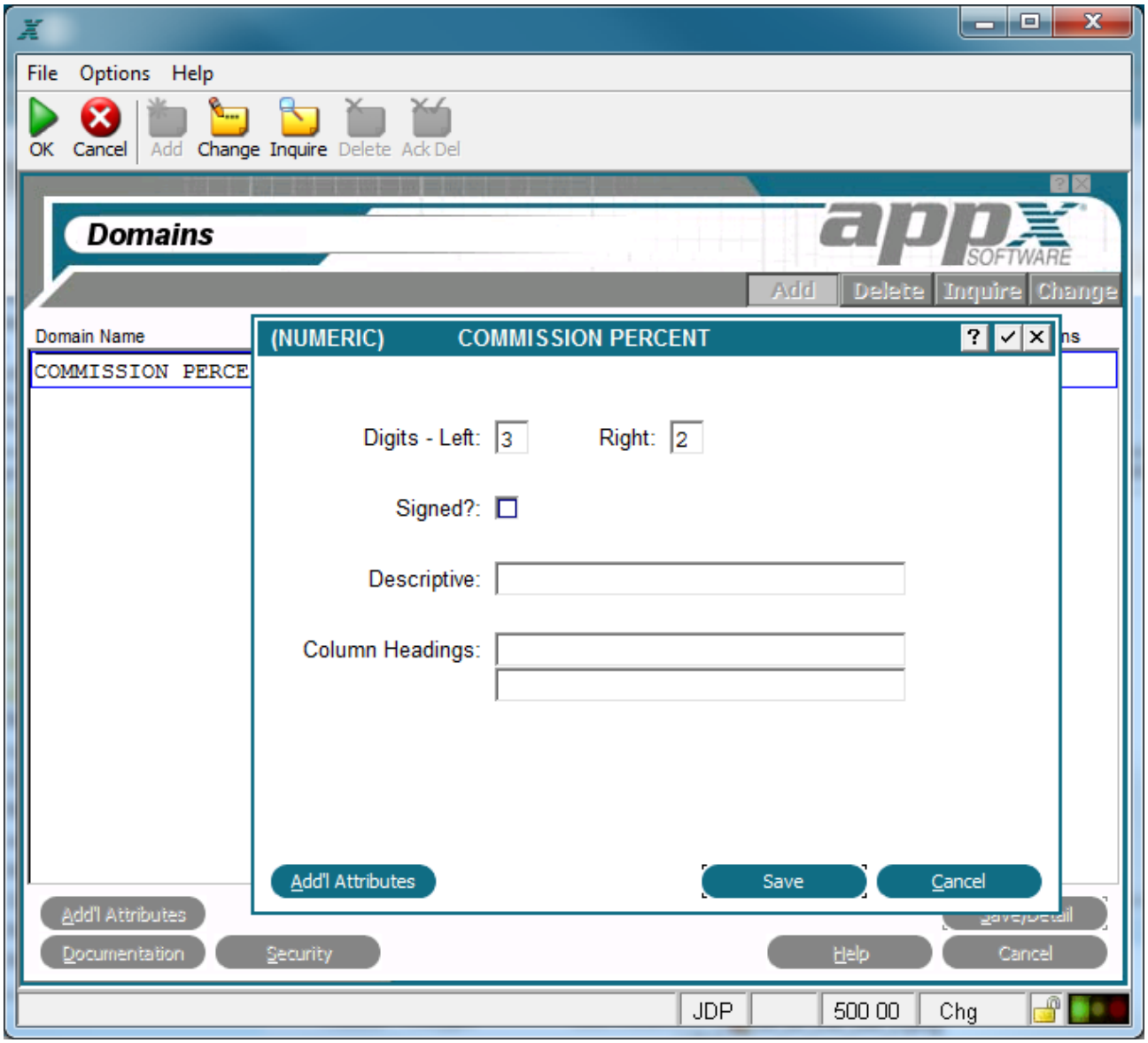
Range Checks is not used for token fields.

Translate? indicates if the value of fields based on this domain should be translated into a designated language if APPX's Language Translation feature is being used. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Numeric Domains

A *numeric* domain is restricted to number, decimal, and sign (-) entries. Examples include amounts, prices, and quantities.

The Numeric Domains overlay, shown below, displays after you complete the entries on the Domains specifications screen if the *Type* youselect is *NUMERIC*.



Numeric Domains Overlay

The Numeric domains overlay contains the following fields:

Digits ? Left. Enter the number of digits to the left of the decimal.

Digits ? Right. Enter the number of digits to the right of the decimal.

Signed? specifies whether the numbers entered in this domain are positive or negative. A 'no' ☐ would ensure that only positive numbers are entered. The default is 'no'.

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a domain itself. Refer to Standard Column Heading Image for additional information.

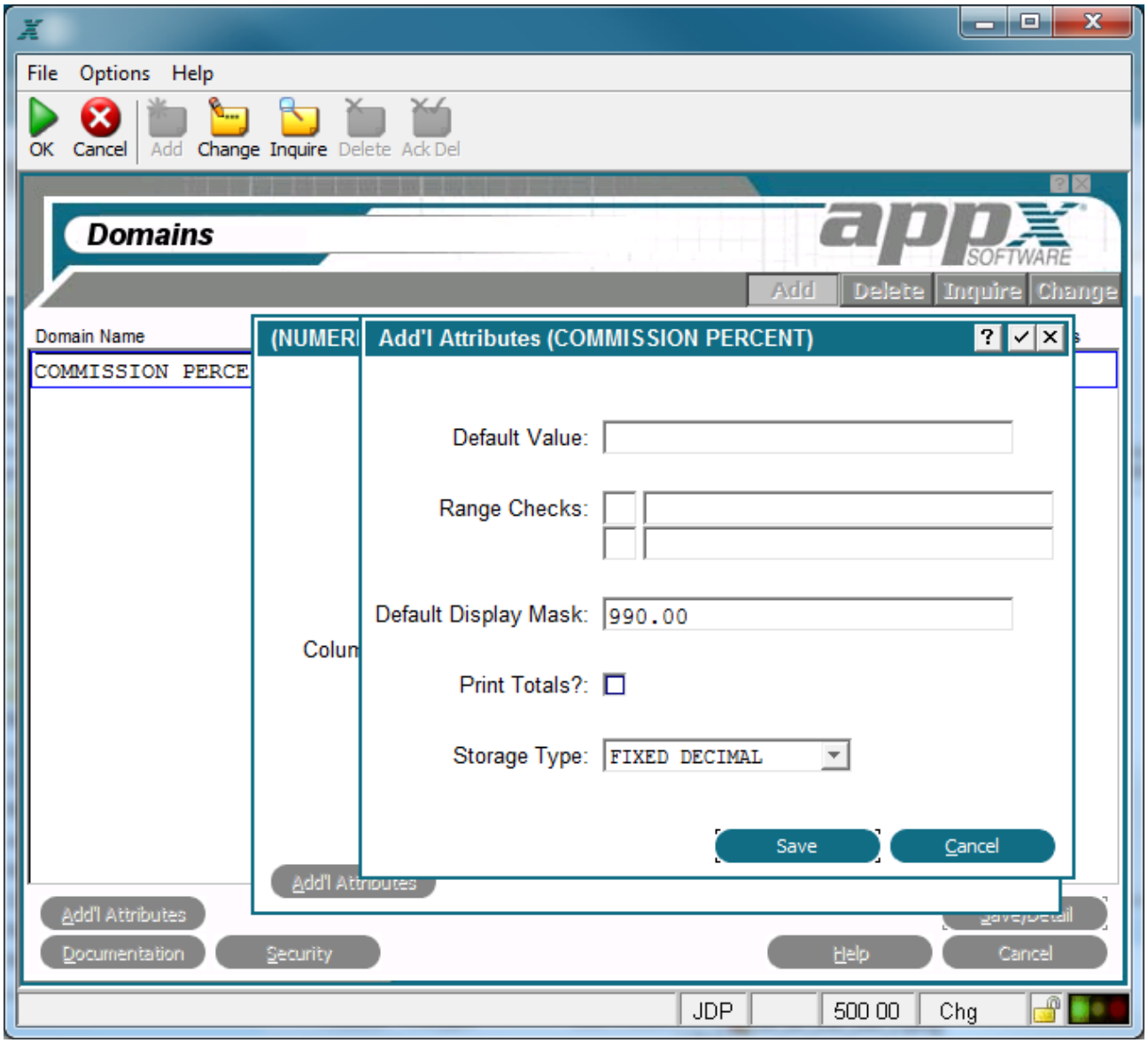
Auto Seq? Click the checkbox to toggle between 'yes' ☑ if this numeric domain represents a sequence number with a value that should be maintained by APPX and 'no' ☐ if it does not.

For Numeric domain type, the following option is available as described in the corresponding section:

Additional Attributes

Numeric Domain Additional Attributes

From the Numeric Domains overlay, the Additional Attributes option accesses the Additional Attributes overlay shown below.



Numeric Domain Additional Attributes Overlay

The numeric domains Additional Attributes overlay contains the following fields:

Default Value establishes a value for all referenced fields whenever they first display an input image in add mode, unless modified by a user. If blank, the starting value is assumed to be the null value.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), ***LE*** (less than or equal to), ***IN*** (includes).

The second component represents the value assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Dflt Dspl Msk controls how fields based on this domain appear on an APPX image to a user (unless overridden at the image item level). If blank, APPX uses a display of non-fixed leading spaces with one significant digit.

Digits to the left of a decimal are ***leading digits***.

Digits to the right of a decimal are ***trailing digits***.

Leading zeros refer to zeros that are to the left of the far left-hand leading digit.

Trailing zeros refer to zeros that are to the right of the far right-hand trailing digit.

There are six types of characters that you can use on a numeric mask: digit placeholders, decimals, group characters, sign characters, currency symbols, and alignment characters, as described in a later section.

Print Totals? indicates whether fields based on this domain should be automatically totaled on reports. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐. This entry is used as a default for the auto-total specification in output and inquiry process definition.

Storage Type determines the internal storage format for all fields that reference this numeric domain. The *Storage Type* options are:

BINARY ? The number is stored in binary form. The high order bit determines the sign: on or *1* for positive, and off or *0* for negative. The decimal position is established by the *Decimals -- Left/Right* entries.

FIXED DECIMAL employs a packed decimal format that stores two decimal digits for each byte with the exception of the last bit, which is the sign bit. The decimal position is established by the *Decimals -- Left/Right* entries.

FLOATING DECIMAL employs a combination of binary and packed decimal formats that always requires a total of nine bytes of storage. The first 15 digits are stored as packed decimal with two decimal digits for each byte (for a total storage requirement of eight bytes). The final byte (binary) determines the maximum number of digits that currently appears to the right of the decimal.

The default is *FIXED DECIMAL*. For a comprehensive discussion of these options, see Numeric Storage Types.

Numeric Storage Types

There are three storage types available for numeric domains, numeric fields, and numeric work fields. These are discussed in detail below.

BINARY ? The number is stored in binary form. The high order bit determines the sign: on or *1* for positive, and off or *0* for negative. The decimal position is established by the *Decimals -- Left/Right* entries. Binary storage is appropriate when the associated data has a fixed decimal position, and a

maximum of 10 significant digits for non-decimal values (9999999999) or nine digits for decimal values (9999999.99). Dollar amounts, for example, where you know there are always two digits to the right of the decimal, are particularly suited for this type of storage.

Binary storage minimizes storage space requirements and maximizes performance. There are no restrictions imposed on the mathematical operations that you can perform on binary data.

The internal storage length for binary fields is either one, two, or four bytes. The specific storage length depends upon the maximum number of digits in a field, whether or not a field is signed, and range checks, if any.

To calculate the storage length for a binary field, you determine the smallest of the signed and unsigned ranges in *Table 2-3-1* that contains all the possible values for the field, including any range check values. For example, a field with possible values from *0* to *255* requires two bytes of storage rather than one byte if it includes a range check of LE 256.

Table 2-3-1. Internal Storage Lengths for Binary Fields

Storage	Range of Signed Numerics	Range of Unsigned Numerics
One Byte	-128 to +127	0 to 255
Two Bytes	-32,768 to +32,767	0 to 65,535
Four Bytes	-2,147,483,648 to +2,147,483,647	0 to 4,294,967,295

> Note that ranges with maximum and minimum values of two digits or less always require one byte of storage. Ranges consisting of values in excess of five digits always require four bytes.

FIXED DECIMAL employs a packed decimal format that stores two decimal digits for each byte with the exception of the last bit, which is the sign bit. The decimal position is established by the *Decimals ? Left/ Right* entries.

Fixed decimal storage is appropriate for fields with lengths greater than the lengths that are permitted for binary storage, and for which a constant decimal position can be assigned. The maximum field length is 31 significant digits.

This option requires more bytes of internal storage than a binary field, but less than a variable decimal field. To calculate the internal storage length of a fixed decimal field, apply the following formula and round up to the nearest byte:

(Total Digits + 1) / 2

For example, a field with 10 digits requires six bytes of storage: *(10 + 1) / 2,* rounded up to the nearest byte.

FLOATING DECIMAL employs a combination of binary and packed decimal formats that always requires a total of nine bytes of storage. Although the field definition allows for 15 digits to the left of the decimal point plus 15 digits to the right of the decimal point, only the first 15 digits of the actual

number are stored. These 15 digits are stored as packed decimal with two decimal digits for each byte (for a total storage requirement of eight bytes). The final byte (binary) determines the maximum number of digits that currently appears to the right of the decimal.

Floating decimal storage is appropriate for decimal fields without a consistent decimal position. These fields are limited to a maximum of 15 significant digits. There are no restrictions imposed on the mathematical operations that you can perform on floating decimal fields.

This option requires more bytes of internal storage for any given number of significant digits than either of the other options, or a consistent nine bytes. These nine bytes are composed of eight bytes stored in a packed decimal format (for the 15 digits), and a one-byte binary value that stores the current location of the decimal point (0 to 15).

The default is *FIXED DECIMAL.* Actual storage requirements are determined by the *Storage Type, Decimals ? Left/Right, Signed?,* and *Range Checks* specifications.

The attributes of each of the three storage types, binary, fixed decimal, and floating decimal, are summarized in *Table 2-3-2* below.

Table 2-3-2. A Comparison of Storage Types for Numeric Domains/Fields

Attribute	Binary	Fixed Decimal	Floating Decimal
Decimal Position	Fixed	Fixed	Variable
Storage Requirements	Minimum	Intermediate	Maximum
Digit Limitation	10 (or 9 with decimal)	31	15 significant digits
Performance	Best	Intermediate	Worst

Six Types of Characters Used in Numeric Masks

There are six types of characters that can be used in a numeric display mask - digit placeholders, sign characters, currency symbols, decimals characters, group characters, and alignment characters. These characters are described below:

Digit Placeholders - There are four **digit placeholder** characters, each representing a potential significant digit in a numeric field. The choice of one placeholder over another impacts the appearance of any zeroes and blanks in a field.

0 - represents a character position that always displays. It either contains the numeric value in the data or, if the data is blank in that position, a 0 as a placeholder. If the number of trailing digits is variable, 0s are used to designate the minimum number of digits to display.

8 - represents a character position that contains either a numeric value in the data or, if the data is zero in a leading or trailing position, a space. An 8 converts a 0 to a fixed space. The number *8* is used to guarantee decimal or currency sign alignment while eliminating leading and trailing 0s.

9 - represents a character position which, if leading or trailing and zero, is eliminated from a left- or right-justified mask. In other words, a 9 converts a *0* to a non-fixed space. The number *9* (as opposed to the number *8*) is used to conserve space when the alignment of decimals and currency signs is not a concern.

* - represents a character position that, if leading and zero, is replaced by an asterisk. Asterisks are primarily used to ensure that a number is not altered on a printout, such as an accounts payable check.

Sign Characters - There are six sign character types that APPX uses to identify positive and negative numbers. Only one type can be used in a single mask. You can enter the characters anywhere on a mask (leading or trailing). The bracket characters '( )' or '< >' however, must be positioned to surround the digit placeholders.

+ - displays as a + if a number is positive, and is replaced by a - if the number is negative.

? - only displays if a number is negative. If the number is positive, it is replaced with a fixed or non-fixed space, depending upon its position relative to the alignment character.

( ) - surround negative numbers. If the number is positive, it is replaced with a fixed or non-fixed space, depending upon its position relative to the alignment character.

<> - surround negative numbers. If the number is positive, it is replaced with a fixed or non-fixed space, depending upon its position relative to the alignment character.

DR - identifies a negative number in a field that normally contains a credit balance. If a number is positive, it is replaced by a CR.

CR - identifies a negative number in a field that normally contains a debit balance. If a number is positive, it is replaced by a DR.

Currency Symbols - The currency symbol, entered as a $, is used to identify numbers stated in terms of a specific currency. The maximum length for a currency symbol is three characters, and the maximum number of currency symbols in a mask is two, one leading and one trailing.

Decimal Characters - A decimal character is entered into a mask as a '.' (',' internationally) to separate the leading and trailing digits in a number. For variable decimal numbers, the position of the decimal indicates the minimum number of trailing digits.

Group Characters - A **group character** is entered as a ',' ('.' internationally) to separate digits into groupings of thousands.

Alignment characters - Alignment characters are optional, justification-control characters that are represented by an underscore (_). They separate fixed leading or trailing portions of a mask from justifiable leading or trailing portions. Alignment characters indicate that data cannot be shifted farther than the position that is represented by their placement on a mask.All characters placed before a leading underscore and after a trailing underscore maintain a fixed position. (Leading underscores precede digit placeholders, and trailing underscores follow.) The character position that is occupied by an underscore is eliminated when a field displays.

Mask Characters Influenced by Values in System Administration

The following three characters displayed in numeric masks are influenced by system administration values:

Currency symbol. When displayed to a user, the $ is replaced with the specified currency symbol, and displays in the position (either leading or trailing) that is specified for the symbol. For example, a U.S. dollar sign ($) always displays in a leading position. A British pound sign (#) also displays in a leading position.

For masks with a single currency symbol, a leading sign displays as the far left-hand character on a mask. A trailing symbol displays as the far right-hand character of a mask. If other non-digit characters are included in a display, such as sign characters, the currency symbol is presented outside of these characters; for example: *<750>*. To fine-tune the placement of leading and trailing symbols, you must use both leading and trailing currency symbols on a mask.

For masks with both leading and trailing currency symbols, the symbol displays in a specific, designer-designated, leading or trailing position. The designer assumes control over the appearance of the symbol relative to other non-digit characters in a field. The designer can, for example, place currency symbols inside the < > sign character. The symbol that displays (leading or trailing) depends on the system administration specification. The other symbol is ignored.

Decimal point. When displayed to a user, the '.' is replaced with the decimal character that is appropriate for the language in use.

Group character. When displayed to a user, the ',' is replaced with the group character that is appropriate for the language in use.

Refer to the *System Management Manual* for additional information.

Text in Numeric Masks

In addition to the six types of characters described earlier that can be included in a numeric display mask, a mask can include text. For example, it may be desirable to insert the text 'percent' into a numeric mask to the right of the digit placeholders.

Formats Excluded by Numeric Masking Facility

APPX's numeric masking facility was designed to provide maximum flexibility. You can define a mask in any format that is not specifically excluded below.

Masks must include at least one digit placeholder, and no more than 15 digit placeholders.

Each digit placeholder character, if used, must appear in the following sequence in the mask:

98*0.089.

*9*s, if used, must define the outside boundaries for digits in a mask. Leading *9*s must be placed to the left of all other digit placeholders, and trailing *9*s must be placed to the right of all other digit placeholders.

99880.08999 Correct, 98980.08998 Incorrect

*8*s, if used, must be placed between any *9*s and the *s or *0*s. Leading *8*s must be placed to the right of any *9*s, and to the left of any *s or *0*s. Trailing *8*s must be placed to the left of ant *9*s, and to the right of *0*s.

9,980.089 Correct, 9,890.098 Incorrect, 9,*80.089 Incorrect

*s are leading digit placeholders only. If used, they must be placed between any leading *9*s or *s and any leading *0*s in the mask.

*0*s, if used, must define the inside boundaries for digits in a mask. Leading *0*s must be placed to the right of all other digit placeholders, and trailing *0*s must be placed to the left of all other digit placeholders.

The only characters that can be placed between any two digit placeholders are the decimal and group characters, or another digit placeholder.

A mask can contain only one decimal, and the decimal must be followed by a digit placeholder.

A group character, if included in a mask, must be positioned to the left of any decimal and used to separate groups of three digit placeholders. For example, APPX considers an entry of *9,99* to be text rather than digit placeholders and a group character because the group character is not associated with a group of three-digit placeholders.

The paired sign indicators '( )' or '< > must be placed outside of the far right- and left-hand digit placeholders in a mask.

(99,990.009) Correct, <99,990.009> Correct, 9(9,990.009) Incorrect

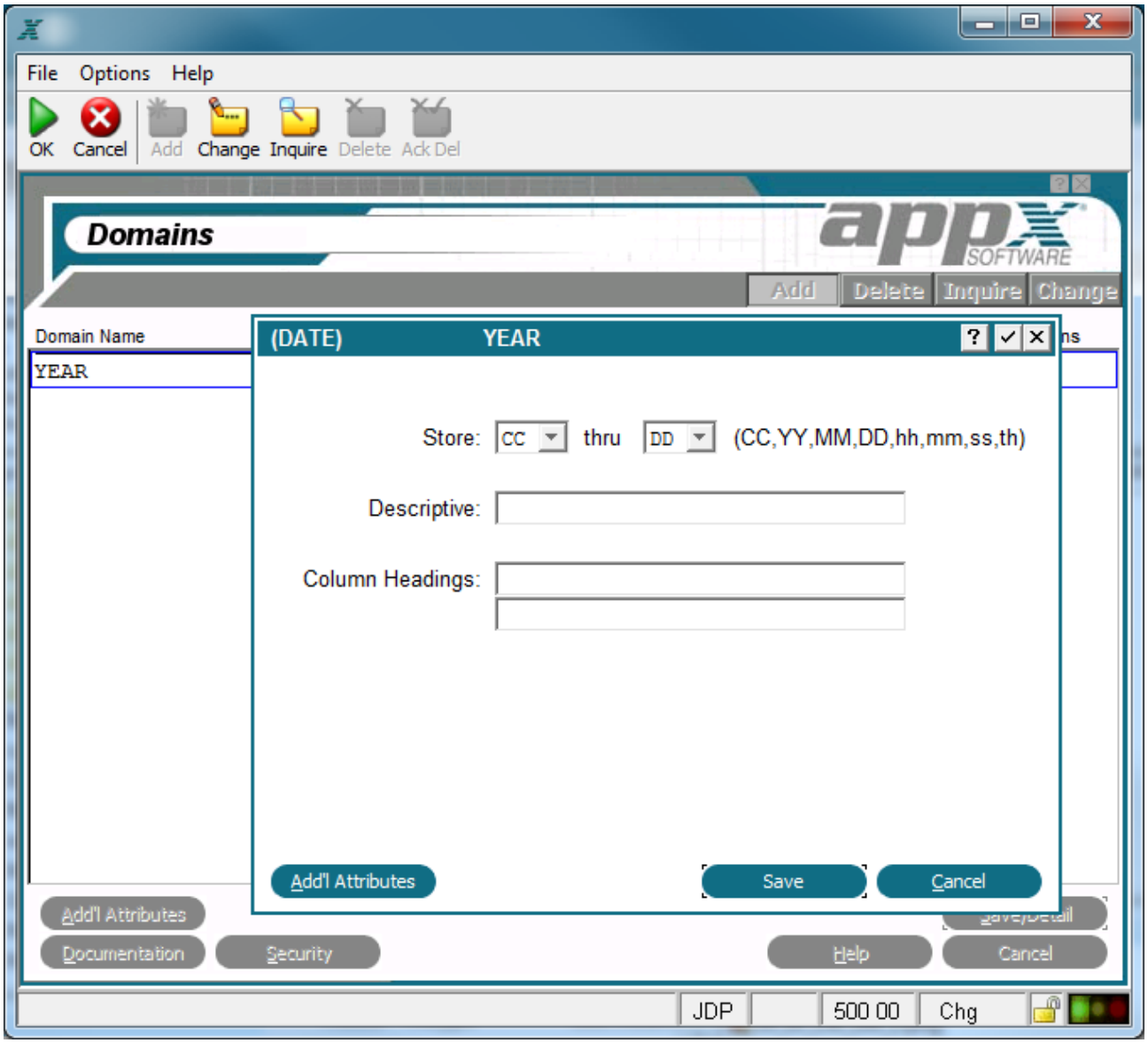
Text, if entered, must be placed outside of the far right- and left-hand digit placeholders in a mask.

Date Domains

A date domain contains date and/or time information. This information may, at your option, range from a century through a hundredth of a second.

Examples of date/time domains include invoice dates, order dates, elapsed time data, date/time stamps used to uniquely identify records.

The Date domains overlay, shown below, permits you to add date/time-specific attributes to those already defined for the domain. It automatically displays after you complete the entries in the Domains specifications screen if the type you selected is *DATE.*



Date Domain Overlay

The Date domains overlay contains the following fields:

Store thru designates the parts of a date that are physically stored.Valid entries areCC (Century), YY (Year), MM (Month), DD (Day), hh (Hour), mm (Minute), ss (Second), th (hundredth of a second).

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a domain itself. Refer to Standard Column Heading Image for additional information.

The Date domains Additional Attributes overlay contains the following fields:

Default Value - see definition for Default Value under Numeric Domains.

Range Checks - see definition for Range Checks under Numeric Domains.

Dflt Dspl Msk controls how fields based on this domain appear to a user on an APPX image, unless overridden at the image item level. If left blank, the date mask specified for the application (in Application File Maintenance in System Administration) is used or, if that is also blank, the date mask specified in System Parameters is used. Refer to the Display Mask (Date/Time) section in Using the Character Based Image Editor for additional information about this entry.

Storage Type determines the internal storage format of the date field. The *Storage Type* options for Date domains are:

BINARY The date is stored in binary format.

PACKED DECIMAL stores two decimal digits for each byte.

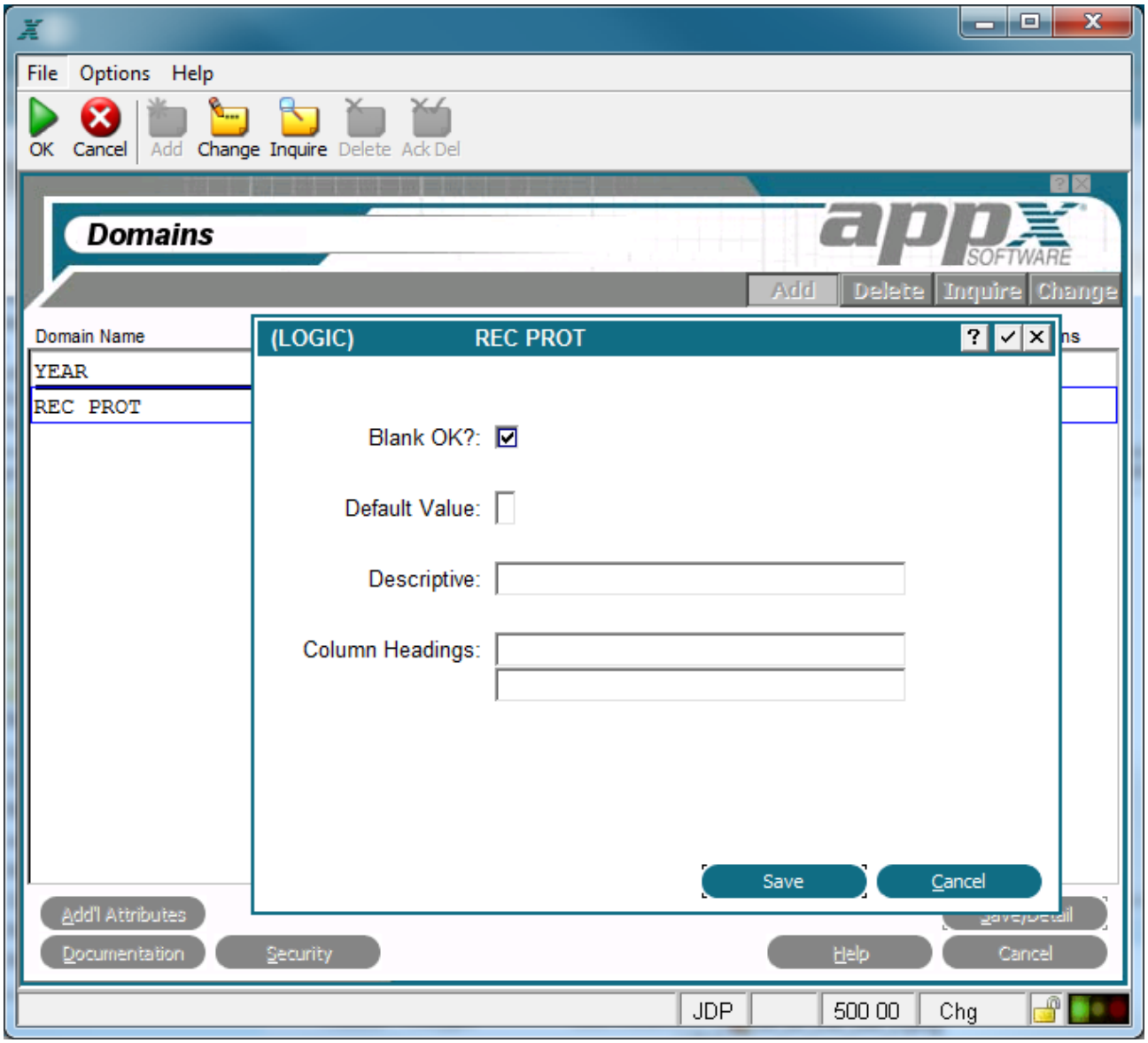
ALPHA stores the external representation of data.

The default is **PACKED DECIMAL**.

Logic Domains

A *logic* domain has possible values of 'yes' ☑, 'no' ☐, or unknown ? (Y, N or blank using Character Mode). Examples include various application parameters such as whether or not to post transactions on an accrual basis, and control domains that govern the execution of subroutines based upon an *exists/does not exist* condition.

The Logic domains overlay, shown below, permits you to add logic-specific attributes to those already defined for the domain. It automatically displays after you complete the entries on the Domains specifications screen if the *Type* you select is *LOGIC*.



Logic Domain Overlay

The Logic domains overlay contains the following attributes:

Blank OK? indicates, for information only, whether a user should be permitted to leave a field referencing this domain blank on an input image. (Whether or not such a field can actually be left blank is controlled by the image item specification 'Required?'.) The default is 'no' ☐ (N using Character Mode). Click the checkbox to toggle between 'yes' ☑ (Y using Character Mode) and 'no' ☐ (N using Character Mode) values.

Default Value establishes a starting value for image items whenever they first display in add mode on an input image, unless modified by a user. The *Default Value* options are blank (for unknown), Y or N.

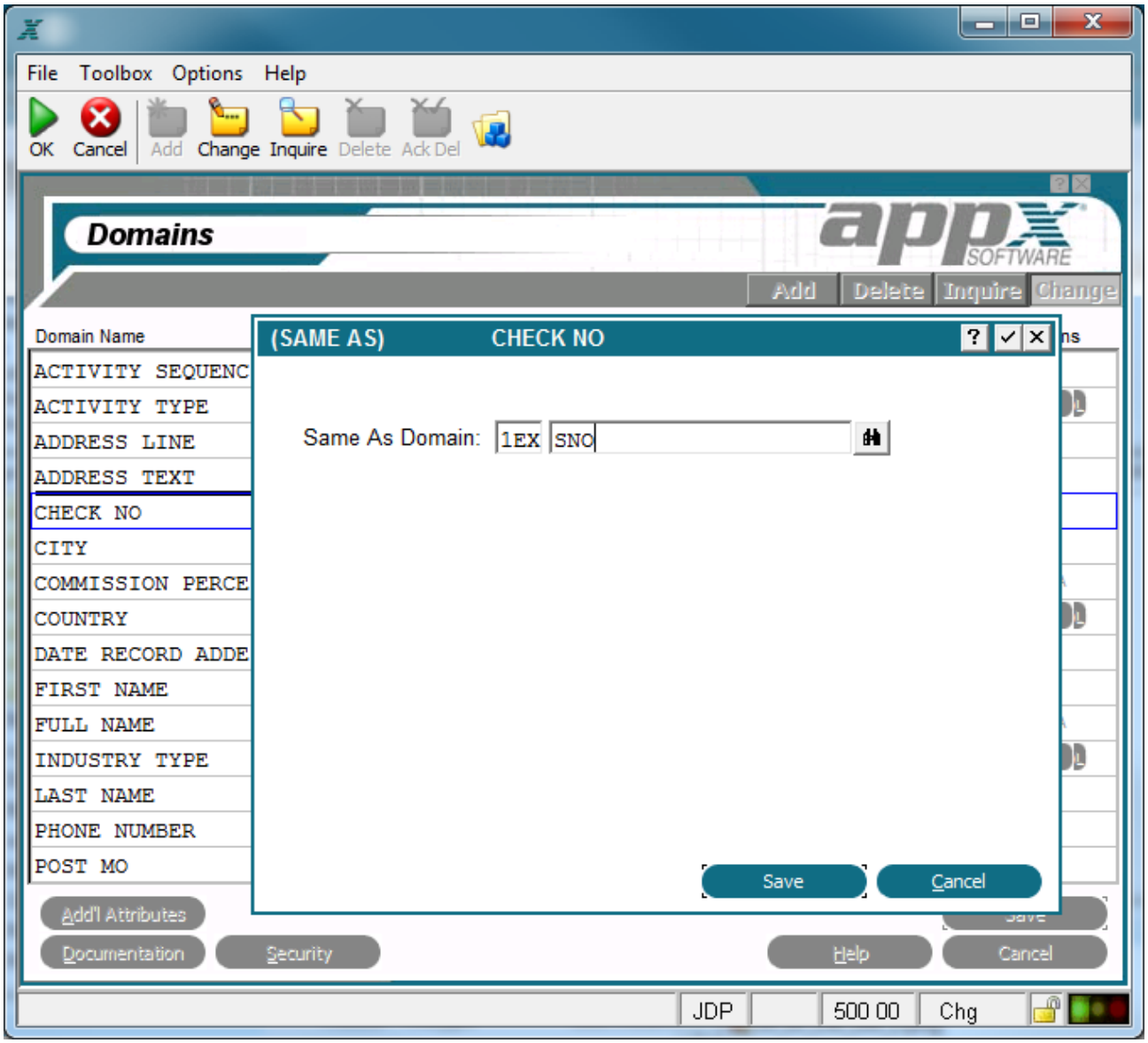
Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Same As Domains

A *Same As* domain shares the same characteristics as a domain in another application. This allows you to define fields throughout your database with the same characteristics while ensuring that all fields in an application reference a local domain.

The *Same As* domain overlay, shown below, allows you to identify a domain in another application within your database that has the same characteristics required for a domain in your current application. It automatically displays after you complete the entries on the Domains specifications screen if the *Type* you select is *SAME AS*.



Same As Domain Overlay

The *Same As* domains overlay contains the following field:

Same As Domain identifies a domain in another application within your database that has the same characteristics required for the local domain.

CHAPTER 2-4

Files and Fields

Introduction to Files and Fields

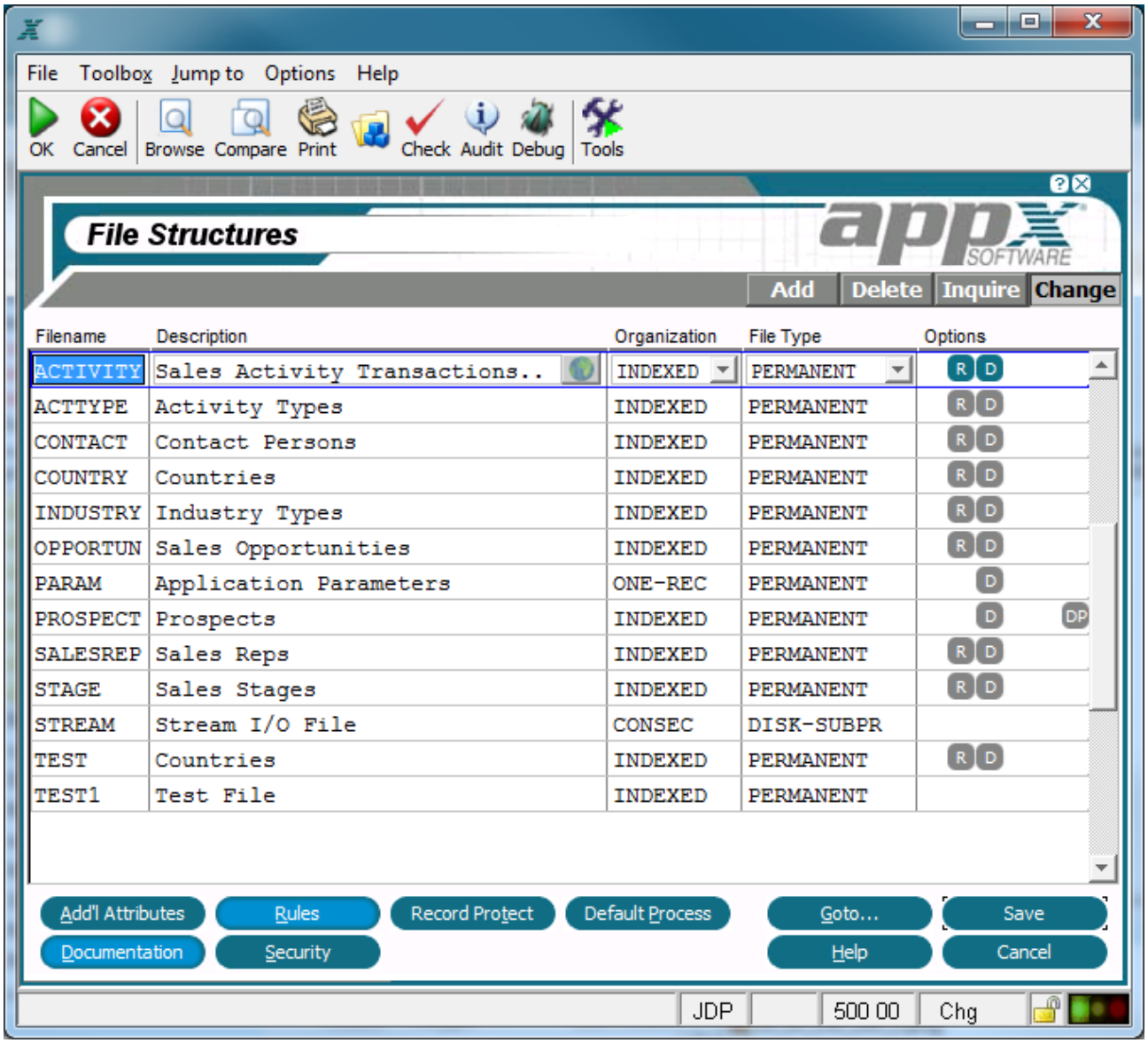
Files are data storage structures for APPX fields (individual items of alphanumeric, numeric, date/time, and logic information in an APPX database). *Fields* represent the smallest units of data storage in APPX applications. Fields are grouped together as records stored within files. The record layout for a file is determined by the fields defined for that file within the data dictionary

The Files Stuctures option from the Application Design Menu is used to define or maintain the specifications and documentation for an application's files and fields. The specifications on the Files/Fields screens represent a combination of the specifications that define the file storage characteristics. File specifications include *File Name, Description, Organization,* and *File Type.*

Once specifications for a file have been completed, screens for fields within that file can be accessed. The actual screens that display depend upon whether or not you select an option and the specifications you enter at various stages in the definition process.

Files

The Files/Fields screen, shown below, displays when you select the files option from the Application Design menu. The Files/Fields screen presents a scrolling display of file specifications. Once specifications for a file have been entered, you can access the Fields screen for that file by selecting Enter ☑.



Files/Fields Screen

The Files/Fields screen contains the following fields:

File Name uniquely identifies each file in a database. *File Name* also serves as the name of the current record area.

Description provides a longer, more flexibly formatted alternative to the technical *File* name. If blank, APPX uses the *File* name as the *Description*. Because *Description* is less cryptic and easier to understand than *File Name*, APPX uses it when communicating with users wherever possible. An example is the construction of error and warning messages. If a user selects an input process for a file that was not created (Balance, for example), the system might display the message 'Account Balance file does not exist.' We suggest that you use a plural entry for *Description* and avoid appending the word 'file'.

Organization determines the way records are stored in and retrieved from a file. The *Org* options are:

ONE-REC files are consecutive files that are limited to one record.

CONSEQ files are organized according to the relative sequence that records are added to a file. Records are retrieved by relative position.

INDEXED files are organized according to the content of specified fields, or key fields. Records are retrieved by key path.

The default is *INDEXED*. Refer to the File Organizationsection in for more information.

File Type There are two broad categories of file type: *permanent* and *temporary*. Permanent files are stored on disk and remain there whether the user is logged on or not. Temporary files can be available for a process and its subprocesses, for a set of related processes, or for an entire session. Temporary files can be stored on disk or in memory, or not stored at all. In general, memory files are faster and can improve performance. There are eight distinct file types:

PERMANENT files are stored on disk and remain there whether the user is logged on or not.

DISK-SUBPROCESS files are temporary, stored on disk, and deleted when the main process ends.

DISK-RELATED files are temporary, stored on disk, and deleted when the process that called the related processes (usually a job process) ends.

DISK-DETACHED files are temporary, stored on disk, and remain available until the user logs off.

MEMORY-SUBPROCESS files are temporary, stored in memory, and deleted when the main process ends.

MEMORY-RELATED files are temporary, stored in memory, and deleted when the process that called the related processes (usually a job process) ends.

MEMORY-DETACHED files are temporary, stored in memory, and remain available until the user logs off.

WORKING-STORAGE files are temporary, not stored at all, and deleted when the process that is using them ends. For instance, working-storage files can be used to pass file-related information from an update process to a related subroutine. Refer to the Working-Storage Files section in this manual for more information.

Interprocess Communication provides a complete discussion of detached, related, and subprocess files and processes. Also, refer to the File Storage Options and Temporary versus Permanent Files sections of this manual for additional information.

Options are indicators that are present whenever documentation (T), rules (R), additional attributes (AA), record protection (RP), or default process (DP) have been defined for this file.

The Files/Fields screen contains the following options as described in the corresponding sections:

Additional Attributes

Rules

Record Protection

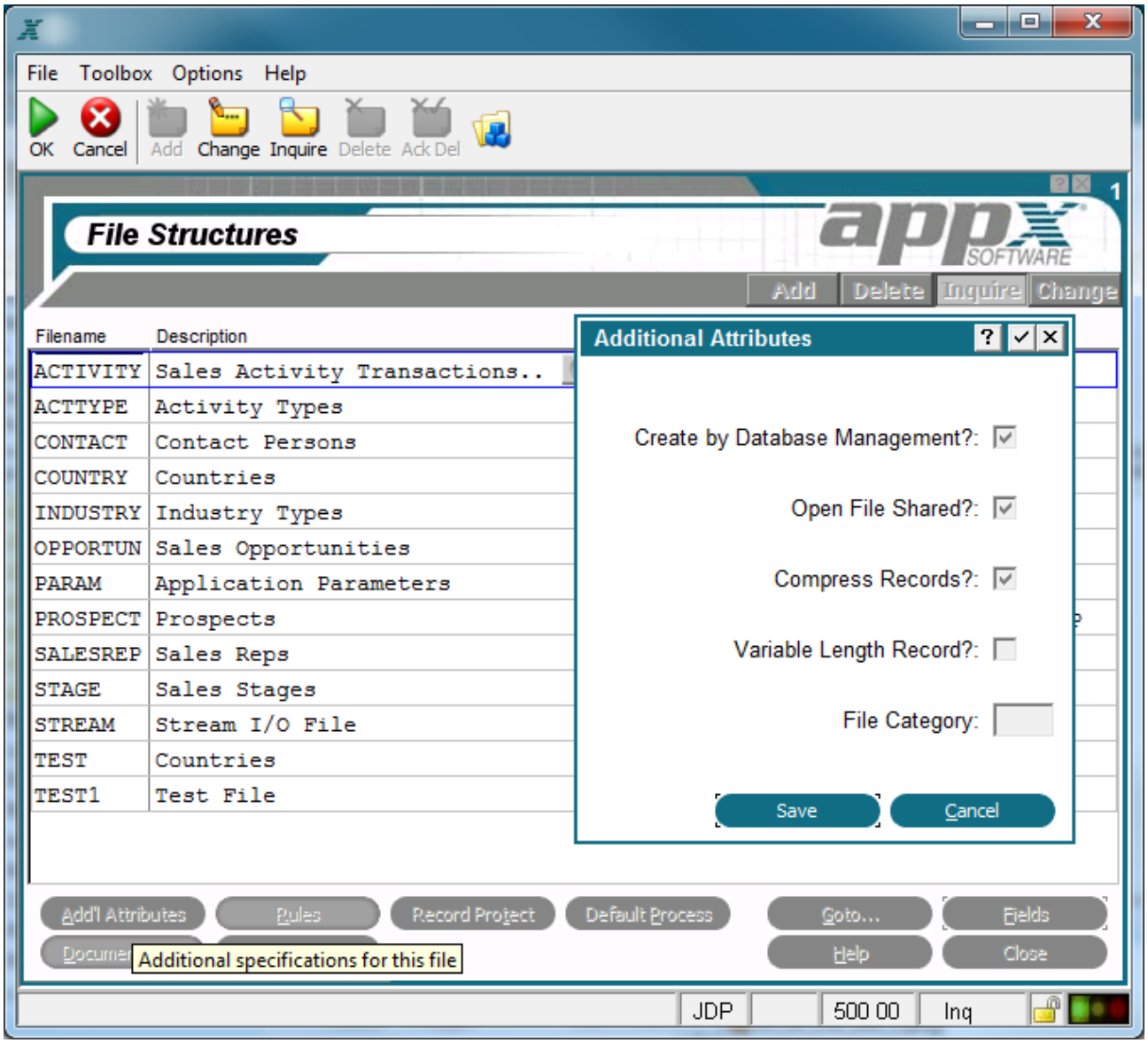
Default Process

Documentation

Security

Files Additional Attributes Option

The files Additional Attributes overlay displays when you invoke the Additional Attributes option from the Files/Fields screen. From this overlay, you can enter additional parameters for the file. Upon completion, you are returned to the Files/Fields screen.



File-Level Event Points for Rules Overlay

The files Additional Attributes overlay contains some or all of the following fields, depending upon the file type:

- **Create By Database Management?** indicates how a permanent file is to be created, either with the create utility in database management, or by the designer with statements. The specification does not apply to temporary files. The Create by Database Management? options are:

☑ A file is to be created automatically by the create utility in database management.

☐ You assume exclusive control over when a file is created. It is created when an APPX process executes a CREATE statement. The system, however, includes this file on display screens in database management, permitting the database manager to establish defaults, such as the number of records in the file.

The default is 'yes' ☑.

Open File Shared? indicates whether or not you want this file to be shared between users. The *Open File Shared?* options are:

☑ The file is to be shared between users.

☐ The file is to be used exclusively by the user that first opens the file. This exclusivity continues until the user closes the file.

The default is 'yes' ☑.

Compress Records? indicates whether or not the records in a file are to be compressed, when possible. Compression optimizes the use of external storage devices by eliminating empty space in a record. Whether or not records can be compressed, and the way they are compressed, depends upon the operating system. In some systems, compressed records in consecutive files may not be modifiable. Refer to your system manual for additional information. The *Compress Records?* options are 'yes' ☑, which tells APPX to compress when possible, and 'no' ☐, which tells APPX not to compress. The default is 'yes' ☑.

Variable Length Record? indicates whether or not the record storage length for a file varies from record to record. Select 'yes' ☑ for variable length storage in which APPX allocates the exact amount of space required to store each field in a record (the fixed length), less the trailing null portion of the record. When a record is read from such a file, APPX restores the truncated, null fields. On some systems, variable length records in sequential files may not be modifiable.

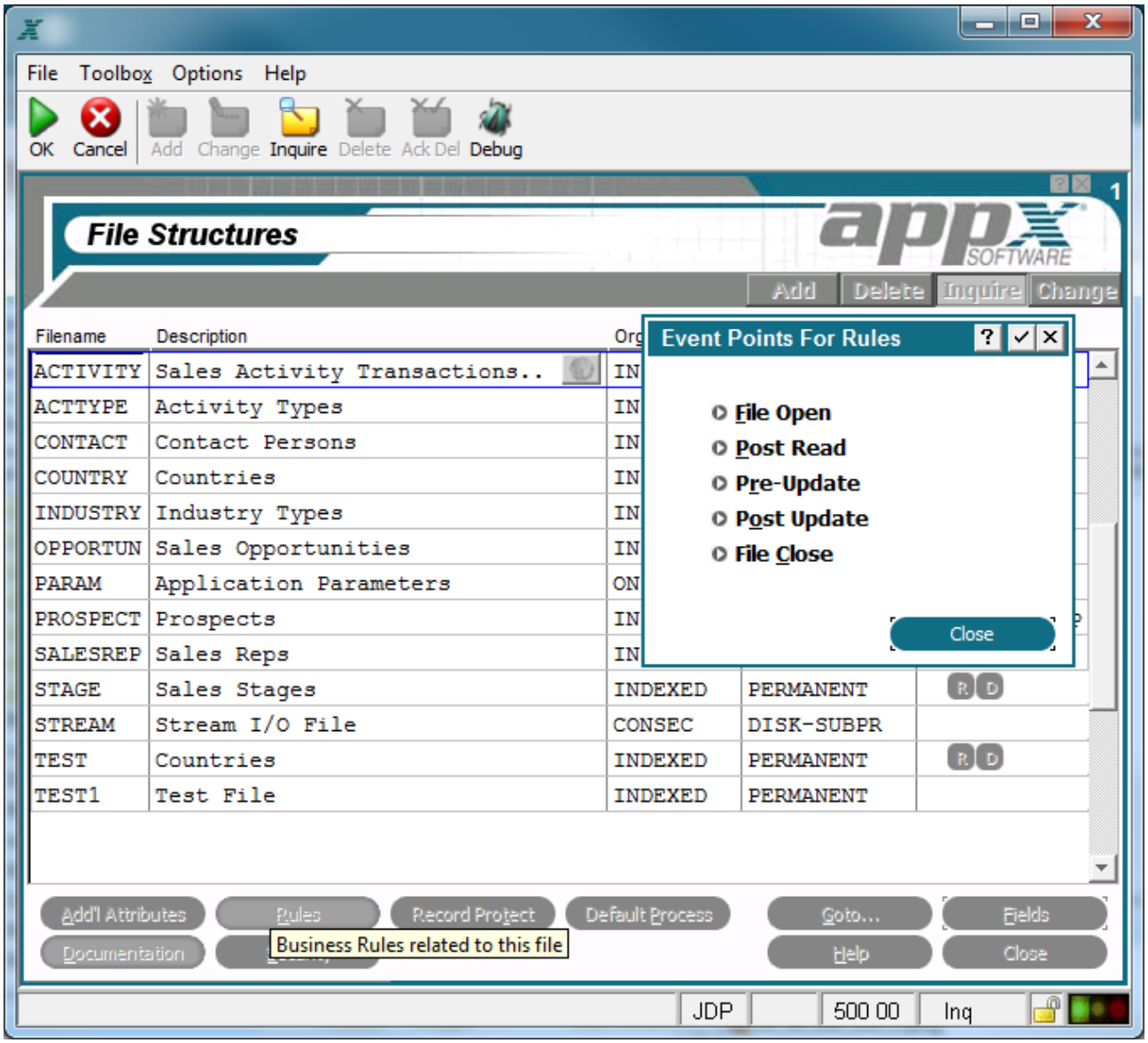
Select 'no' ☐ for fixed length storage in which APPX allocates a predetermined amount of space for each record, regardless of whether or not the entire allocation is necessary. This length is equal to the sum of the lengths of the fields in record. The default for this field is 'no'. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Files with variable length records undergo a 'quick restructure' when fields have been added at the end of the record. The restructure process must still be run, but only the file header is processed, not each individual record. This dramatically decreases restructure time when comparing the restructure time for a file with fixed-length records.

Category is used by utilities that automatically generate applications.

Files Rules Option

The Rules option from the Files/Fields screen accesses the File Level Event Points for Rules overlay shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted. This option allows you to define ILF code that is executed whenever the designated file is accessed or updated in any APPX process.



File-Level Event Points for Rules Overlay

The File Level Event Points for Rules overlay contains the following options:

File Open

file open accesses the ILF editor for the File Open event point. Upon completion, you are returned to the Event Points overlay. This code is executed whenever the file is opened by a process.

Post Read

post read accesses the ILF editor for the Post Readevent point. Upon completion, you are returned to the Event Points overlay. This code is executed immediately following the execution of a read statement on the file (READ, READNEXT, or BEG READ) or automatic read of the file when designated as a PCF file.

Pre-Update

pre-update accesses the ILF editor for the Pre-Update event point. Upon completion, you are returned to the Event Points overlay. This code is executed immediately prior to the issuance of an update statement on the file (WRITE, REWRITE or DELETE) or automatic update of the file when designated as a PCF file.

Post Update

post update accesses the ILF editor for the Post Update event point. Upon completion, you are returned to the Event Points overlay. This code is executed immediately following the execution of an update statement on the file ((WRITE, REWRITE or DELETE) or automatic update of the file when designated as a PCF file.

File Close

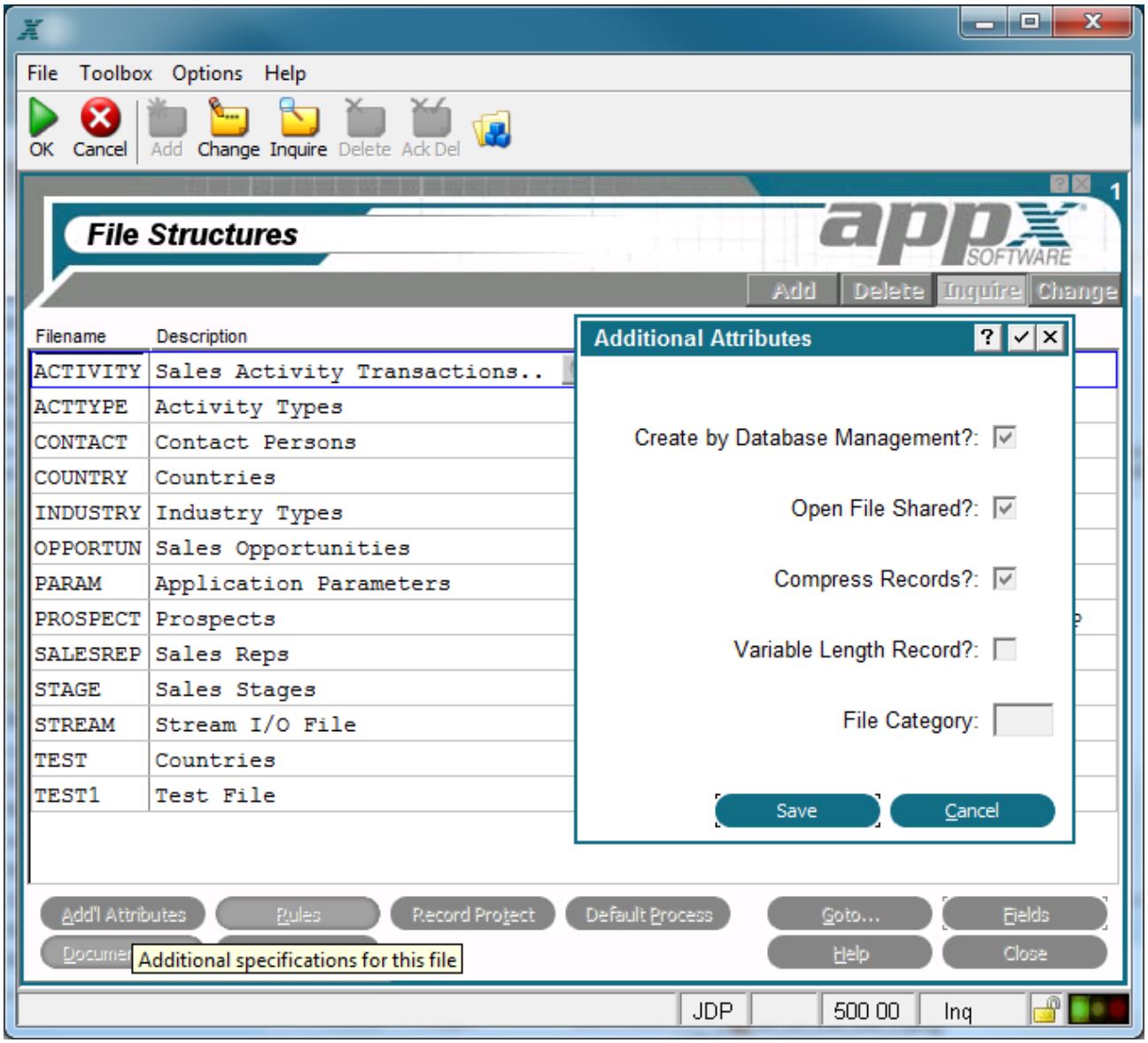
file close accesses the ILF editor for the File Close event point. Upon completion, you are returned to the Event Points overlay. This code is executed whenever the file is closed by a process.

Using file-level event points localizes complex update rules into a single location, assuring that your code executes for every update. Since these event points execute within the context of a file-level process, they share very little data with other processes. In fact, the only thing shared between a file-level process and the 'foreground' process is the PCF record buffer. For example, in the Post Read event point, you have access to the contents of the record just retrieved. If changes are made in the record buffer, those changes are reflected in the foreground process. In the Pre-Update event point, you have access to the PCF record buffer as delivered by the foreground process. File-level event points use their own copies of work variables so even work fields are not shared with other processes.

To create file level event points, simply select the option corresponding to the desired execution point. See the Event Points and File-Level Event Points sections for further information.

Files Additional Attributes Option

The files Additional Attributes overlay, shown below, displays when you invoke the Additional Attributes option from the Files/Fields screen. From this overlay, you can enter additional parameters for the file. Upon completion, you are returned to the Files/Fields screen.



Additional Attributes Overlay

The files Additional Attributes overlay contains some or all of the following fields, depending upon the file type:

Create By Database Management?

Indicates how a permanent file is to be created, either with the create utility in file management, or by the designer with statements. The specification does not apply to temporary files. The Create by Database Management? options are:

☑ A file is to be created automatically by the create utility in file management.

☐ You assume exclusive control over when a file is created. It is created when an APPX process executes a CREATE statement. The system, however, includes this file on display screens in file management, permitting the database manager to establish defaults, such as the number of records in the file.

The default is 'yes' ☑.

Open File Shared? indicates whether or not you want this file to be shared between users. The *Open File Shared?* options are:

☑ The file is to be shared between users.

☐ The file is to be used exclusively by the user that first opens the file. This exclusivity continues until the user closes the file.

The default is 'yes' ☑.

Compress Records? indicates whether or not the records in a file are to be compressed, when possible. Compression optimizes the use of external storage devices by eliminating empty space in a record. Whether or not records can be compressed, and the way they are compressed, depends upon the operating system. In some systems, compressed records in consecutive files may not be modifiable. Refer to your system manual for additional information. The *Compress Records?* options are 'yes' ☑, which tells APPX to compress when possible, and 'no' ☐, which tells APPX not to compress. The default is 'yes' ☑.

Variable Length Record? indicates whether or not the record storage length for a file varies from record to record. Select 'yes' ☑ for variable length storage in which APPX allocates the exact amount of space required to store each field in a record (the fixed length), less the trailing null portion of the record. When a record is read from such a file, APPX restores the truncated, null fields. On some systems, variable length records in sequential files may not be modifiable.

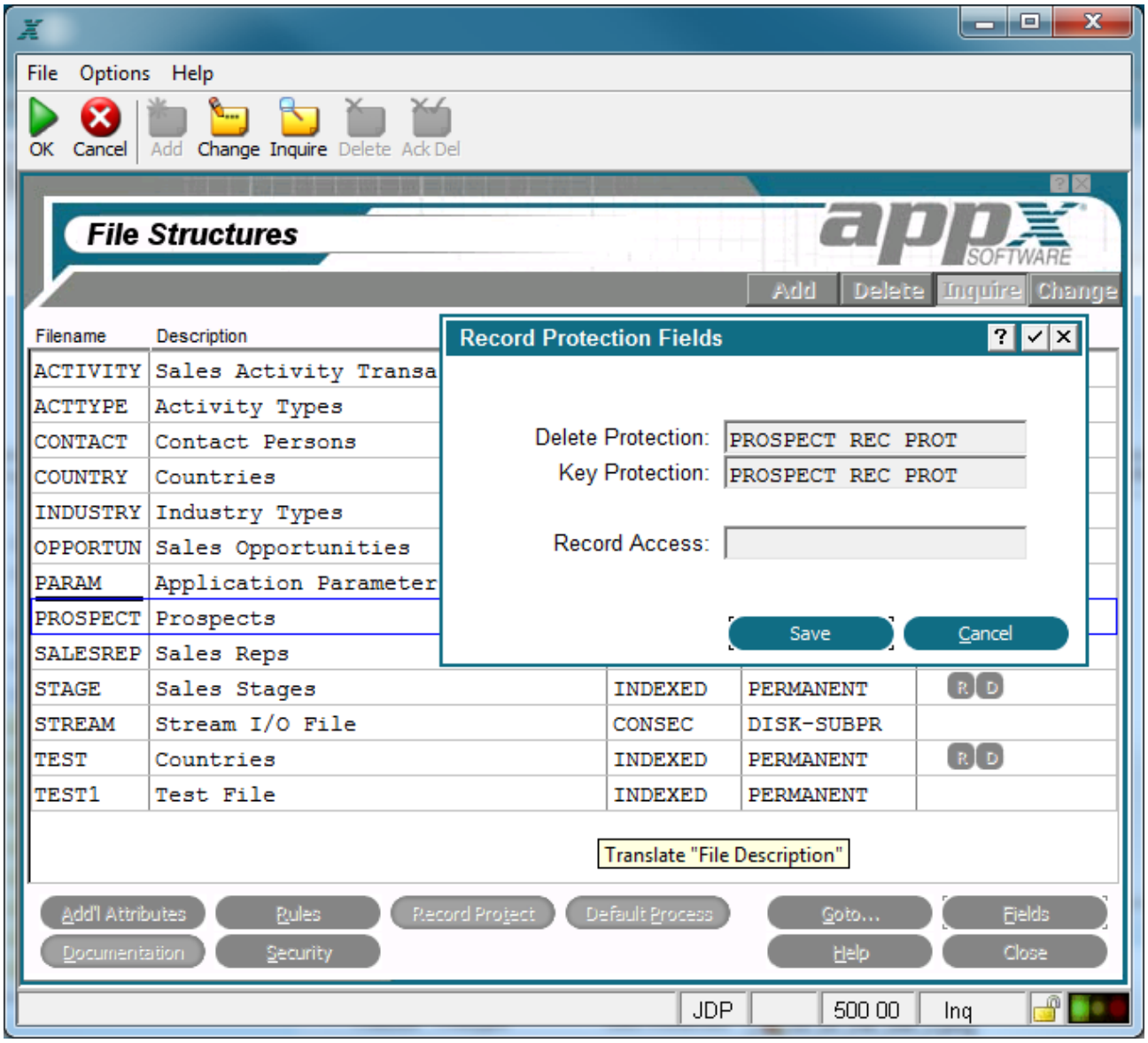
Select 'no' ☐ for fixed length storage in which APPX allocates a predetermined amount of space for each record, regardless of whether or not the entire allocation is necessary. This length is equal to the sum of the lengths of the fields in record. The default for this field is 'no'. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Files with variable length records undergo a 'quick restructure' when fields have been added at the end of the record. The restructure process must still be run, but only the file header is processed, not each individual record. This dramatically decreases restructure time when comparing the restructure time for a file with fixed-length records.

Category is used by utilities that automatically generate applications.

Files Record Protection Option

The Record Protection overlay, shown below, displays when you select the record protection option from the Files/Fields screen. The features in this overlay allow you to prevent users from accessing, modifying or deleting records or record keys.



Files Record Protection Overlay

These fields appear on the Record Protection Overlay:

The **Delete Protection** field allows you to designate a logic or numeric field for record delete protection. A logic field with a value of 'yes' ☑, or a numeric field with a non-zero value, signals to APPX to prevent the record it belongs to from being deleted during data entry. The same field can be designated as both Delete Protection and Key Protection. Protection is only provided within an input

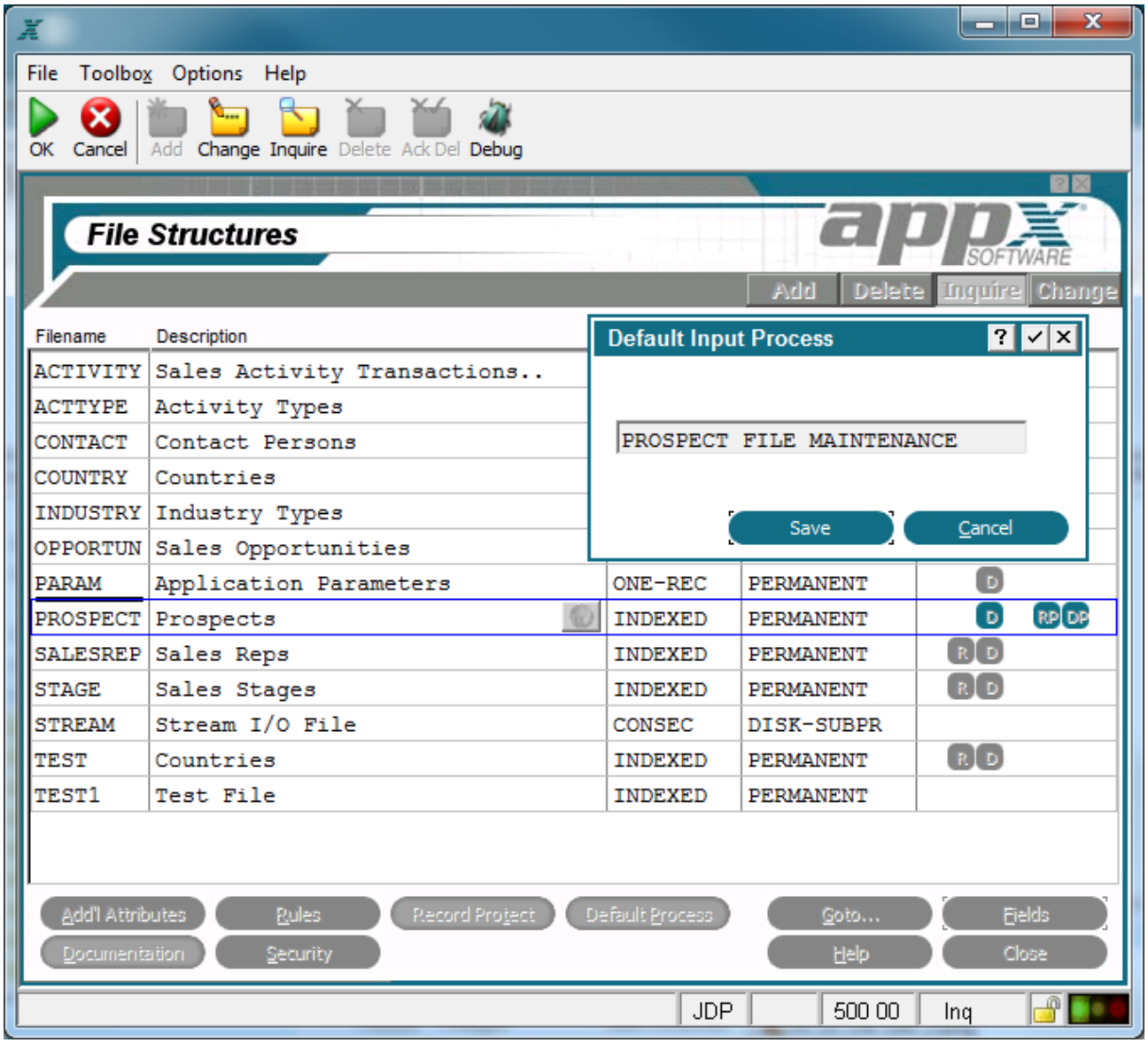
process during Live Operations (see Operational Phase). This field can be used to prevent the creation of orphan records by prohibiting the deletion of records referenced by other records anywhere in a database. You must explicitly maintain the value in this field.

The **Key Protection** field allows you to designate a logic or numeric field for record key protection. A logic field with a value of 'yes' ☑, or a numeric field with a non-zero value, signals to APPX to prevent the primary key for that record from being changed during data entry. The same field can be designated as both Delete Protection and Key Protection.. Protection is only provided within an input process during Live Operations (see Operational Phase). This field can be used to maintain the integrity of a database by prohibiting the modification of keys referenced by other records anywhere in the database. You must explicitly maintain the value in this field.

The **Record Access** field allows you to designate a four-character alphanumeric field for security code. All record accesses upon this file within APPX processes check the contents of this field for access class. If the user does not have rights to the security code stored in this field for the desired record, APPX responds as if the record is not on file. The value in this field must be maintained by the designer and must be four numeric characters. If blank, there are no restrictions.

Files Default Process Option

The Default Input Process overlay appears on the screen when you invoke the dflt proc option from the Files/Fields screen. From this overlay, shown in the figure below, you can optionally identify the APPX input process that is used to maintain this file. Upon completion, you are returned to the Files/Fields screen.



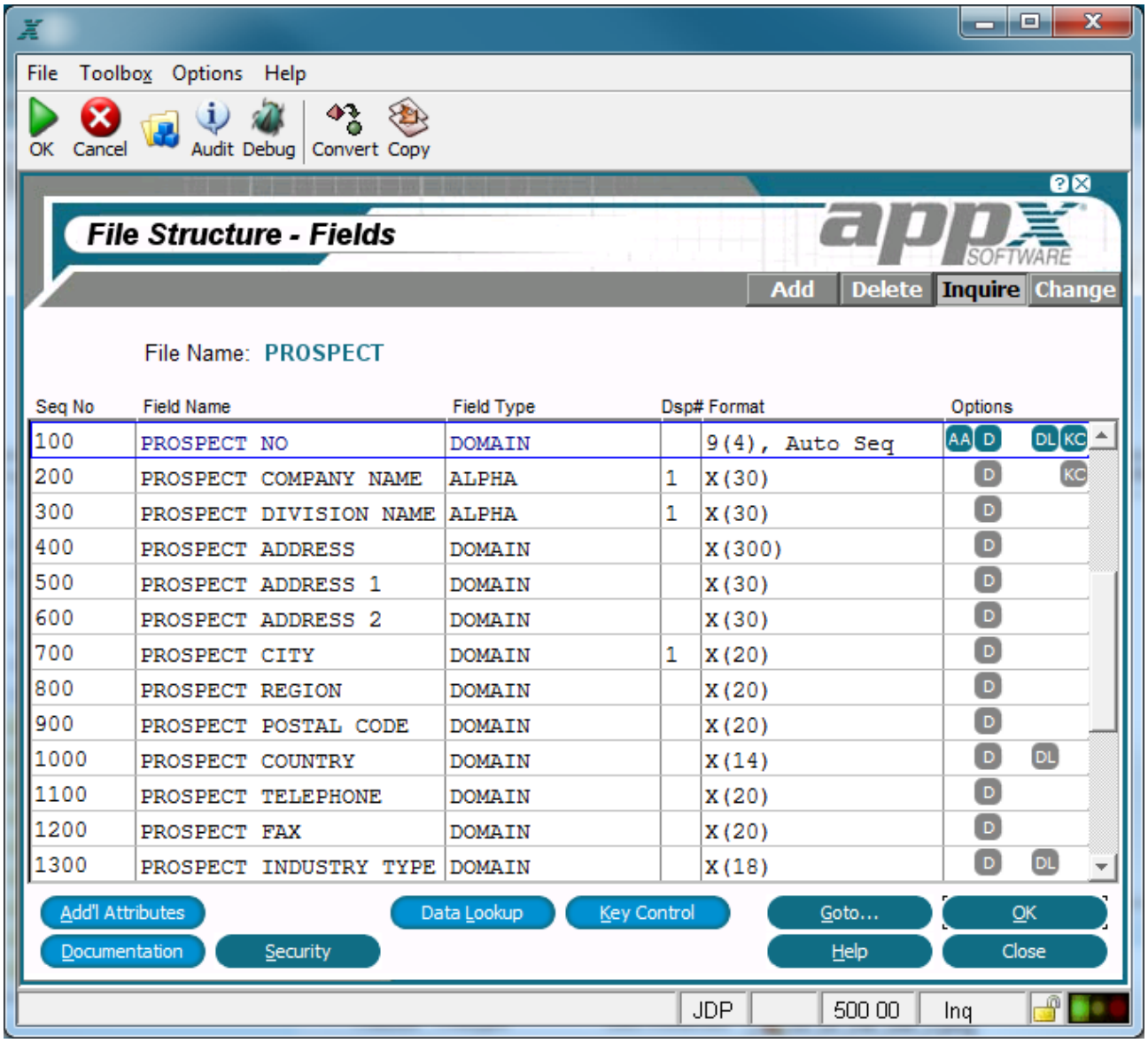
Files Default Input Process Overlay

Default Input Process is a navigational specification that links a field on an image to the input process that optionally executes from the *Scan* screen.

For example, assume that a user is entering a customer number on a sales order screen. The user has forgotten the appropriate customer number, and uses the Scan option to display all of the customers and their numbers. At this point, the user discovers a problem with the customer information. If you defined a default process for the customer file, the user can elect to add a missing customer record or maintain an outdated customer record without ending the Sales Orders entry process. If you did not define a default process, the user must end Sales Orders entry, end the Sales Orders application, select the Accounts Receivable application, and select the Customer File Maintenance process to accomplish the same maintenance activity. Refer to the *User Manual* for a discussion of the Scan option.

Fields

The Fields specifications screen, shown below, establishes attributes that are common to all fields in APPX, regardless of their type. This screen automatically displays after you complete the entries in the Files/Fields specifications screen by selecting Enter ☑.



Fields Screen

The *Fields* screen contains the following fields:

Seq No displays a sequence number that is defaulted by APPX. This default sequence number can be overridden, but must be unique within a file. Sequence numbers determine the order of fields in the record structure. The first field that is defined in add mode is assigned the sequence number *100*, and additional fields are assigned a number that is equal to the highest existing sequence number, plus *100*.

The sequence number of zero is reserved by APPX and cannot be assigned to a data dictionary field.

Key numbers are assigned to primary and alternate keys based upon a key field's sequence number. Refer to the Special Uses for Synonym Fields section for a discussion of the use of synonym fields to alter key numbers.

The sequence number is of particular significance to synonym and substring fields, and to group fields (group headers and group trailers). Synonym and substring fields must have sequence numbers higher than the sequence numbers of the fields they reference. All fields included in a group field must have sequence numbers that fall between the number of the group header and the group trailer or *Thru Field Name* field.

Field Name specifies a unique identifier for each field in a record. As shown in the sample screen above, a common convention is to begin each field name with the name of the file.

Field Type categorizes fields according to their function within APPX. The specifications that are presented on subsequent screen overlays depends on the *Field Type* entered here, although most share some common specifications.The *Field Type* options are:

Domain, which assumes the attributes that are defined for an alphanumeric, date, logic, or numeric domain.

Alpha, for fields that can contain numbers, letters, and special characters (such as *-, #*, or *&*).

Format, for fields that can contain an edit mask.

System, for fields, often referred to as audit fields, that display data that is provided by the system.

Text, for text fields.

Token, for fields with specific values that are stored as corresponding numbers.

Numeric, for fields restricted to number, decimal (.), and sign (-) entries.

Date [reference unavailable in the source], for fields that contain dates and/or times, from a hundredth of a second through a century.

Logic, for fields with possible values of yes ☑, no ☐, or ? to represent an unknown value (Y, N or blank using Character Mode).

Synonym, which provides an alternative name for referencing an existing APPX field.

Substring, which represents a discrete portion of a longer alphanumeric field.

Group Header, which marks the beginning and end of a series of fields in a group field or concatenation.

Group Trailer, a placeholder that optionally marks the final field in a concatenation, permitting future expansion of the group.

If you enter a partial value, APPX selects the option with the next highest value. For example, an entry of *SUB* or simply *S* is equivalent to entering *SUBSTRING*. An entry of *A* references the next highest value: *ALPHA*. Each field type is described in detail later in this chapter.

Dsp#, or *display sequence*, if present, indicates this is a *descriptive field* and also determines the order of the field's appearance relative to other descriptive fields in the file. *Descriptive fields* are fields whose value is important in helping users identify specific records.For example, customer name, contact name, and telephone number fields may all be appropriate descriptive fields for a customer file. They are used in APPX-generated subheadings and on data lookup screens (such as the Scan display when the user selects the Scan option). Fields with duplicate display sequence numbers are displayed according to the field sequence numbers. If *Dsp Seq* is blank, the field is not treated as a descriptive field.

Format shows the structure of the field based on the specifications entered.

Options are indicators that are present whenever documentation (T), data lookup (DL), additional attributes (AA), or key control (KC) have been defined for this field.

The Fields screen contains the following options as described in the corresponding sections:

Additional Attributes (this option is described separately by field type)

Data Lookup

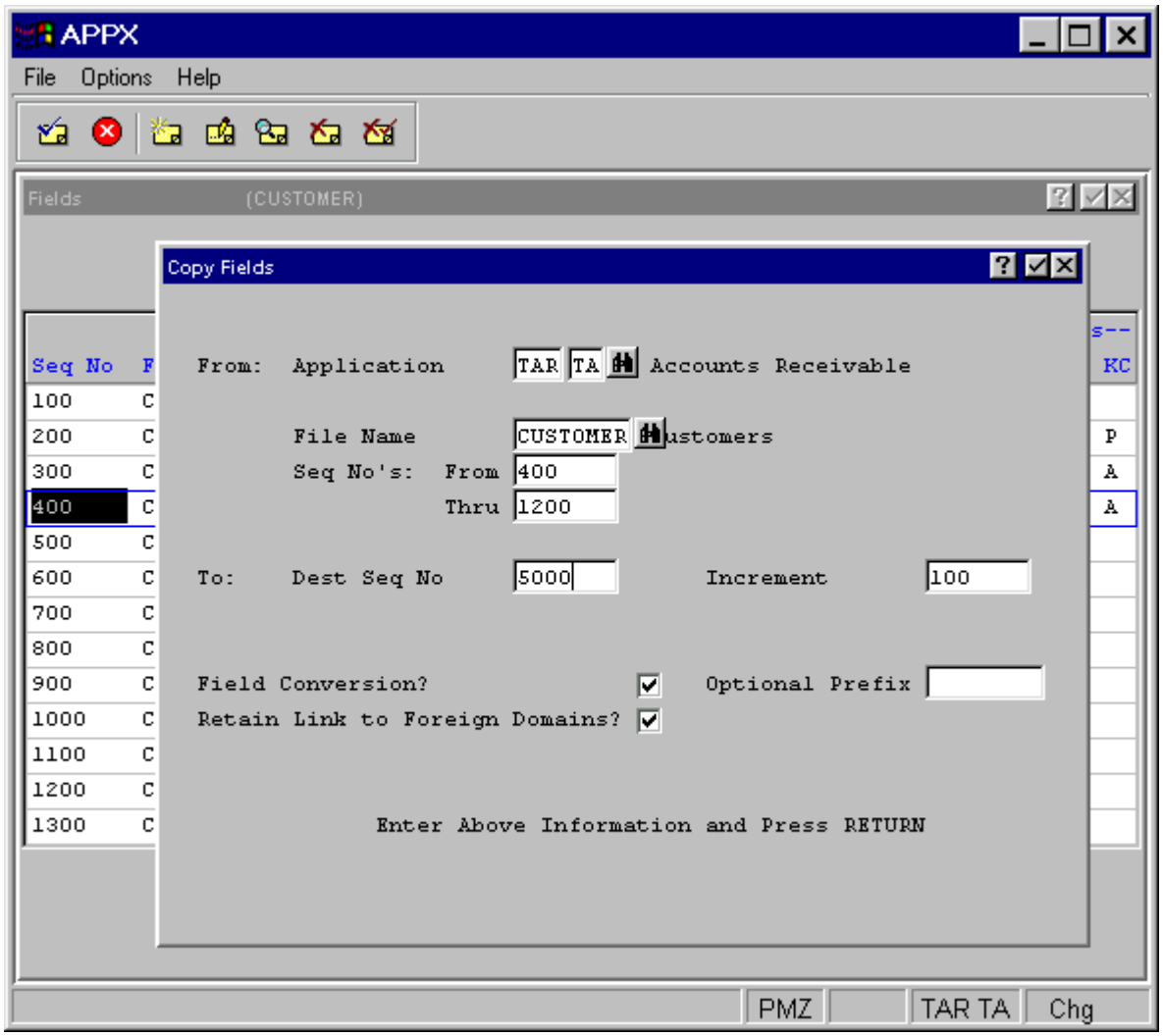
Key Control

Documentation

Security

Fields Toolbox Copy Fields Option

The Copy Fields overlay, shown below, displays when you select the Copy Fields option from the Fields Toolbox Overlay [reference unavailable in the source]. This feature allows you to copy a field or sequence of fields into the data dictionary for the selected file. The selected fields to copy may be from the current file or another file.



Copy Fields Overlay

To copy a field or fields into the current file's data dictionary, you must enter:

Application ID and version corresponding to the location of the file you want to copy fields from.

File Name of the file you want to copy fields from.

Seq No's of the fields you want to copy. If you want to copy a single field, leave the 'thru' sequence number blank.

Dest Seq No is the beginning sequence number for the new fields (or the single sequence number if you are copying just one field).

Increment is the increment to be used in determining successive sequence numbers if you are copying more than one field (a value of 100 will create sequence numbers 2000, 2100, 2200 . . . if you entered 2000 as your destination sequence number).

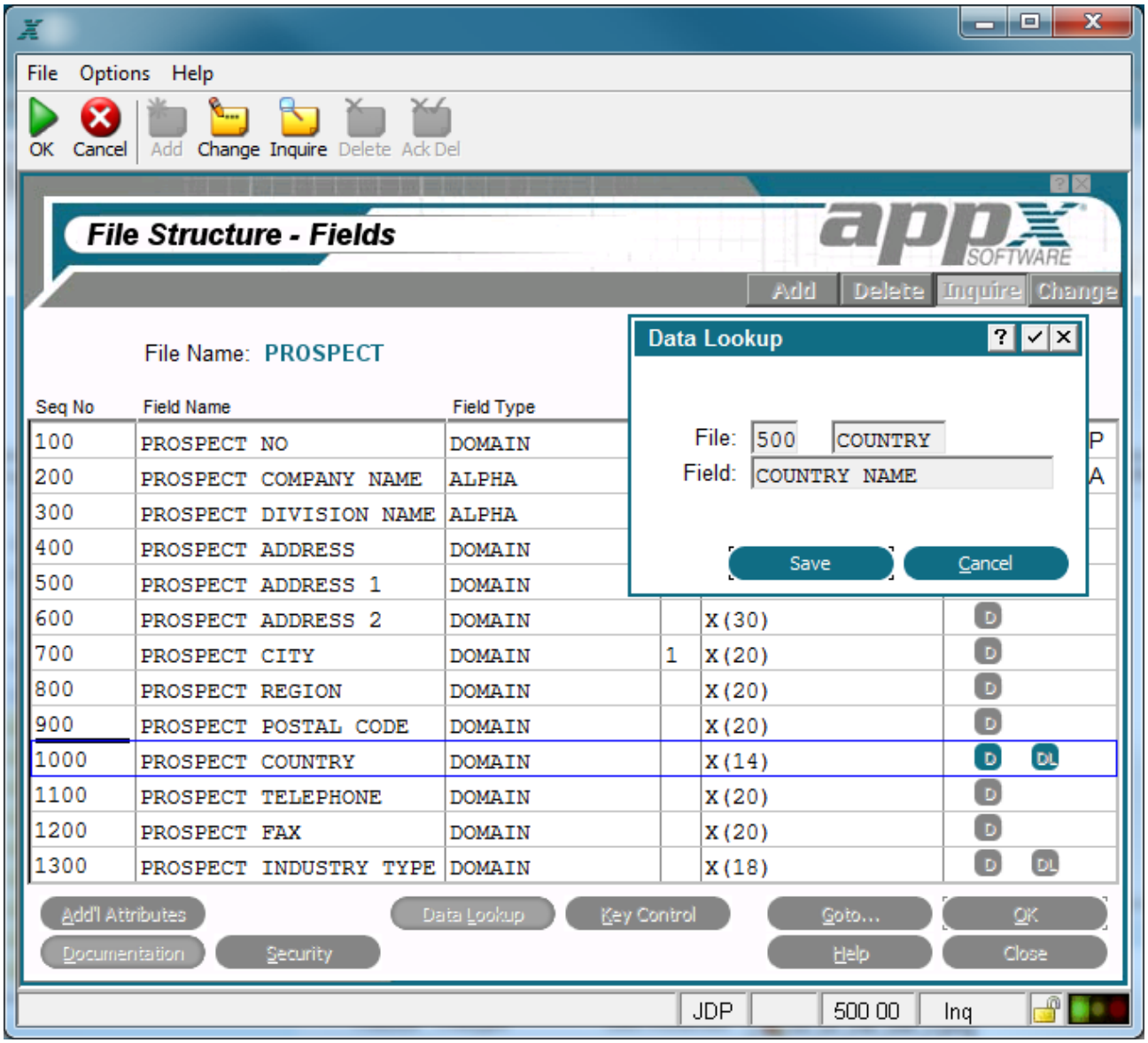
Field Conversion? to control whether or not the field name should be converted to conform to APPX coding standards. Field names should begin with the name of the file that the field name is being copied into. Select the checkbox to toggle between 'yes' ☑ and 'no' ☐. This option should not be used if APPX coding standards have not been used in this record structure.

Optional Prefix is used in conjunction with *Field Conversion?* to substitute the destination field name with a different name for the field name prefix.

Retain Link To Foreign Domains? controls whether or not references to foreign domains (domains outside of the current application) will be retained. For example, if fields from application 'AAA' are being transferred to application 'BBB' then all references to 'AAA' domains are considered foreign domains. The default value of this field is 'yes'. Select the checkbox to toggle between 'yes' ☑ or no' ☐. If 'yes' is selected, references to foreign domains will be retained in the transferred fields. If 'no' is selected, foreign domains will be localized or transferred to the current application. Domains already existing in the current application will not be overwritten but may be transferred separately if desired.

Fields Data Lookup Option

The data lookup option from the Fields screen accesses the Fields Data Lookup Overlay, shown below. If the field can be used as a key to another file, you may wish to specify the file and key field for data lookup purposes. Data Lookup specifications for a field enable use of the scan option to look up a value for the field on an input image or on a record selection screen in a query. These specifications are defaulted as the Data Lookup values whenever the field is defined on an image. In addition, APPX uses this key path to access descriptive information when generating a standard subheading image for the field in an output process. Upon completion of Data Lookup entries, you are returned to the Fields screen.



Fields Data Lookup Overlay

The Fields Data Lookup overlay contains the following fields:

File identifies the application ID and file name of the file to be accessed for data lookup.

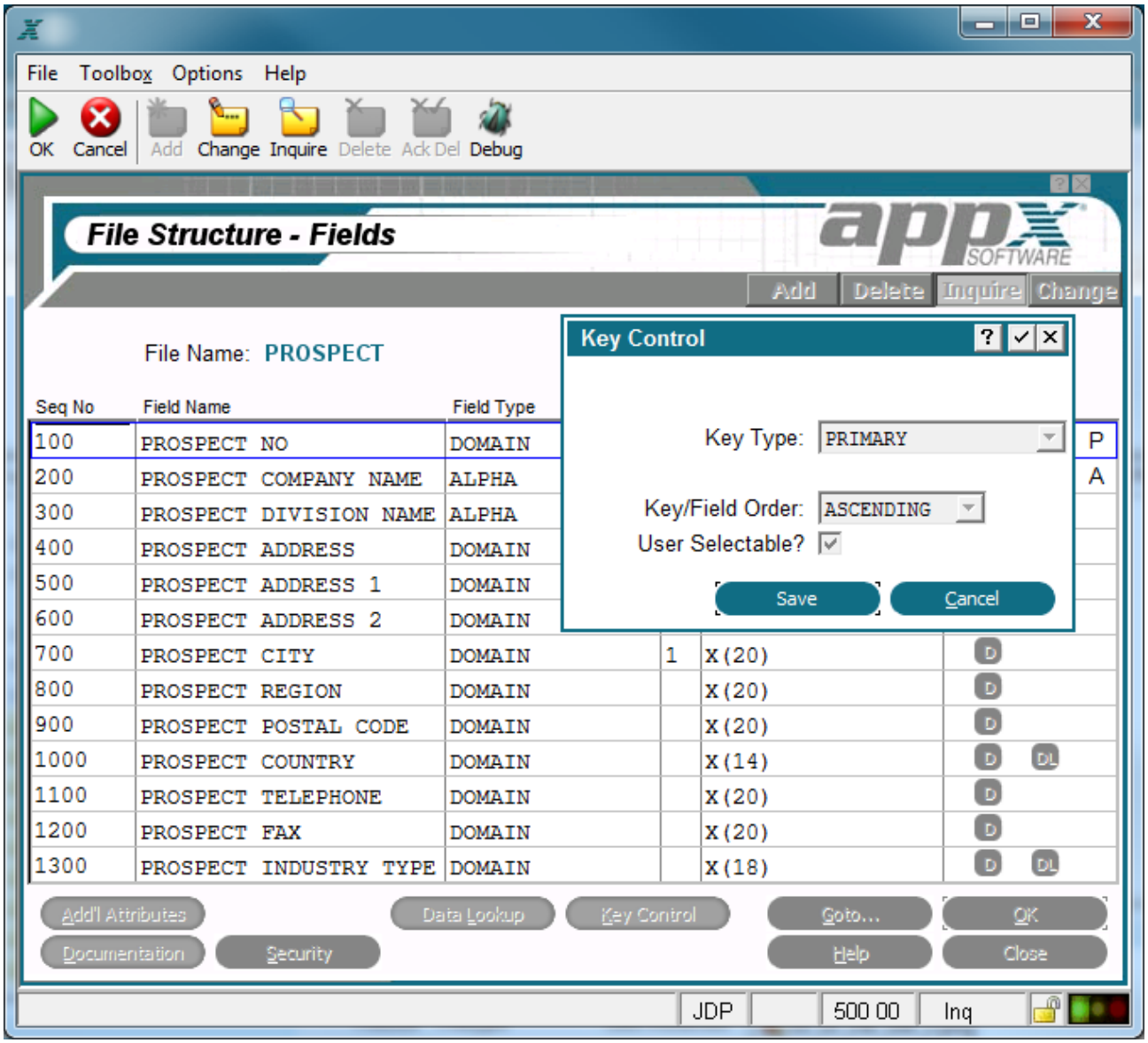
Field identifies a primary or alternate key to the data lookup file. In addition, APPX uses a key field to access related information when generating a standard subheading image in an output process. The user can then look up and select the contents of this field by use of the scan option when entering data in input or query processes for the original field.

Fields Additional Attributes

The Additional Attributesoption from the Fields screen accesses an Additional Attributes overlay, from which you can enter additional parameters for the field. The specific overlay varies by field type. Each overlay is presented later in this chapter according to the respective type of field. Upon completion, you are returned to the Fields screen.

Fields Key Control Option

Key control accesses the fields Key Control overlay, shown below, from which you can define attributes about key fields. This option applies only to key fields (both primary and alternate) for indexed files. For non-key fields, this option is ignored unless a field is part of a group field that is itself a key to an indexed file. Upon completion, you are returned to the Fields screen.



Fields Key Control Overlay

The fields Key Control overlay contains the following fields:

Key Typeindicates whether or not a field is a key field and, if yes, the type of key. A group trailer field cannot be a key field. The *Key Type* options can be scanned and consist of:

PRIMARY

Key fields are the default key paths for a file. APPX requires one (and only one) primary key for each indexed file. All records can be accessed by a primary key path (must be unique).

ALTERNATE

Key fields optionally provide alternative key paths to a file. Duplicate values and up to 16 alternate keys are permitted in APPX.

ALTERNATE/UNIQUE

Key fields optionally provide alternative key paths to a file. Duplicate values are not allowed.

ALTERNATE/FORCED

Key fields are the same as ALTERNATE key fields except that duplicate keys are retreived in primary key order.

The default is blank.

Key/Field Order specifies the order of the key or key segment.

Maximum Key Size: The Primary Key can be up to 255 bytes in length. An Alternate Key can also be 255 bytes in length less the length of the Primary Key. Appx will throw an error while processing the data dictionary if any key in the file is greater than 255 bytes.

User Selectable? determines whether or not a user can switch to a key path with the *Select Access Path* option from within an input process. The *User Selectable'* options are 'yes' ☑, a user can select the key path; or 'no' ☐ where a user cannot select the key path. Its use is restricted to internal access (statements). The default is 'yes'.

Common Fields Specifications

When you select Enter ☑ from the Fields screen, a Fields specifications overlay displays. The specific Fields specifications overlay that appears depends upon the type of field that is currently selected. However, there are some specifications that are shared by most field types (either on the specifications overlay or the additional attributes overlay). These include the following as described in the corresponding sections:

Occurrence

For information about type-specific Fields Specifications overlays, refer to the following sections which discuss each type in detail:

Domain

Alpha

Format

System

Text

Token

Numeric

Date [reference unavailable in the source]

Logic

Synonym

Substring

Group Header

Group Trailer

Occurrence

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767.

A multiple-occurrence field is simply an alternative to defining multiple fields in a file. For example, a balance record in a General Ledger application may contain an ending balance field that is repeated 12 times, one for each month in the year. You could define 12 fields, January Ending Balance, February Ending Balance, March Ending Balance, and so on, or you could define one ending balance field with 12 occurrences.

APPX considers each occurrence as a separate field, uniquely identified by the combination of application ID, field name, and occurrence number. Each occurrence of a multiple-occurrence field is no different from a single-occurrence field in that:

APPX allocates unique physical storage for each occurrence.

You can paint a specific occurrence on an image.

Statements operate on specific occurrences of a field.

Unlike separate fields, however, if a multiple-occurrence field is included in a group, all occurrences become part of the group. It is not possible to selectively include specific occurrences in a group, while excluding other occurrences. However, see Special Uses for Group Fields for some creative ways to manipulate groups and occurrences.

There are two primary advantages of using multiple-occurrence fields. Multiple-occurrence fields:

Minimize the effort that is required to define the data dictionary. You enter a single field definition rather than a separate field definition for each occurrence.

Minimize the effort that is required to manipulate data using APPX statements.

You can exert less control over multiple-occurrence fields than you can over single-occurrence fields because you:

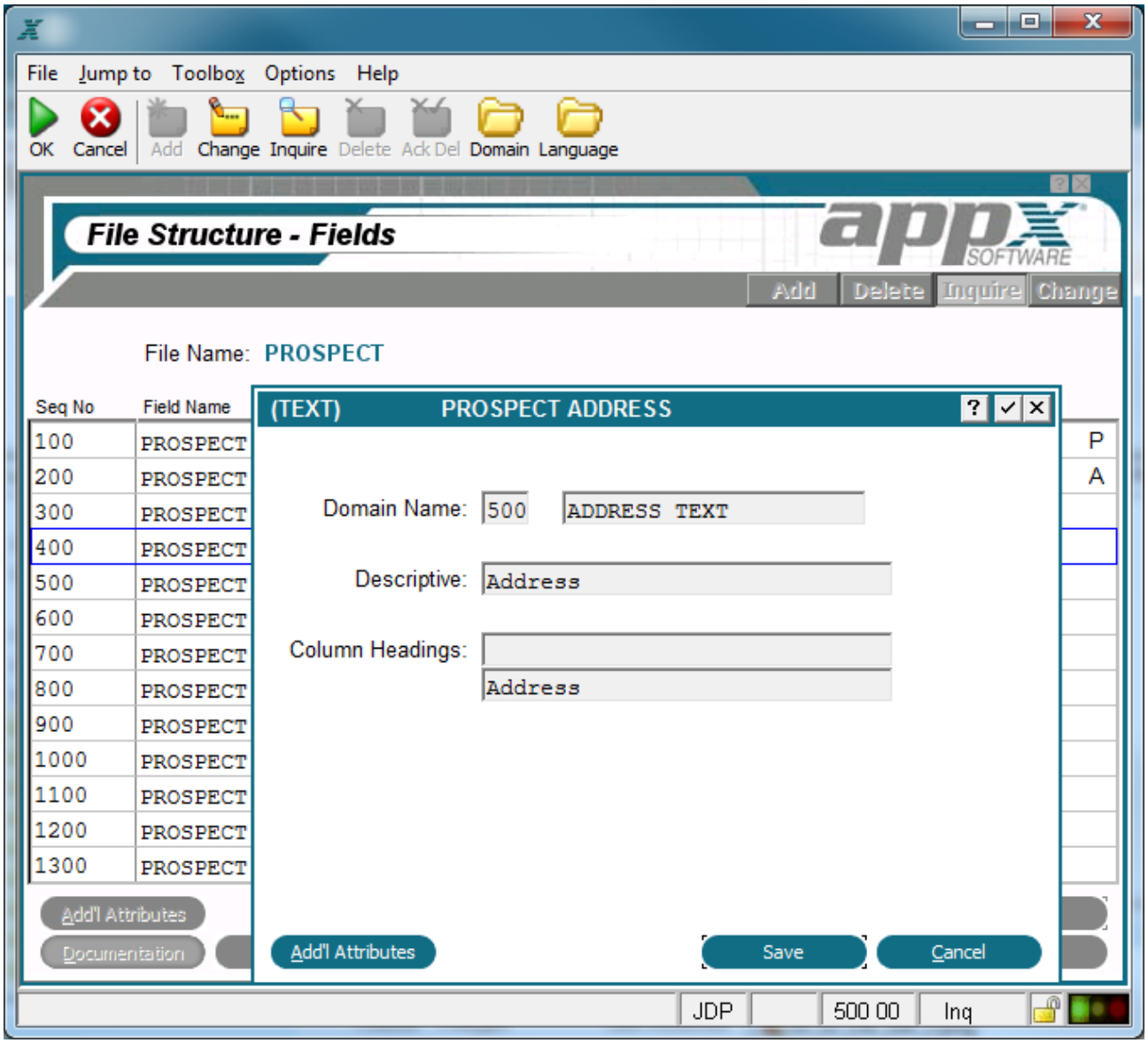
Must include all occurrences in a group.

Cannot define a synonym for a multiple-occurrence field.

Cannot establish a multiple-occurrence substring.

Domain Fields

A domain-type field assumes the attributes that are defined for any type of domain in the same or an outside application. One of the Domain-Type Field Specifications overlays automatically displays after you complete the entries on the Fields specifications screen if the *Field Type* you select is DOMAIN.



Domain Field Specification Overlay (Alpha Domain)

The following fields are contained on the Domain-Type Field Specifications overlay for Alpha, Format, Text, Token, Date, and Logic domains:

Domain Name links a domain-type field to a specific domain in the same or another APPX application.

Descriptive provides a longer, more easily understood alternative to Field Name, one that is not required to be unique within an application. If blank at all default levels, Field Name is used. Because Descriptive is less cryptic and can be more flexibly formatted than Field Name, it is easier to understand, and so the system uses Descriptive when communicating with users. Descriptive is used, for example, when the value of a field displays to a user on a standard image, such as the Select Access Path display or an APPX-generated subheading. We suggest that you use a singular entry for Descriptive, and avoid appending the word 'field'.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for Start of Page and Start of Range class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

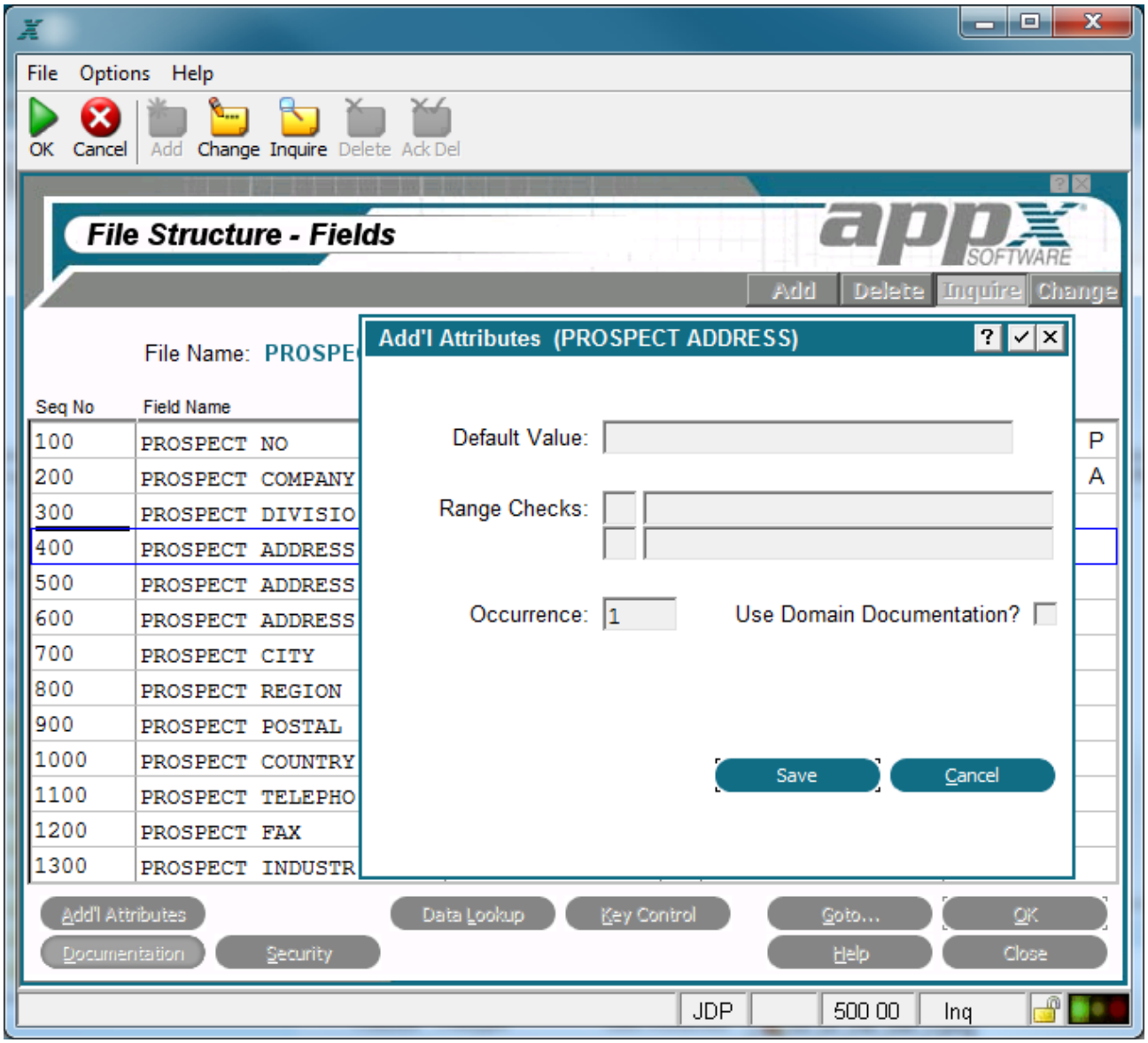
The Domain-Type Field Specification overlays for Alpha, Format, Text, Token, Date, and Logic domains contain the following option described in the corresponding section:

Additional Attributes

Domain Fields Additional Attributes Option

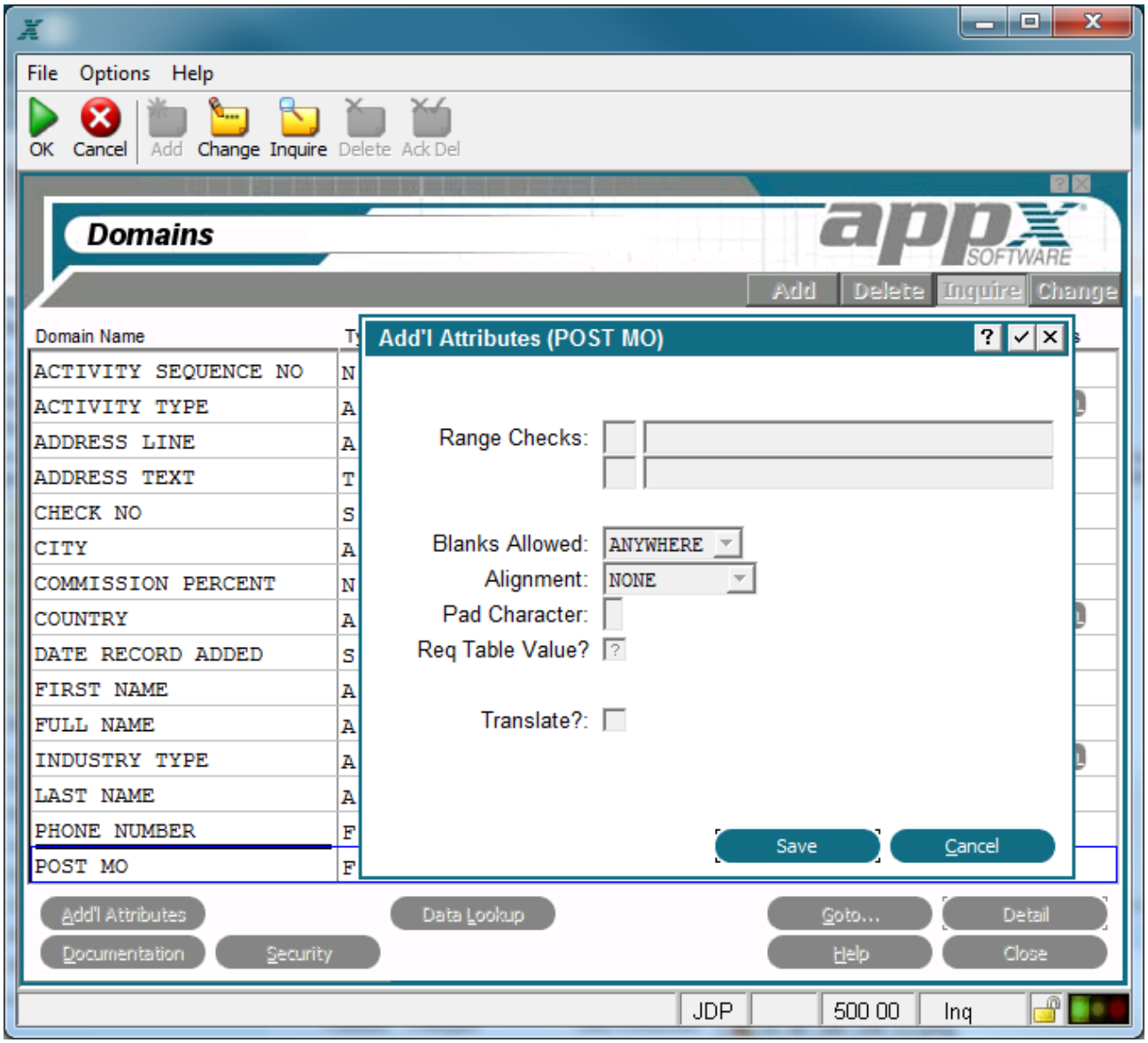
Additional Attributes accesses the domain-type field Additional Attributes overlay, from which you can enter additional parameters for this domain-type field. Upon completion, you are returned to the Domain Fields specifications overlay.

The Domain-Type Field Additional Attributes overlay for *alpha*, *text*, *token* and *date* Domains is shown below.



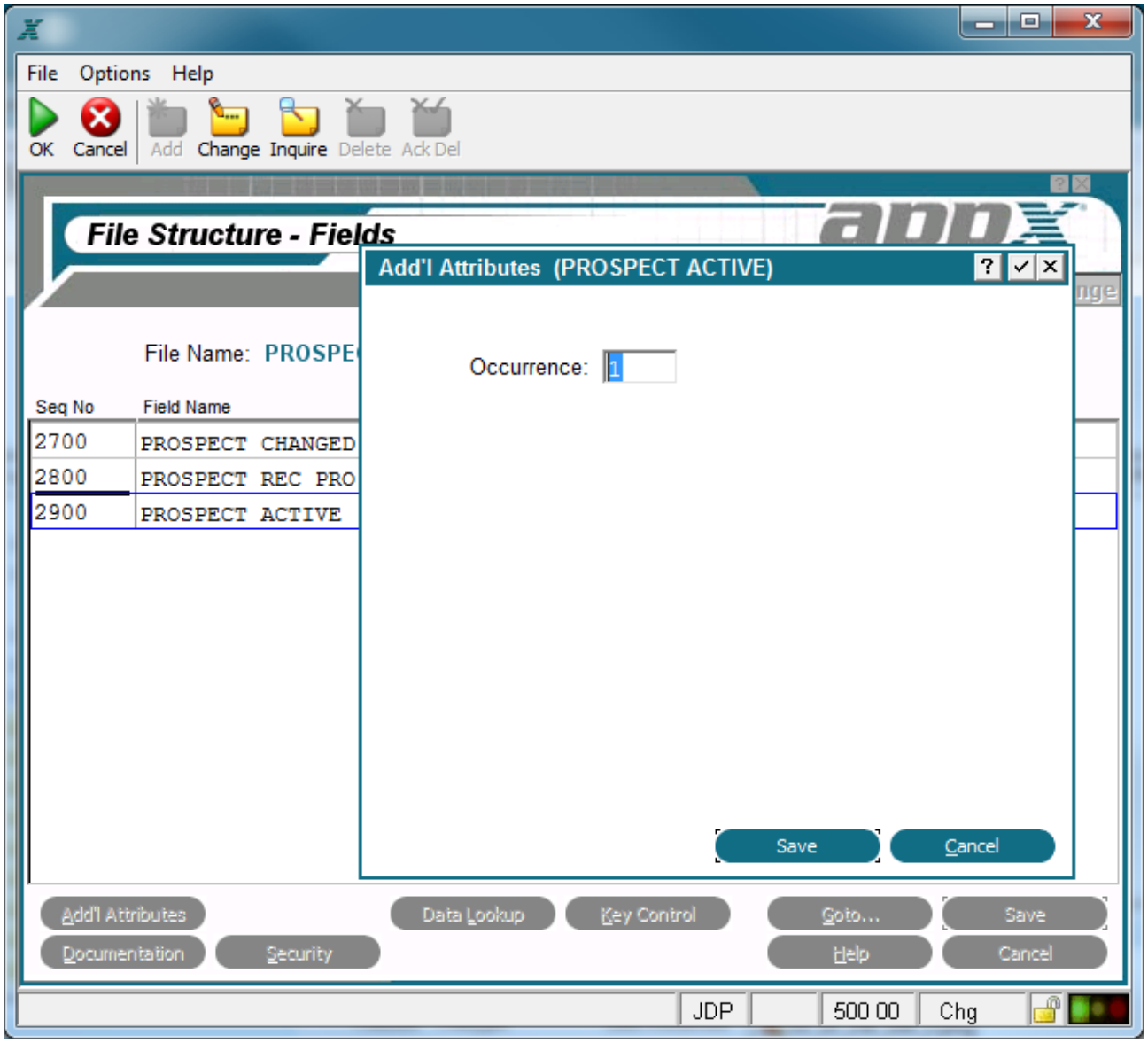
Domain Field Additional Attributes Overlay for Alpha, Text, Token and Date Domains

The Domain-Type Field Additional Attributes overlay for *format* Domains is shown below.



Domain Field Additional Attributes Overlay for Format Domains

The Domain-Type Field Additional Attributes overlay for *logic* Domains is shown below.



Domain Field Additional Attributes Overlay for Logic Domains

Some or all of the following Fields are contained on the Domain-Type Field Additional Attributes overlays for *alpha*, *format, logic, text*, *token* and *date* Domains:

Default Value establishes a modifiable starting value for all referenced fields whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

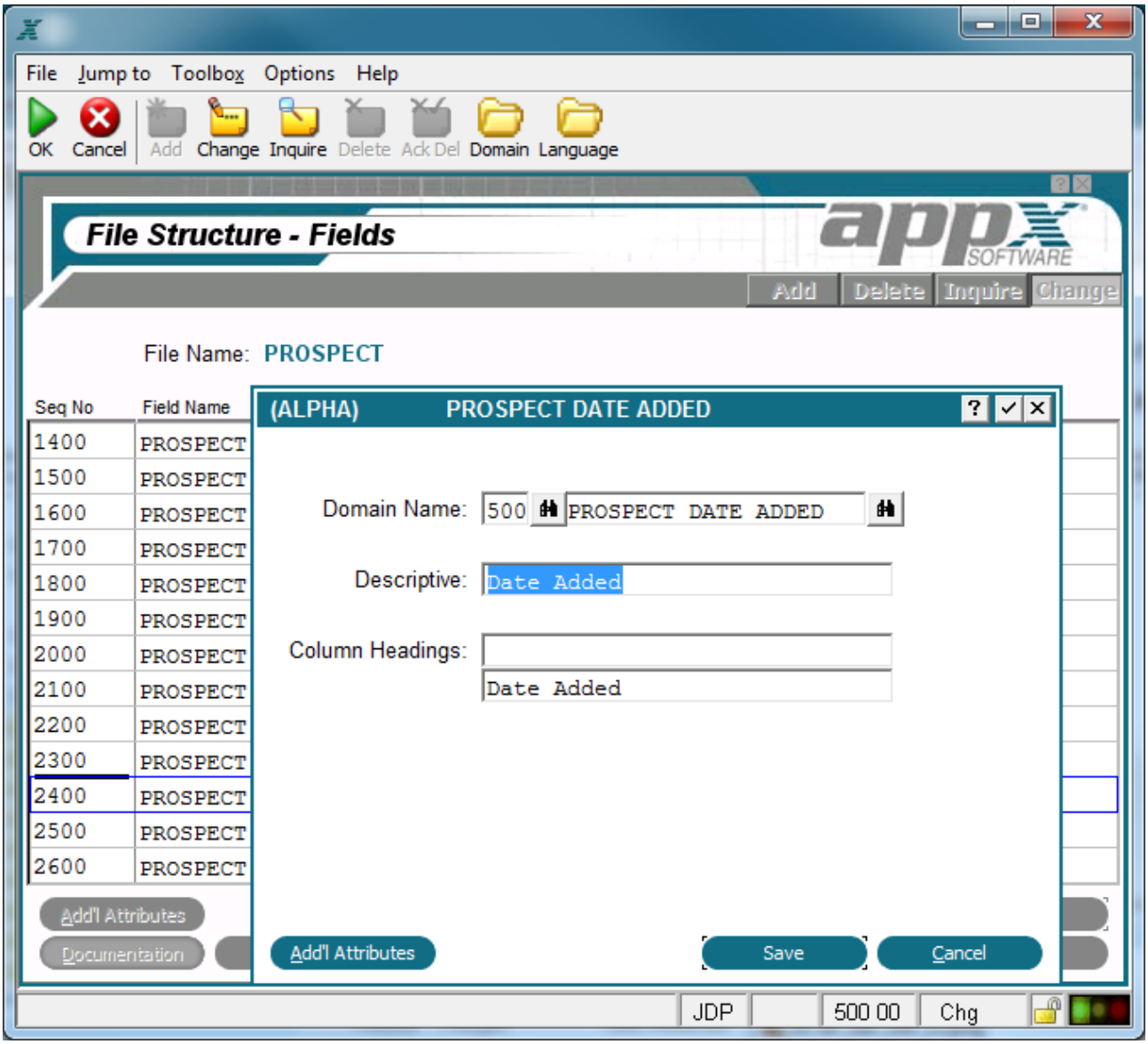
Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Use Domain Doc? Toggle the checkbox between 'yes' ☑ if you want APPX to use the documentation from the domain as Help text and 'no' ☐ if you plan to enter Help text unique to this field.

Print Totals. Enter a Y to indicate that this field should be automatically totaled on reports. This field is used as a default for the auto-total specification in Output and Inquiry Process definition.

Domain Fields (System Domains)

The Domain-type field specification overlay, shown below, displays after you select Enter ☑ from the fields screen if the *Field Type* you select is *DOMAIN* and the domain type is *system*.



Domain Field Specification Overlay (System Domain)

The following fields are contained on the Domain Field Specifications overlay for *system* Domains:

Domain Name: This field is a reference field that identifies a related field. Examples include:

The name of a domain that a field references

Group Header Through Field Name (identifies the final field in the group)

The primary field that a Synonym refers to

The primary field that a Substring belongs to

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used. Refer to the definition of *Descriptive* in the *Domain Fields* section for more information.

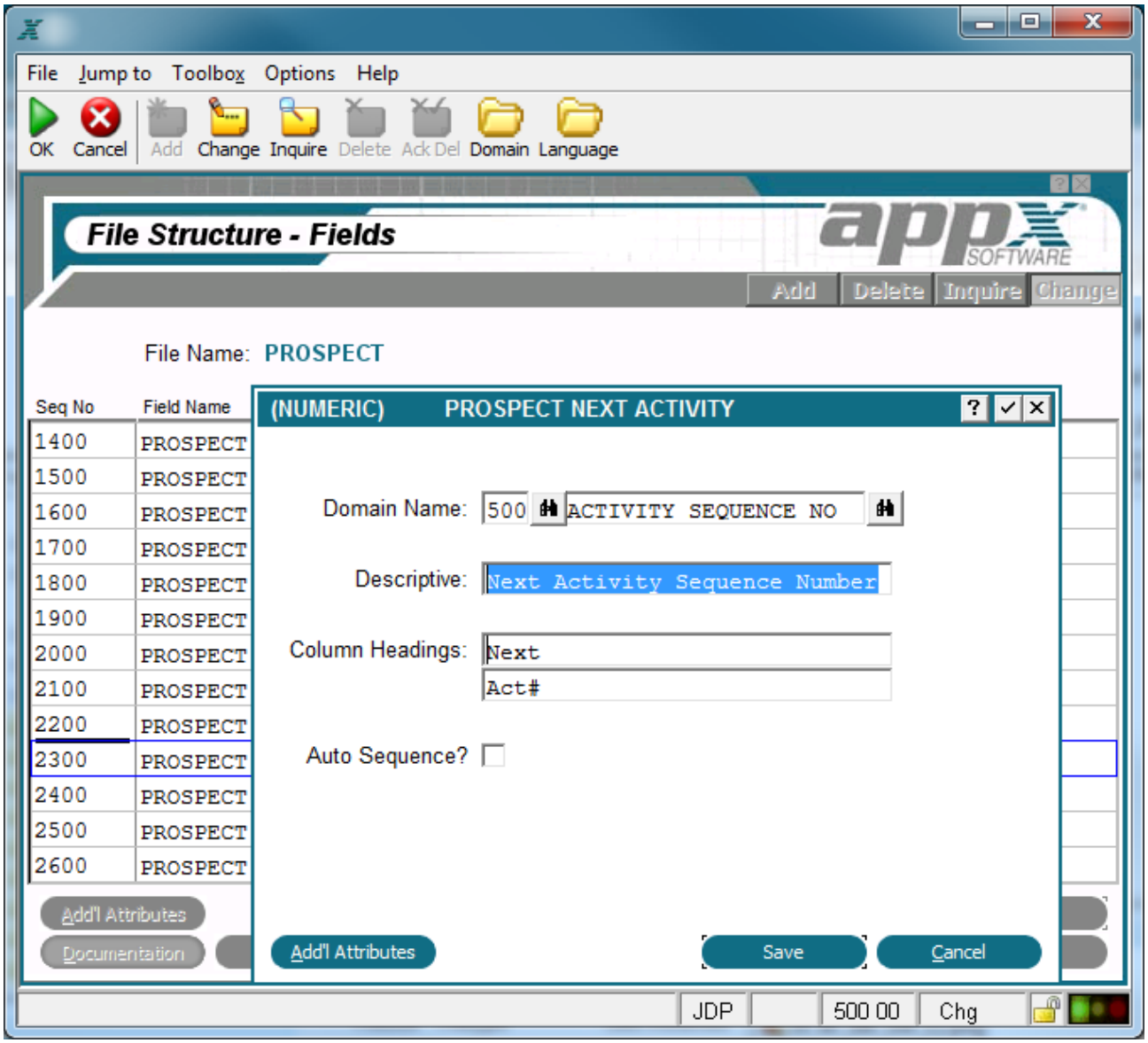
Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

The Additional Attributes option accesses the Additional Attributes overlay which contains only one field:

Use Domain Documentation? Toggle the checkbox between 'yes' ☑ if you want APPX to use the documentation from the domain as Help text and 'no' ☐ if you plan to enter Help text unique to this field.

Domain Fields (Numeric Domains)

The Domain type field specification overlay, shown below, displays after you select Enter ☑ from the fields screen if the *Field Type* you select is *DOMAIN* and the domain type is *numeric*.



Domain Field Specification Overlay (Numeric Domain)

The following fields are contained on the Domain-Type Field Specifications overlay for *numeric* Domains:

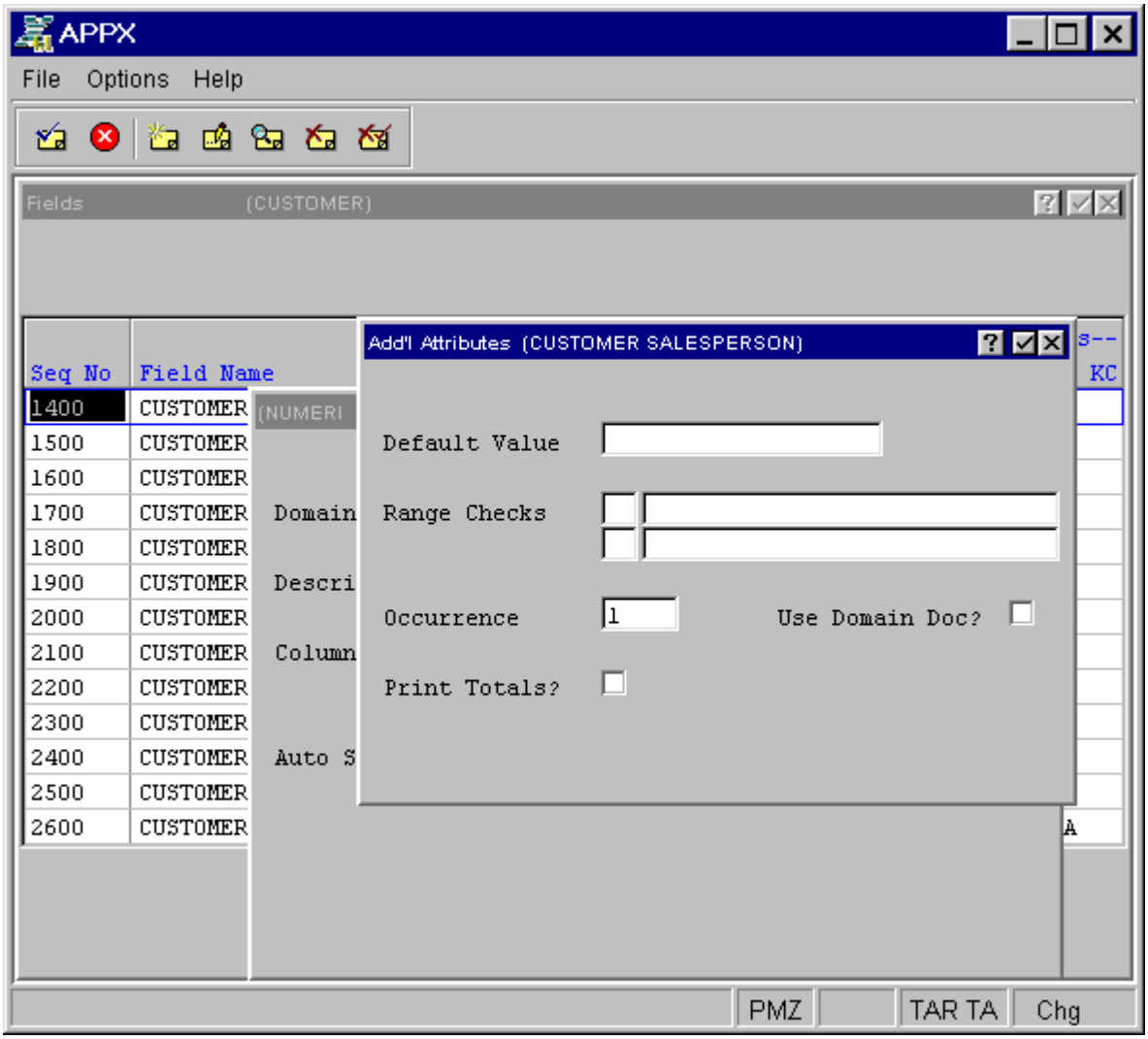
Domain Name links a domain-type field to a specific domain in the same or another APPX application.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Auto Seq? Select 'yes' ☑ if this numeric field represents a sequence number with a value that should be maintained by APPX.

One option, Additional Attributes, is also available on this screen. This option accesses the Additional Attributes overlay for *numeric* Domain Fields shown below. Upon completion, you are returned to the numeric Domain-type field specifications overlay.



Domain Field Additional Attributes Overlay for Numeric Domains

The Additional Attributes overlay for *numeric* Domain Fields contains the following:

Default Value establishes a modifiable starting value for all referenced fields whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are *EQ* (equal to), *NE* (not equal to), *GT* (greater than), *LT* (less than), *GE* (greater than or equal to), and *LE* (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

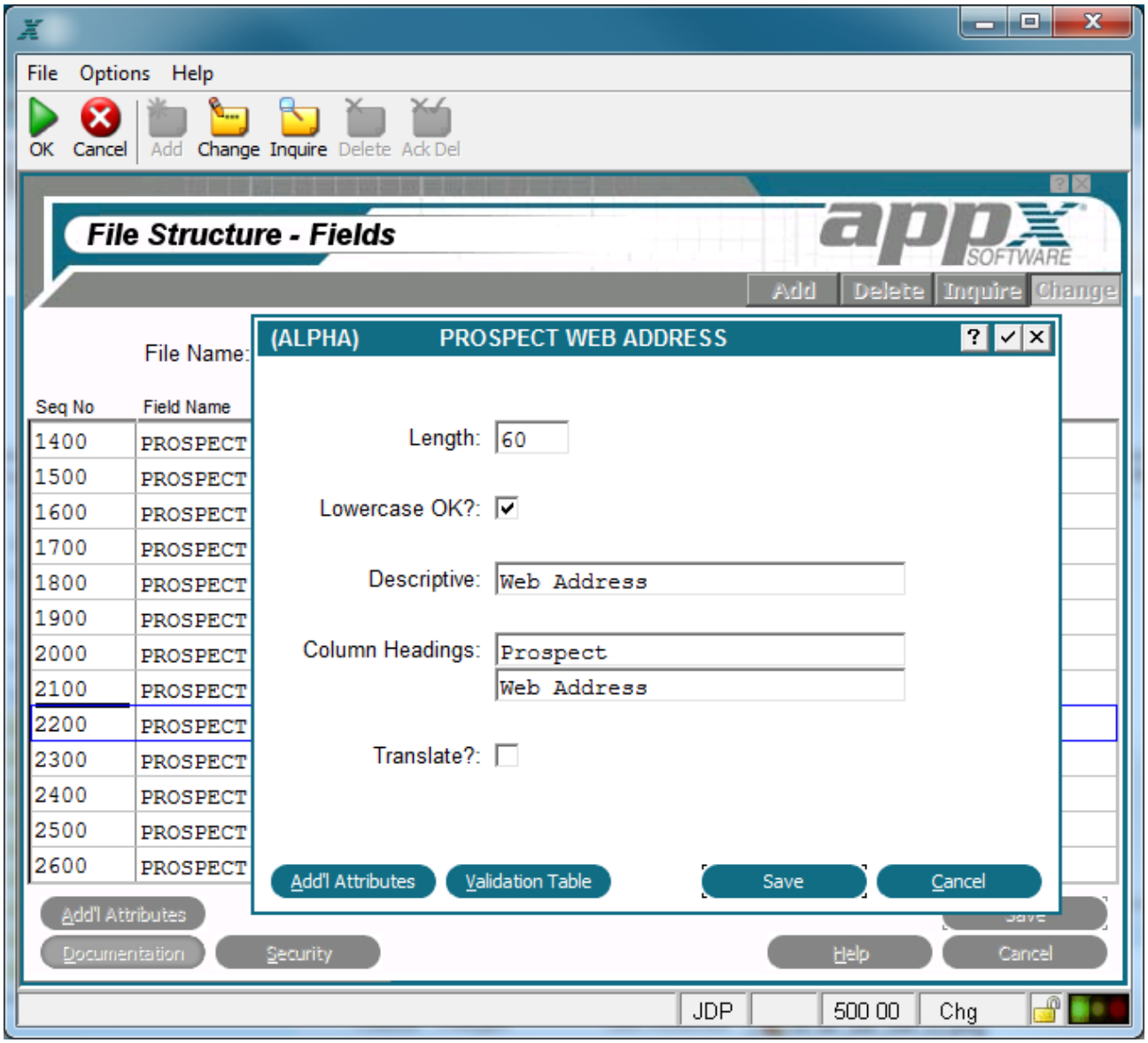
Use Domain Doc? Click the checkbox to toggle between 'yes' ☑ if you want APPX to use the documentation from the domain as Help text and 'no' ☐ if you plan to enter Help text unique to this field.

Print Totals? Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ to indicate if this field should be automatically totaled on reports.

Alpha Fields

An Alpha field can contain numbers, letters, and special characters, such as *#, $,* and *&*. Examples include names, addresses, certain account numbers or serial numbers, and text.

The Alpha fields overlay, shown below, allows you to add Alpha specific attributes to those already defined for fields. The alpha field overlay displays after you complete the entries on the Fields specifications screen if the *Field Type* you select is *ALPHA*.



Alpha Fields Overlay

The Alpha Fields overlay contains the following fields:

Length designates the number of character positions, or length, of this field up to 32,767 (32K) characters.

> **Note:** APPX does not support fields (or records) longer than 32K characters. If you map an APPX file to a pre-existing RDBMS table, you may find that the table includes a column larger than 32K; such columns are often referred to as memo columns. APPX offers limited support for memo columns. You can access a memo column by defining (in the APPX data dictionary) an ALPHA X(***n***) field in the corresponding position.
>
> When you read a record that includes a memo column, APPX will only read the first ***n*** characters

> and will truncate any remaining data. If you read a record *with hold* and APPX would have to truncate a memo field, the read will fail. Reading a record *with hold* implies that you may try to update the record and APPX will try to prevent you from losing data through truncation. If you need to delete a record that would include truncated data, use partial-record I/O to avoid truncation. You can also use *partial-record I/O* to update other fields in the record. In general, you should avoid reading memo columns except in those cases where you actually need the data.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used. Refer to the definition of *Descriptive* in the Common Domain Specifications section of this manual for more information.

Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Translate? Indicates if this domain or field is eligible for language translation. Currently the following field types may be translated (others will have the field protected)

Token fields

Alpha & Format fields that have a validation table

Work fields that are Token, Alpha, Format, or Text

It's currently the designer's responsibility to insure that translatable work fields without a validation table are read only.rovides

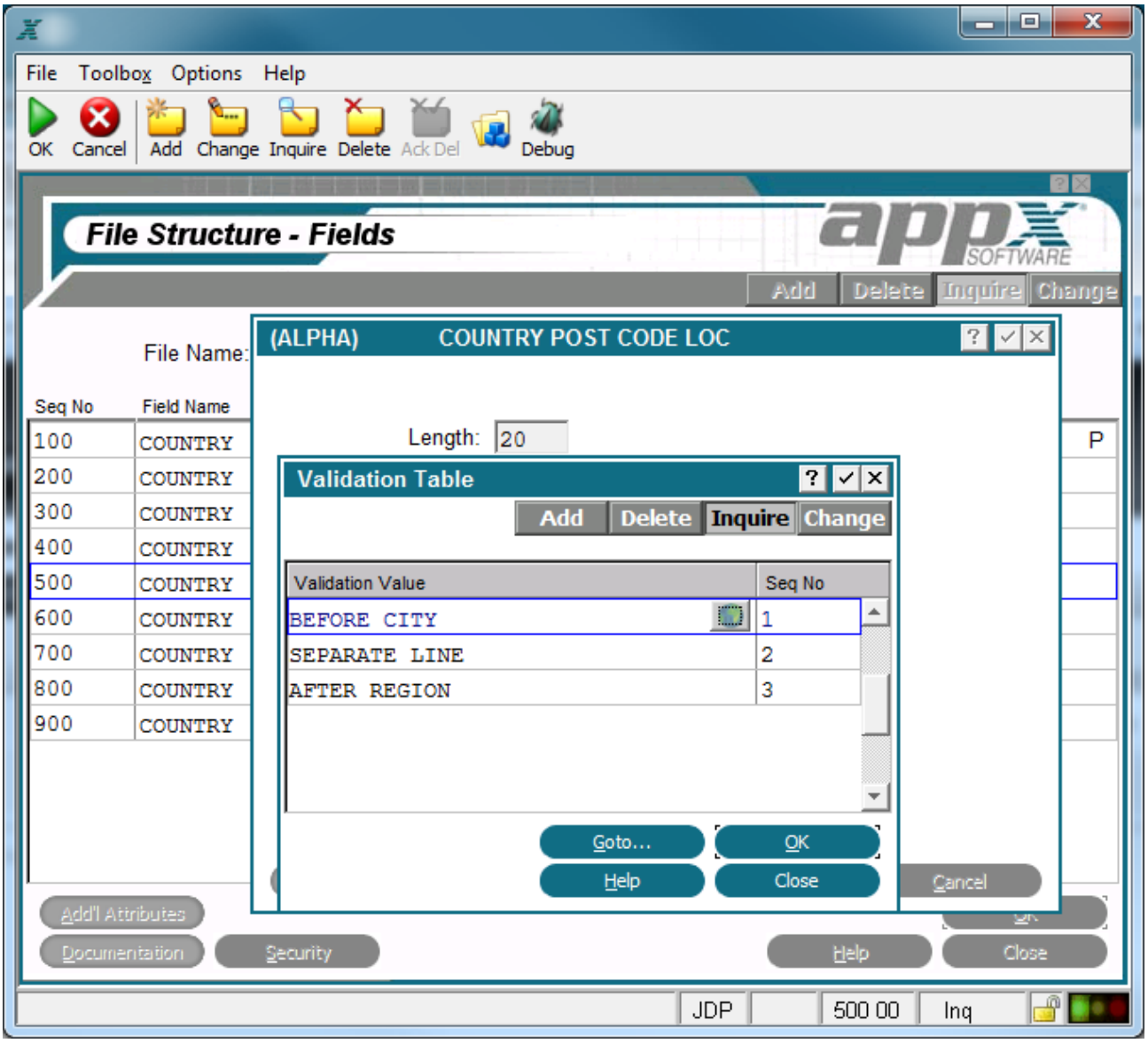
The Alpha Fields overlay provides two options which are described in the corresponding sections:

Additional Attributes.

Validation Table

Alpha Fields Validation Table

The Validation Table option from the Alpha Fields overlay accesses the Validation Table overlay, shown below. A validation table provides a more powerful alternative to the use of range checks for data validation when there is a known set of values. Through the list feature, it provides the user with visibility of all the possible field values as well as the ability to select the desired value.



Alpha Fields Validation Table Overlay

You can establish a validation table for any Alpha field in the data dictionary. The entries in the table are case-sensitive. If you enter a validation value in all capital letters, an application user must enter the value in all capital letters.

Validation table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, validation does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application. All validation values are available for review and selection by the end user through the list feature.

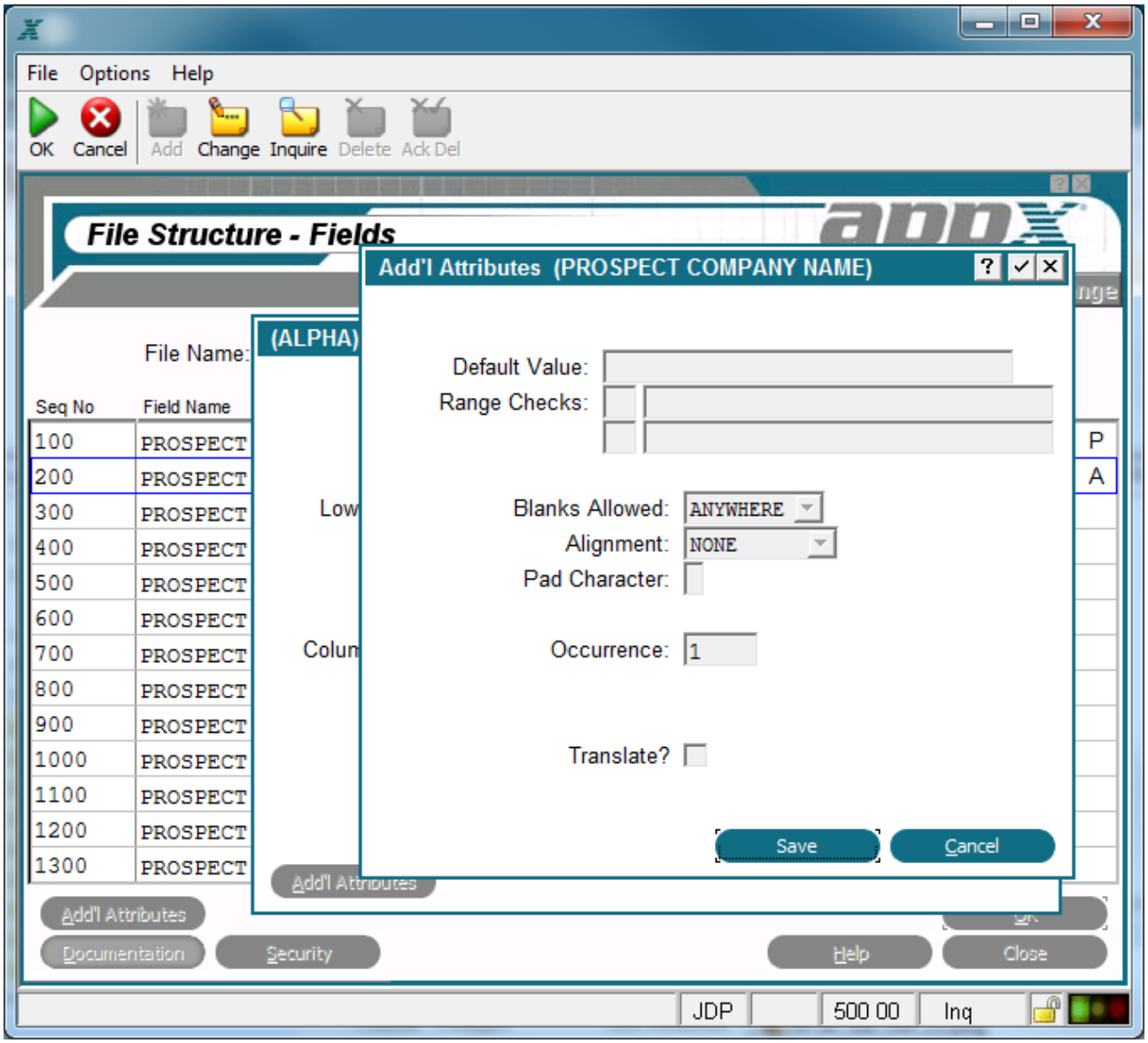
The Validation Table overlay contains the following fields:

Validation Value provides a valid field value. It is case-sensitive and is used for online review, selection, and validation. Note that validation values newly added to the data dictionary are not available to a current APPX user until the user exits and re-enters APPX.

Seq No provides an identifying number for the associated validation value. It is defaulted by APPX and can be overridden, but it must be unique within a table.. It determines the order in which validation values are presented, both for selection by the user and for editing in application design. APPX assigns the first validation value a number of *1*, with additional values assigned a number that is equal to the highest existing sequence number plus *1*. APPX does not require that sequence numbers be contiguous within a table.

Alpha Fields Additional Attributes

From the Alpha field overlay, you have an Additional Attributesoption. The Alpha field Additional Attributes overlay is shown below.



Alpha Field Additional Attributes Overlay

The Alpha Field Additional Attributes Overlay contains the following fields:

Default Value establishes a modifiable starting value for all image items whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Blanks Allowed indicates whether or not blanks are permitted and, if so, where they can be placed. The *Blanks Allowed* options are ***NONE, TRAILING,*** and ***ANYWHERE***.The default is *ANYWHERE*.

Alignment determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** The default is *NONE*.

Pad Character indicates the character to be used instead of leading and trailing spaces in a field.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

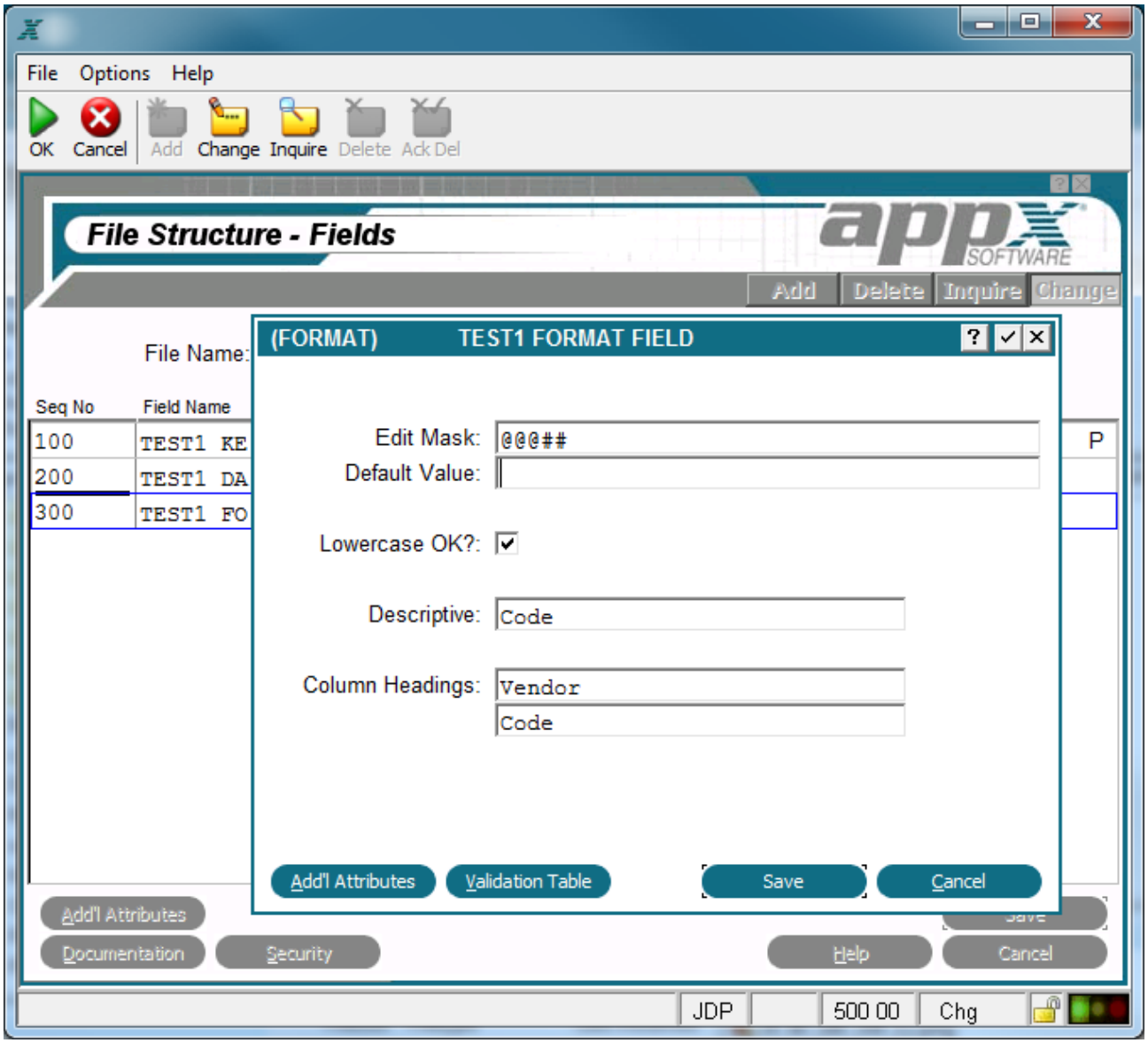
Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Require Table Value? indicates whether or not to require one of the validation table values to be entered. To force the user to enter one of the defined values, click the checkbox to toggle it to 'yes' ☑ (Y using Character Mode). If a 'no' ☐ (N using Character Mode) value is selected, the validation table shown when the user selects the list feature, is advisory only and the user can enter a value not listed in the table. If there is no validation table defined, this option does not apply and cannot be selected. If there is a validation table and *Translate?* is ☑, this option should also be ☑ (Y using Character Mode).

Format Fields

A format type field is like an alpha field except that its primary characteristic is an edit mask.

The Format Field overlay, shown below, displays after you complete the entries on the Fields specifications screen if the *Field Type* you select is *FORMAT*.



Format Field Overlay

The Format Field overlay contains the following fields:

Edit Mask establishes format requirements for data validation. A mask character representing the allowable values is entered for each position in a field. The mask characters are:

#(numbers only)

@(letters only)

&(numbers and letters only)

!(any characters)

*(use default value character) - The valid character for this position in a mask is defined by referencing the same position in the default value.

For example, you can mask a phone number field with the following entry: ###*###*####.

Default Value establishes a starting value for all referenced fields whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image. The positioning of constant characters in the default value must correspond to the positions of *s, if any,in the edit mask. For example, a possible default value for the phone number mask indicated in *Edit Mask* earlier is: _ _ _ - _ _ _ - _ _ _ _ (the underlines are blanks).

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement overrides a 'no' value in this field and displays as lowercase.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

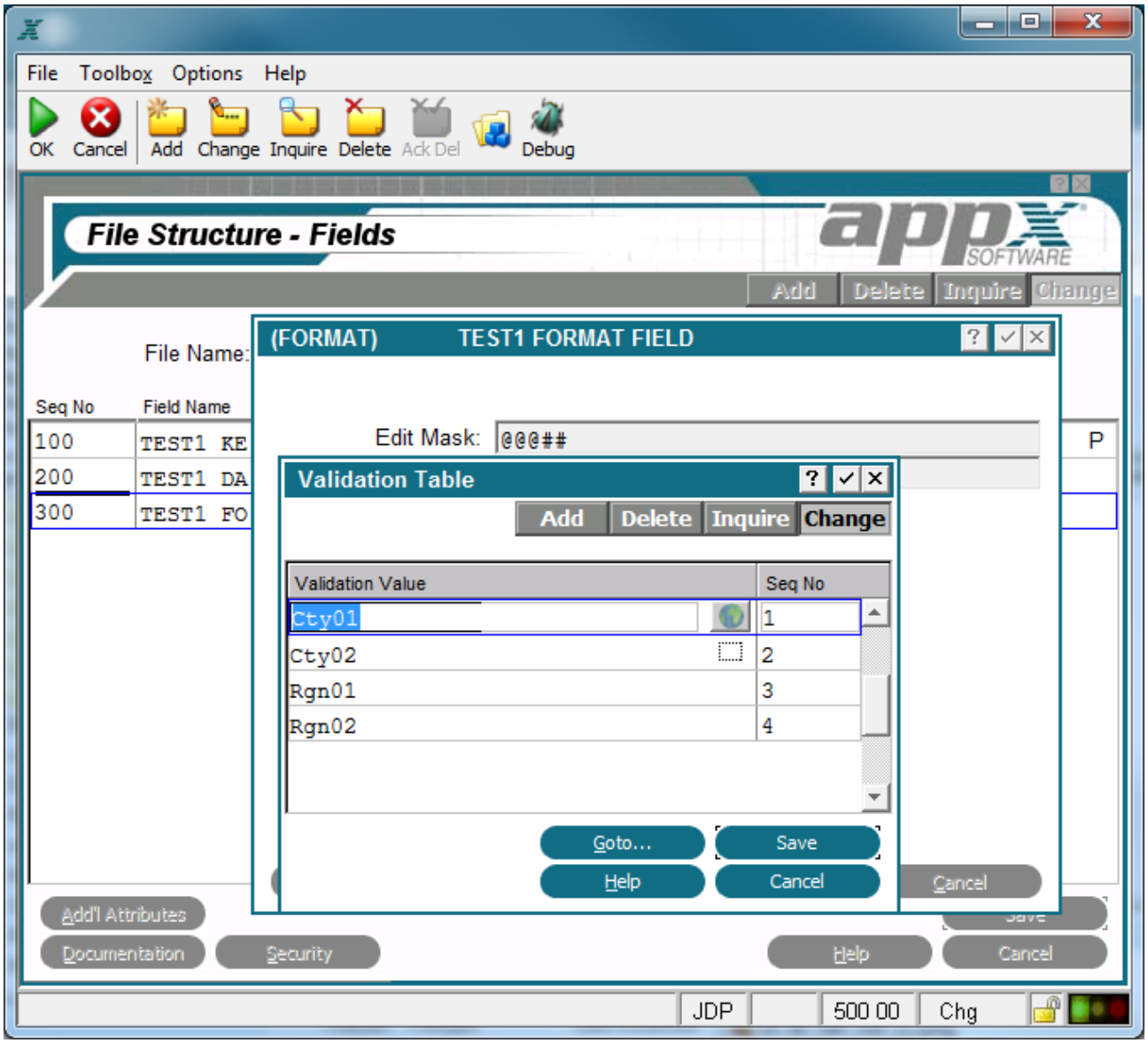
Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Additional Attributes.

Validation Table.

Format Fields Validation Table

The Validation Table option from the Format Fields overlay accesses the Validation Table overlay, shown below. A validation table provides a more powerful alternative to the use of range checks for data validation when there is a known set of values. Through the list ▼ feature, it provides the user with visibility of all the possible field values as well as the ability to select the desired value.



Format Fields Validation Table Overlay

You can establish a validation table for any Format field in the data dictionary. The entries in the table are case-sensitive. If you enter a validation value in all capital letters, an application user must enter the value in all capital letters.

Validation table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, validation does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application. All validation values are available for review and selection by the end user through the list ▼ feature.

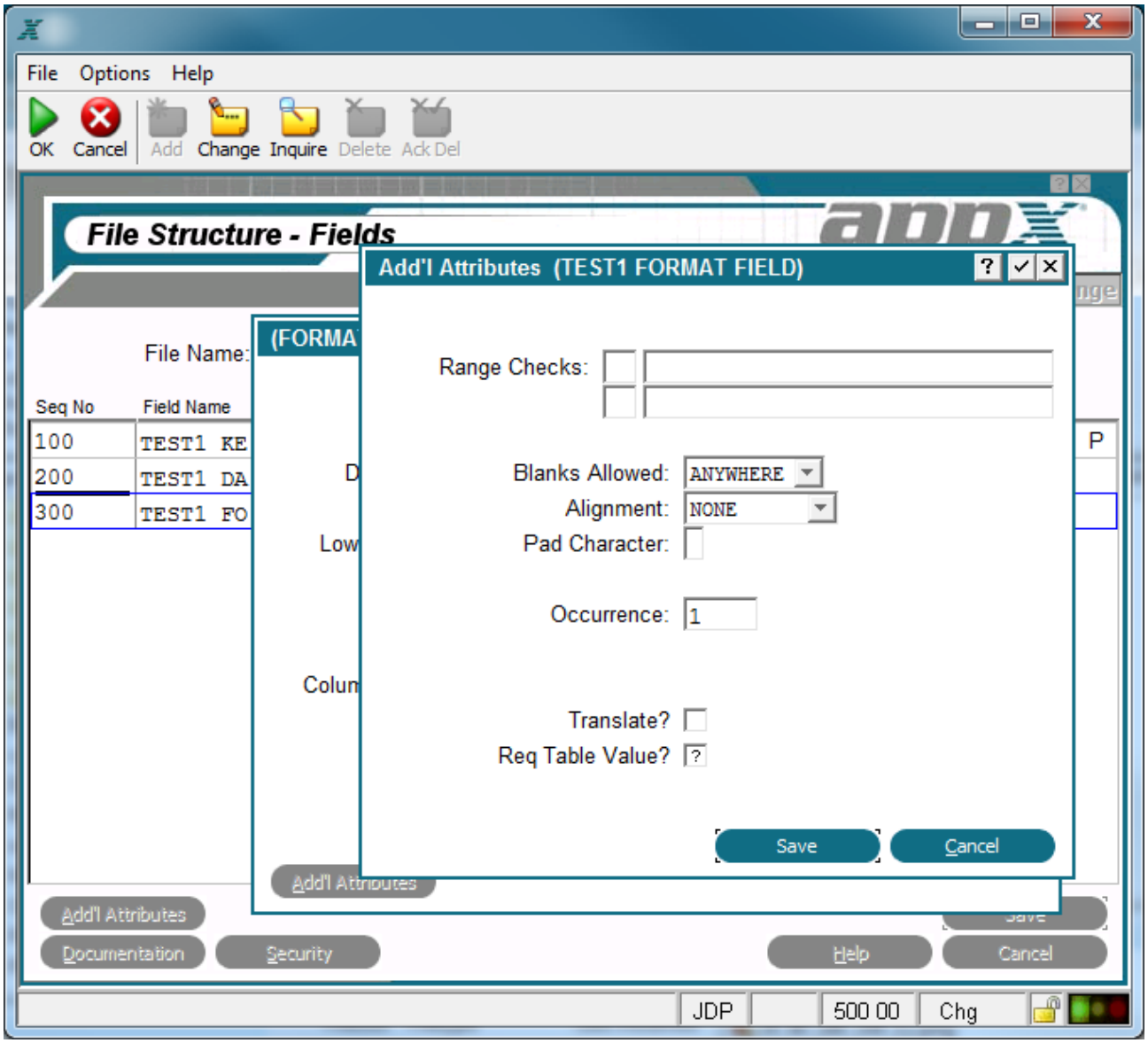
The Validation Table overlay contains the following fields:

Validation Value provides a valid field value. It is case-sensitive and is used for online review, selection, and validation. Note that validation values newly added to the data dictionary are not available to a current APPX user until the user exits and re-enters APPX.

Seq No provides an identifying number for the associated validation value. It is defaulted by APPX and can be overridden, but it must be unique within a table.. It determines the order in which validation values are presented, both for selection by the user and for editing in application design. APPX assigns the first validation value a number of *1*, with additional values assigned a number that is equal to the highest existing sequence number plus *1*. APPX does not require that sequence numbers be contiguous within a table.

Format Fields Additional Attributes

From the Format field overlay, you have an Additional Attributesoption. The Format field Additional Attributes overlay is shown below.



Format Field Additional Attributes Overlay

The Format Field Additional Attributes Overlay contains the following fields:

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are **EQ** (equal to), **NE** (not equal to), **GT** (greater than), **LT** (less than), **GE** (greater than or equal to), and **LE** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Blanks Allowed indicates whether or not blanks are permitted and, if so, where they can be placed. The Blanks Allowed options are ***NONE, TRAILING,*** and ***ANYWHERE*** (the default).

Alignment determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** The default is *NONE*.

Pad Character indicates the character to be used instead of leading and trailing spaces in a field.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

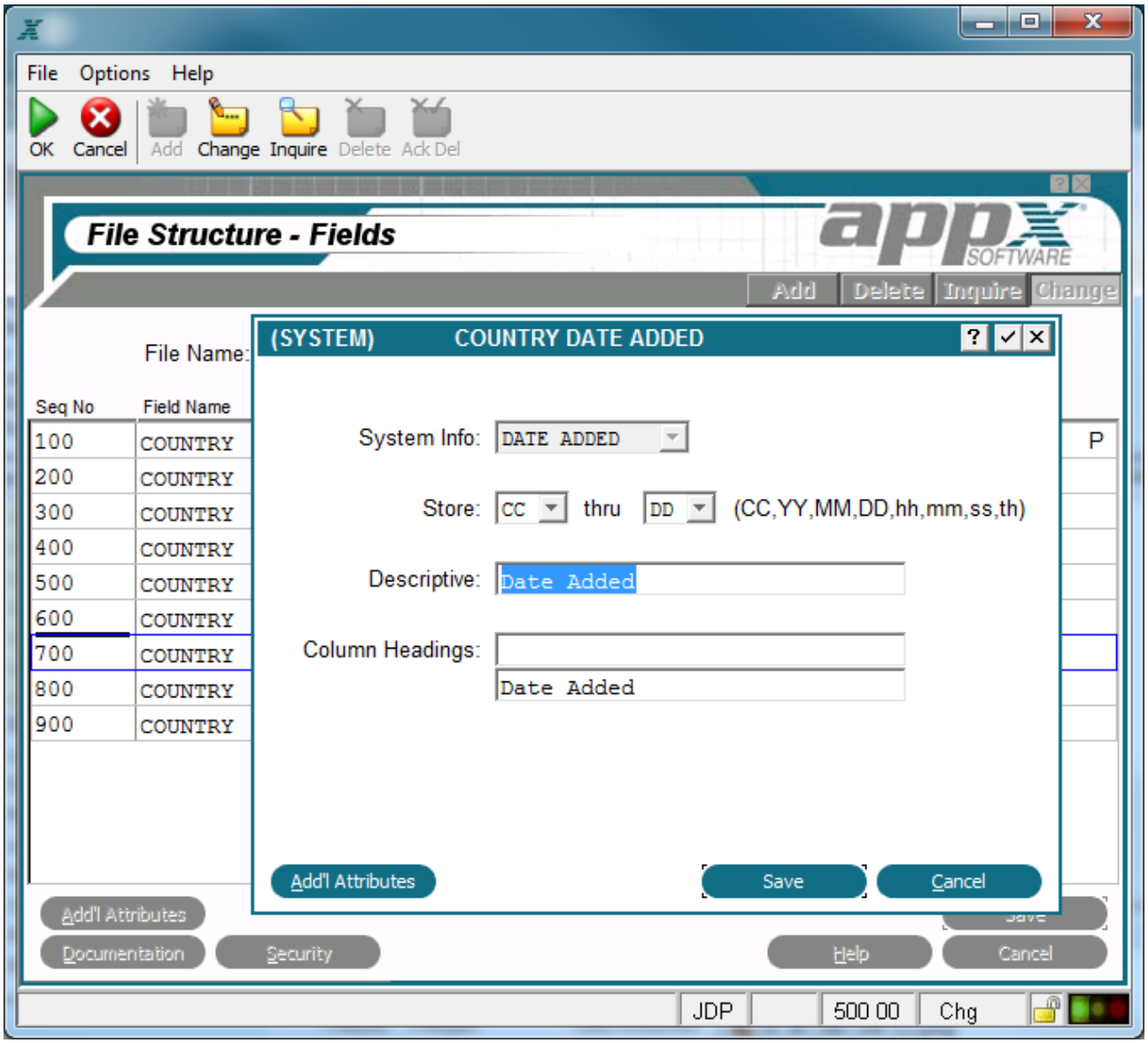
Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Require Table Value? indicates whether or not to require one of the validation table values to be entered. To force the user to enter one of the defined values, click the checkbox to toggle it to 'yes' ☑ (Y using Character Mode). If a 'no' ☐ (N using Character Mode) value is selected, the validation table shown when the user selects the list feature, is advisory only and the user can enter a value not listed in the table. If there is no validation table defined, this option does not apply and cannot be selected. If there is a validation table and *Translate?* is ☑, this option should also be ☑ (Y using Character Mode).

System Fields

A system field, often referred to as an audit field, displays data that is provided by the system.

The System Field overlay, shown below, allows you to add system specific attributes to those already defined for fields. The System Field overlay displays after you complete the entries on the Fields specifications screen if the *Field Type* you select is *SYSTEM*.



System Field Overlay

The System Field overlay contains the following fields:

System Info indicates the type of system field. Select from **DATE ADDED, DATE CHANGED, USER ADDED** and **USER CHANGED.** After selecting enter, the remaining fields are displayed.

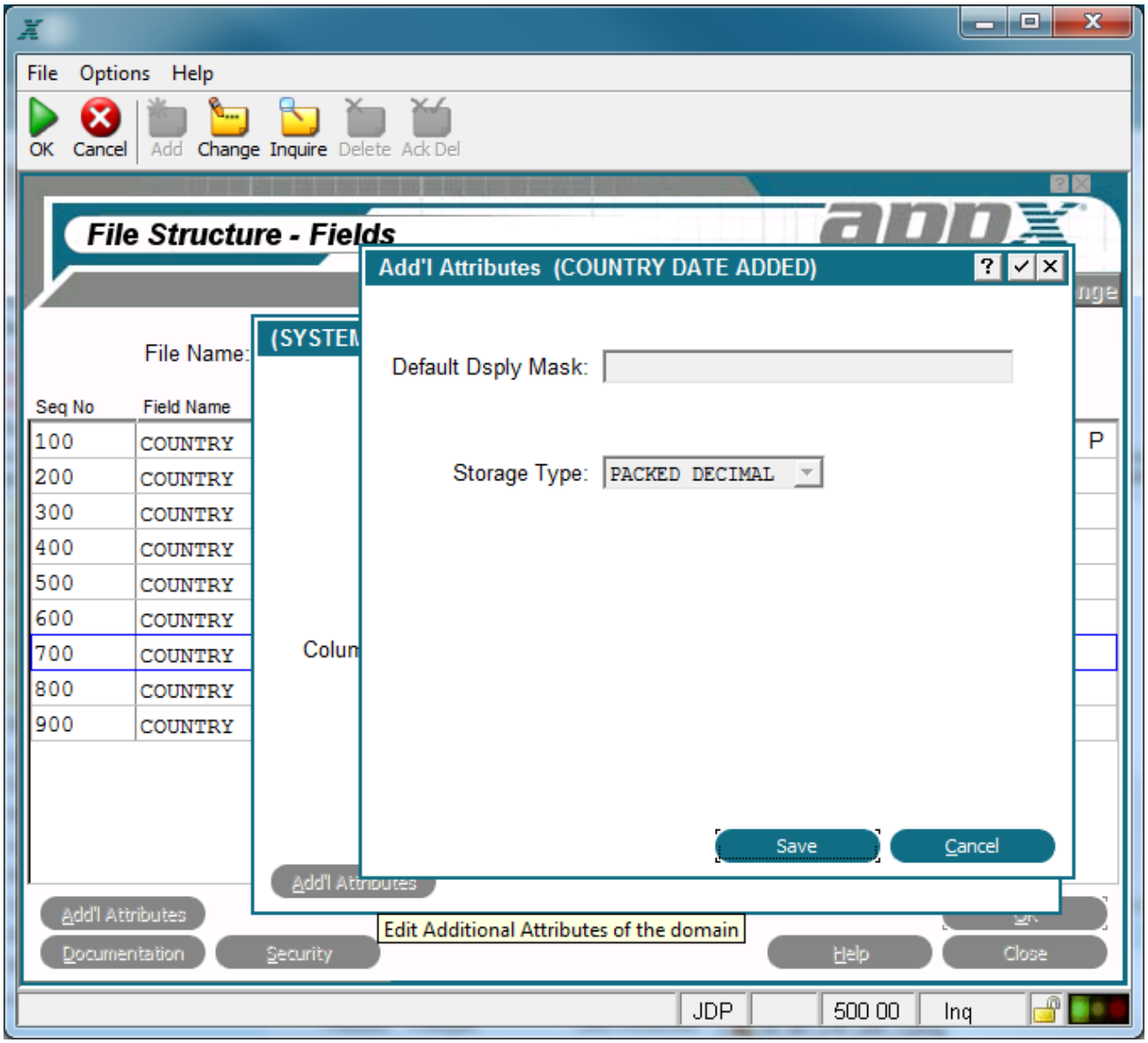
Store thru is displayed for system date fields only and indicates the upper and lower components of this date/time field.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

System Fields Additional Attributes

The System Fields Additional Attributes overlay.



Additional Attributes Overlay

Default Dsply Mask: Display Mask for a date/time item determines which parts included in the data dictionary Store/thru specification (month, year, or hour, for example) display on an image. This entry can include more or less parts than the data dictionary, and can be presented in a different order. If more parts are included, those parts that are not present in the data dictionary are discarded from the mask before presentation to a user. Each position in a mask may contain a part placeholder, a pad character, a special character, text, or a separator character. Refer to the chapter of the Designer Reference manual for a complete explanation of various types of Date display masks.

Storage Type determines the internal storage format of the data.

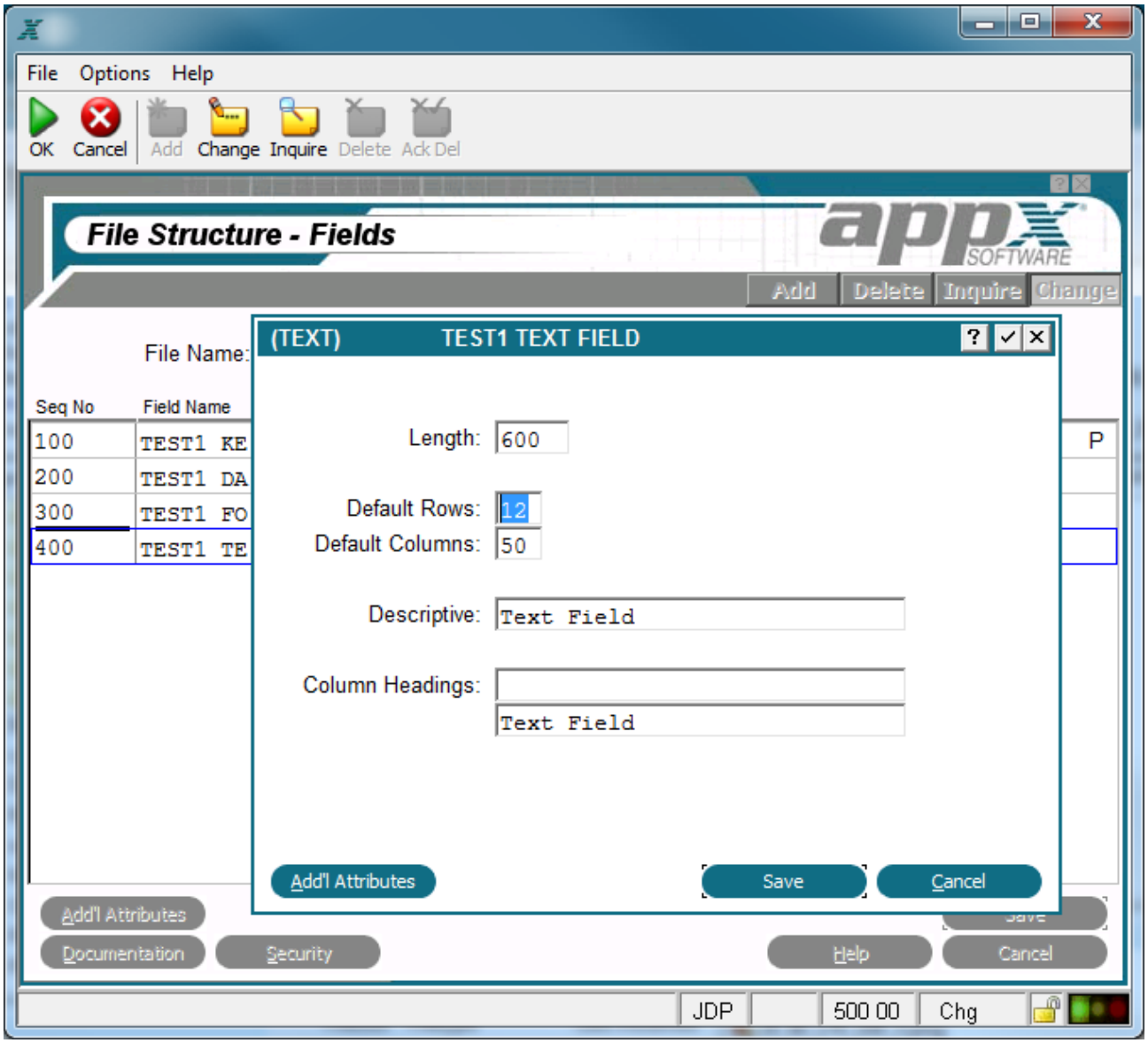
The Storage Type options are:

BINARY -- the date is stored in binary format.
PACKED DECIMAL -- the date is stored two decimal digits per byte.
ALPHANUMERIC -- the date is stored in its external representation.

Text Fields

A text field allows a user to enter a block of text on the data entry screen.

The text field overlay, shown below, allows you to add text specific attributes to those already defined for fields. The text field specifications overlay displays after you complete the entries on the fields screen if the *Field Type* you select is *TEXT*.



Text Field Overlay

Length designates the number of character positions, or length, of this field.

Default Rows/Cols determines the default number of rows and columns to be used when specifying a field on an image.

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used.

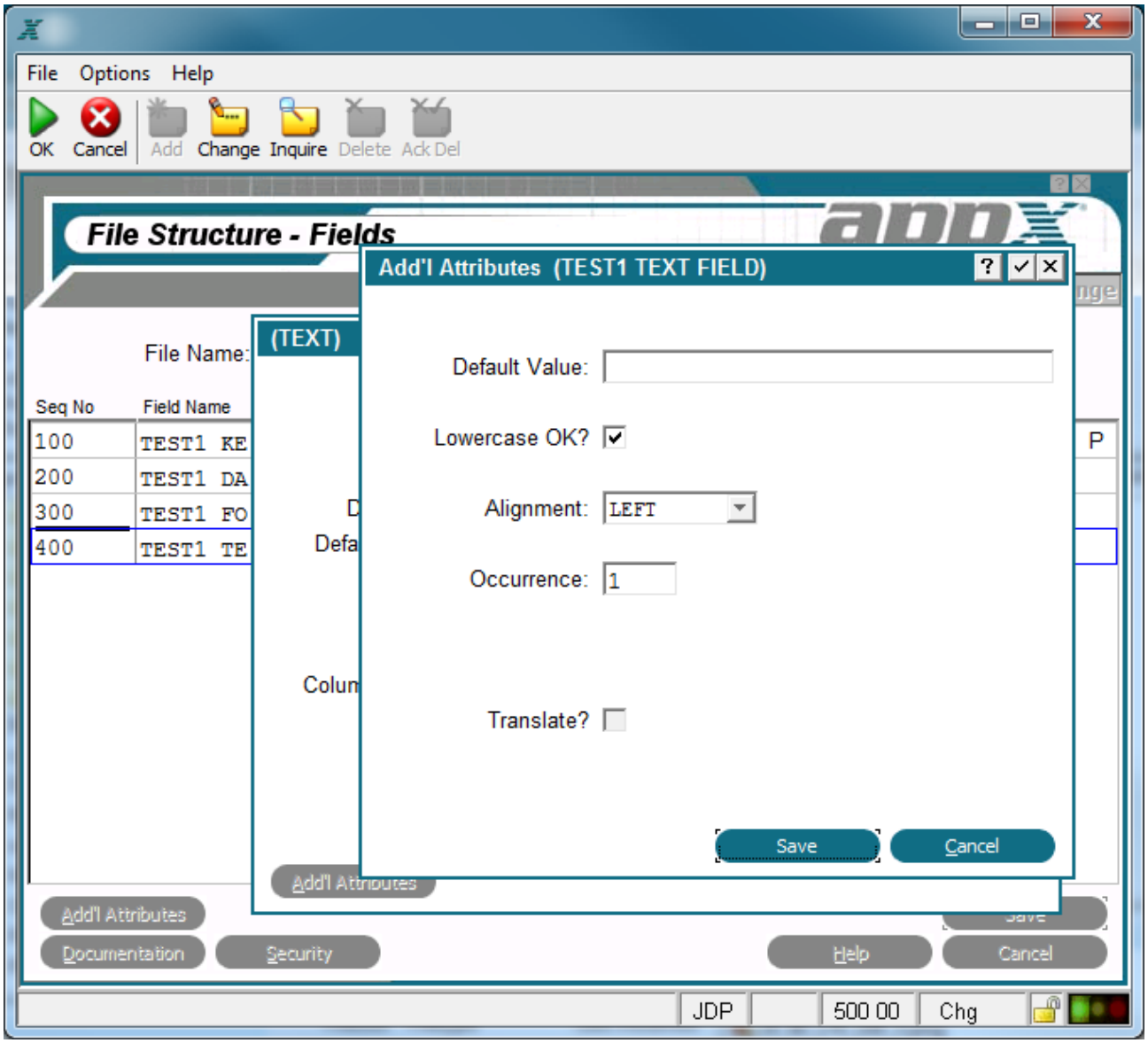
Col Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a domain itself. Refer to Standard Column Heading Image for additional information.

For Text field type, the following option is available as described in the corresponding section:

Additional Attributes

Text Fields Additional Attributes

From the Text field overlay, you have an Additional Attributesoption. The Text field Additional Attributes overlay is shown below.



Text Field Additional Attributes Overlay

The Text Field Additional Attributes Overlay contains the following fields:

Default Value indicates the value that should be placed into this field when adding new records to a file. This value can be changed by the user, if desired.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries. The default is 'yes' ☑.

Alignment determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** The default is *NONE*.

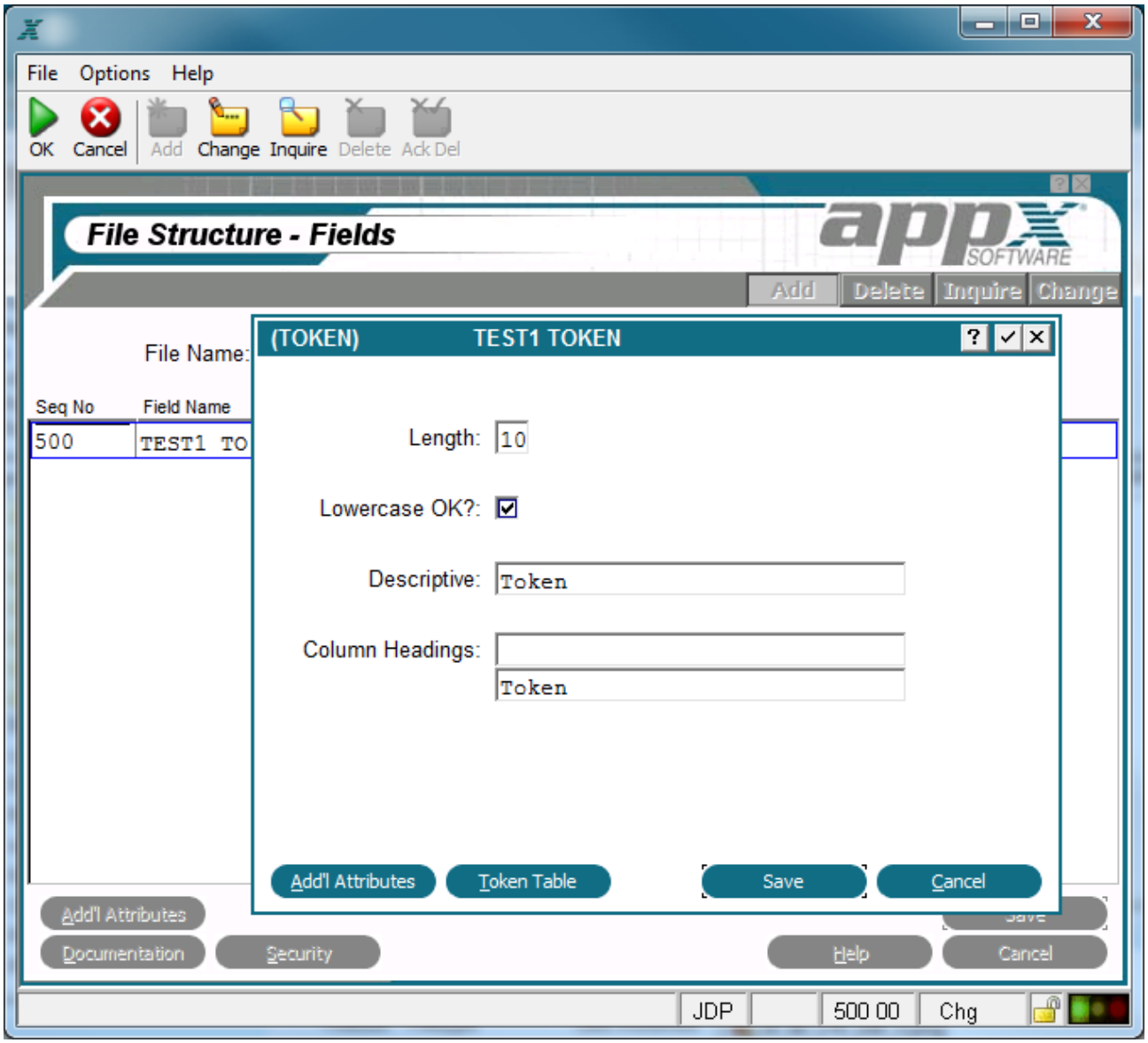
Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Translate? normally indicates if the value of the field should be translated into a designated language if APPX's Language Translation feature is being used. However, this option is not available for a text file field (unlike a text work field) and cannot be selected.

Token Fields

A token field is like an alpha field but it has specific values that are stored as corresponding numbers.

The token field overlay, shown below, allows you to add token specific attributes to those already defined for fields. The token fields specification overlay displays after you complete the entries on the fields screen if the *Field Type* you select is *TOKEN*.



Token Field Overlay

The Token Field Specifications overlay contains the following fields:

Length designates the number of character positions, or length, of this field.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

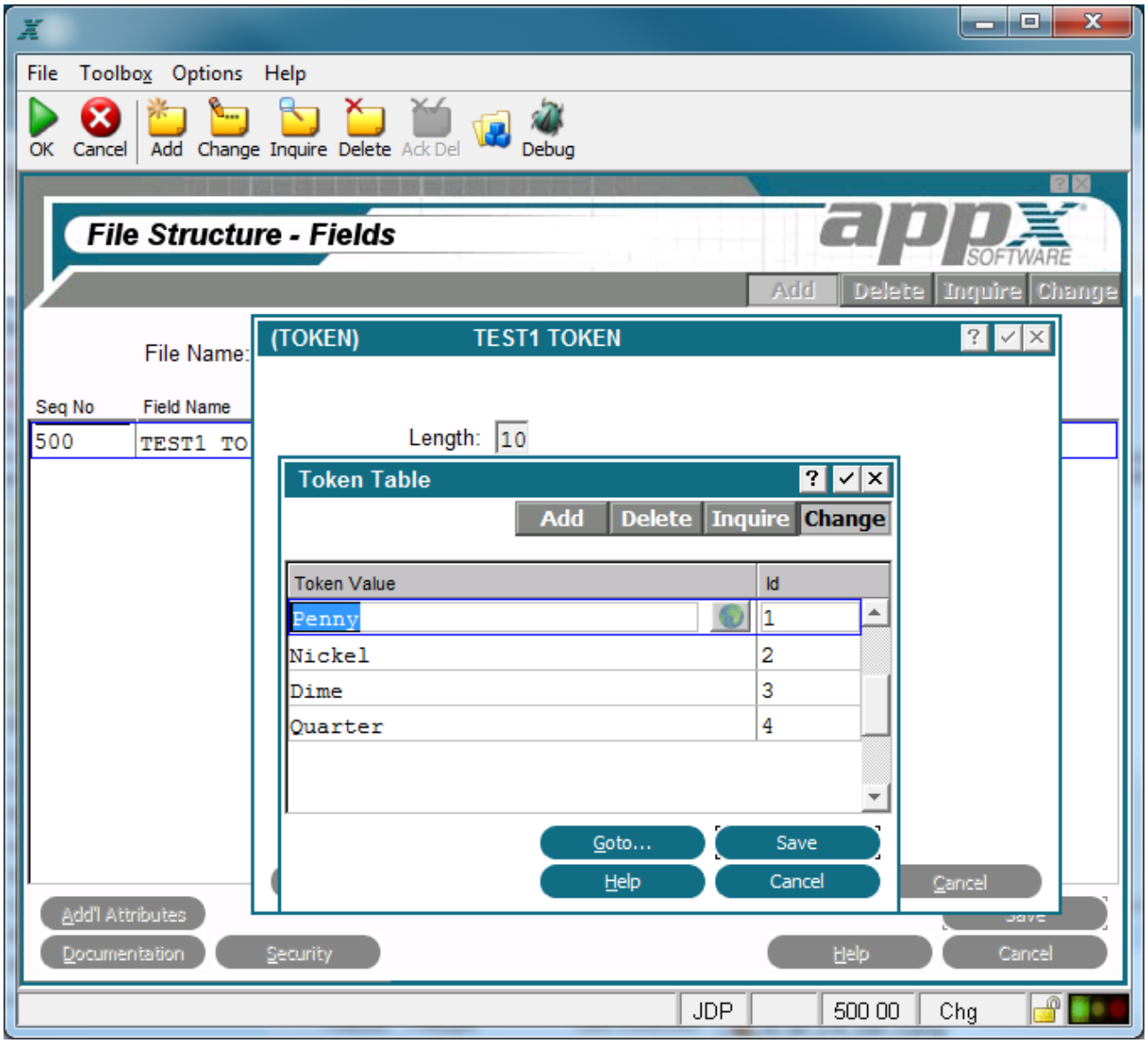
For Token field type, the following options are available as described in the corresponding sections:

Additional Attributes

Token Table

Token Fields Token Table

token table accesses the Token Table overlay, shown below. A token table provides an alternative to the use of range checks for data token.



Token Fields Token Table Overlay

You can establish a token table for any Token field in the data dictionary. The entries in the table are case-sensitive. If you enter a token value in all capital letters, an application user must enter the value in all capital letters.

Token table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, token does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application.

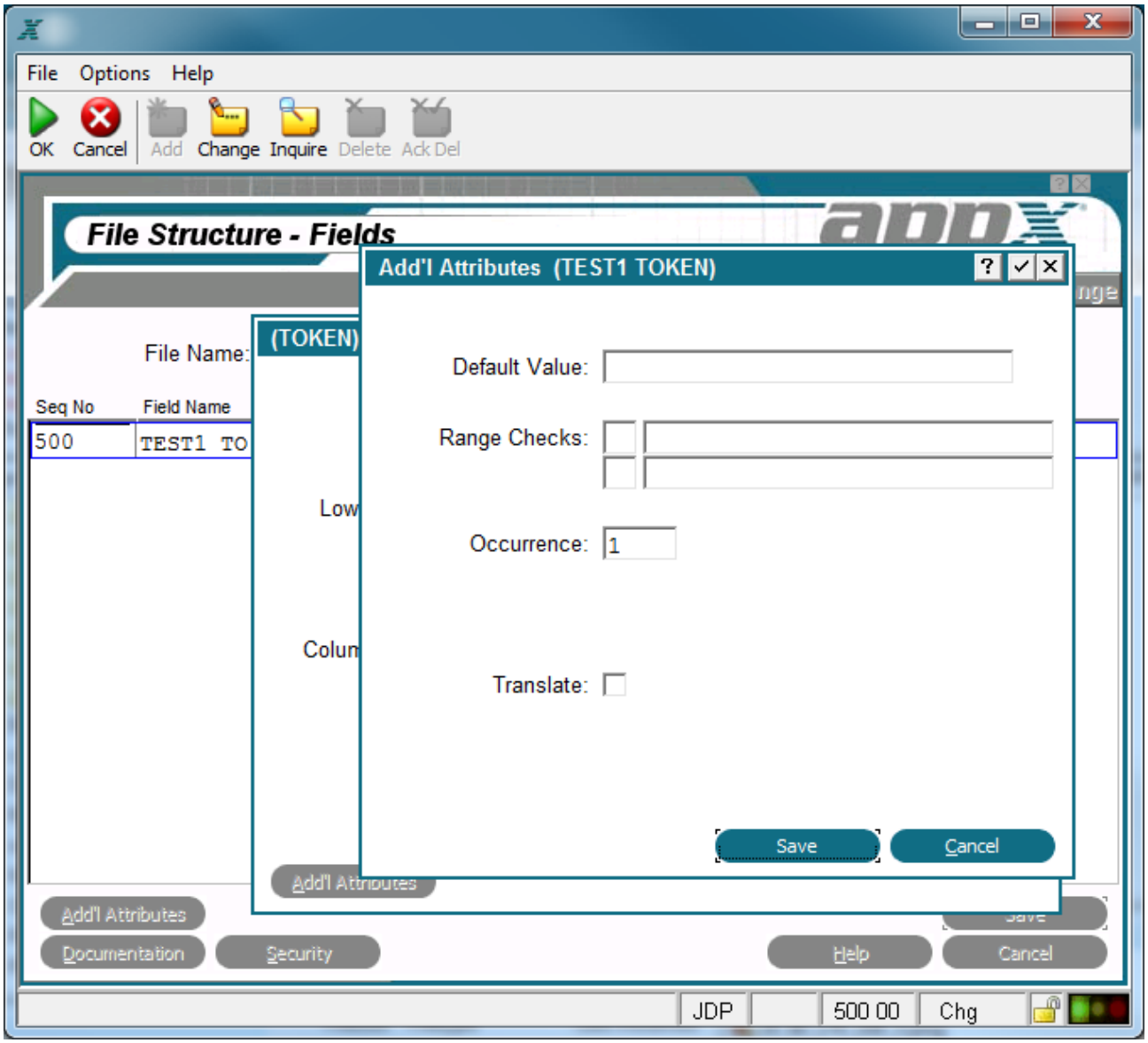
The Token Table overlay contains the following fields:

Token Value is the alphanumeric value associated with the token ID. APPX automatically translates between token values and ID's whenever necessary. This entry is case-sensitive. If entered in capital letters, an application user must also enter the value in capital letters.

ID displays a unique number that is defaulted by APPX. This specification establishes the binary value that APPX stores in place of the associated token value. APPXassigns the first token value an ID of *1*, with additional values assigned an ID that is equal to the highest existing ID plus *1*. The default can be overridden, but must be unique within a table. APPX does not require that ID's be contiguous within a table.

Token Fields Additional Attributes

From the Token field overlay, you have an Additional Attributes option. The Token field Additional Attributes overlay is shown below.



Token Field Additional Attributes Overlay

The Token Field Additional Attributes Overlay contains the following fields:

Default Value establishes a modifiable starting value for all image items whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

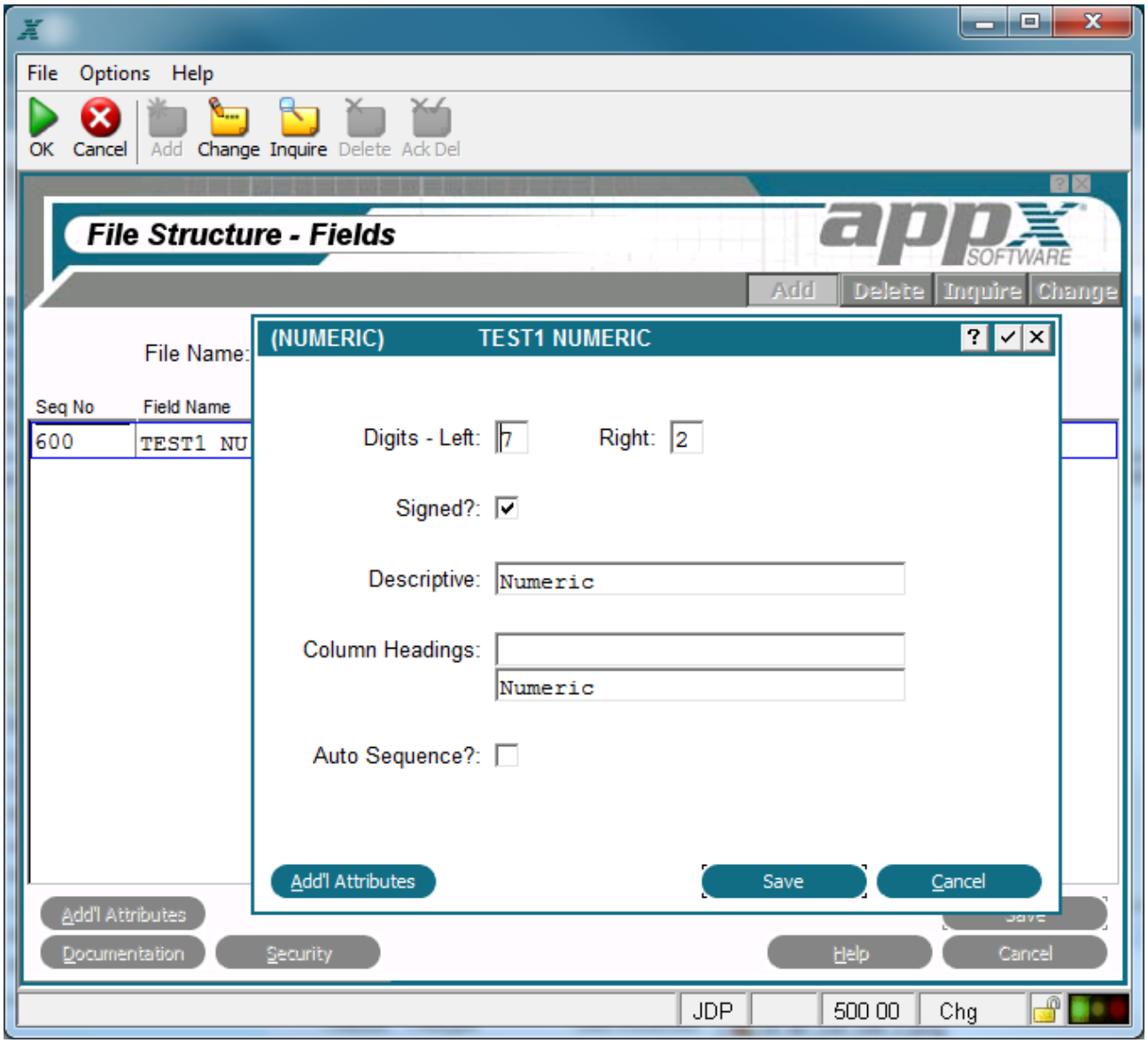
Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Translate? indicates if the value of the field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Numeric Fields

A *numeric* field is restricted to number, decimal, and sign (-) entries. Examples include amounts, prices, and quantities.

The Numeric fields overlay, shown below, permits you to add numeric-specific attributes to those already defined for the field. It automatically displays after you complete the entries on the Fields specifications screen if the *Field Type* youselect is *NUMERIC*.



Numeric Fields Overlay

The Numeric fields overlay contains the following fields:

Digits Left. Enter the number of digits to the left of the decimal.

Digits Right. Enter the number of digits to the right of the decimal.

Signed? specifies whether the numbers entered in this field are positive or negative. 'No' ☐ would ensure that only positive numbers are entered. The default is 'no' ☐ if no digits have been defined to the right of the decimal, 'yes' ☑ if digits have been defined to the right of the decimal. Click the checkbox to toggle between 'yes' and 'no'.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

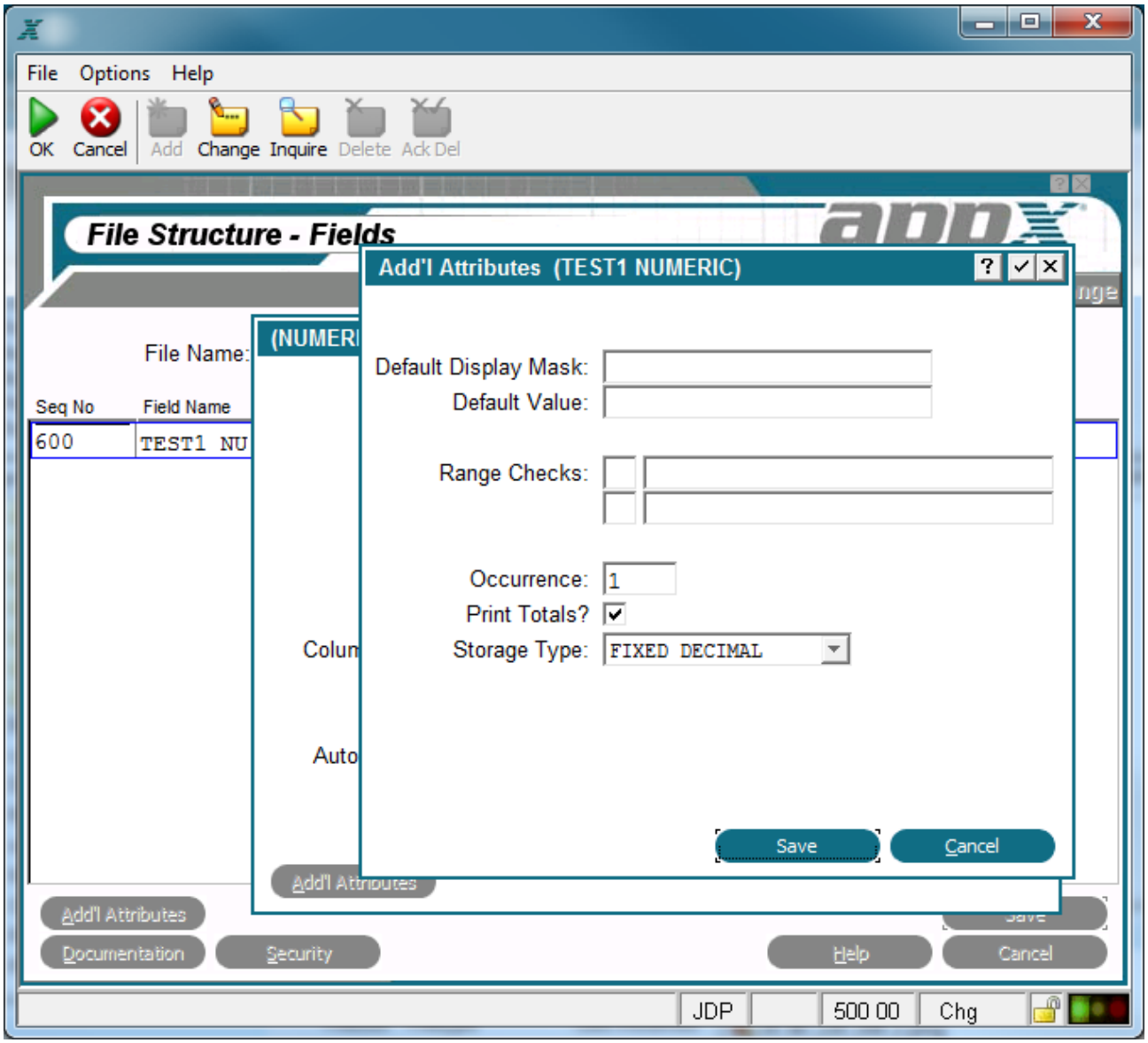
Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Auto Seq? Select 'yes' ☑ if this numeric field represents a sequence number with a value that should be maintained by APPX. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐. Note that *Auto Seq?* only appears if the numeric field has no decimal places and is only maintained in Input process while in Add mode. Writing new records in a Subroutine will not increment the value.

Additional Attributes

Numeric Fields Additional Attributes

From the Numeric fields overlay, you can access the Additional Attributes option, shown below.



Numeric Fields Additional Attributes Overlay

The numeric fields Additional Attributes overlay contains the following fields:

Dflt Display Msk designates the format that the data displays to a user in an APPX image. This entry establishes the *Display Mask* default for all image items that reference the numeric field. If blank, APPX uses a display of nonfixed leading spaces with one significant digit. Refer to the *Numeric Domains* section for additional information about this entry.

Default Value establishes a starting value for all image items whenever they first display in add mode in an input image, unless modified by a user. If blank, the starting value is assumed to be the null value.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Print Totals? Select 'yes' ☑ to indicate that this field should be automatically totaled on reports. This field is used as a default for the auto-total specification in output and inquiry process definition. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Storage Type determines the internal storage format for data. The *Storage Type* options are:

BINARY ? The number is stored in binary form. The high order bit determines the sign: on or *1* for positive, and off or *0* for negative. The decimal position is established by the *Decimals ? Left/Right* entries. The maximum field length is 10 digits for non-decimal numbers or 9 digits for decimal numbers.

FIXED DECIMAL employs a packed decimal format that stores two decimal digits for each byte with the exception of the last bit, which is the sign bit. The decimal position is established by the *Decimals ? Left/Right* entries. The maximum field length is 31 digits.

FLOATING DECIMAL employs a combination of binary and packed decimal formats that always requires a total of nine bytes of storage. Although the field definition allows for 15 digits to the left of the decimal point plus 15 digits to the right of the decimal point, only the first 15 digits of the actual number are stored. These 15 digits are stored as packed decimal with two decimal digits for each byte (for a total storage requirement of eight bytes). The final byte (binary) determines the maximum number of digits that currently appears to the right of the decimal.

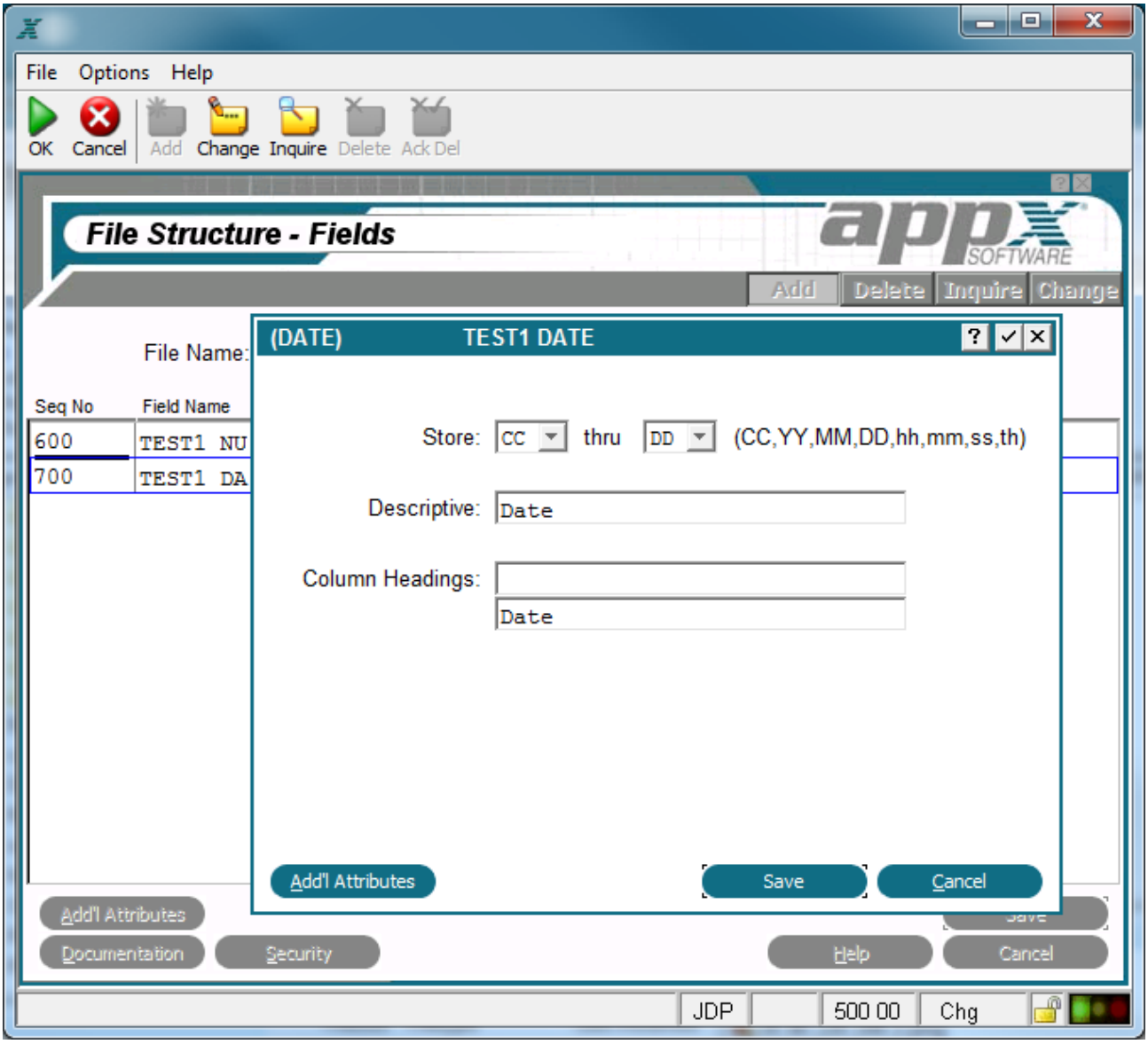
The default is *FIXED DECIMAL*. For a comprehensive discussion of these options, see Numeric Storage Types.

Date Fields

A date field contains date and/or time information. This information may, at your option, range from a century through a hundredth of a second. A field definition may also include separator characters (such as */*, -, or *:*) and text, including the day of the week and the name of the month.

Examples of date/time fields include invoice dates, order dates, elapsed time data, date/time stamps used to uniquely identify records, and audit trail fields such as date-added and date-changed.

The Date fields overlay, shown below, permits you to add date/time-specific attributes to those already defined for the field. It automatically displays after you complete the entries in the Fields specifications screen if the *Type* you select is *DATE*.



Date Fields Overlay

The Date fields overlay contains the following fields:

Store thru designates the parts of a date that are physically stored.Valid entries can be selected from a list by clicking the list button to the right of the field. Valid entries are:

CC	(Century)
YY	(Year)
MM	(Month)

DD	(Day)
hh	(Hour)
mm	(Minute)
ss	(Second)
th	(Tick (hundredth of a second))

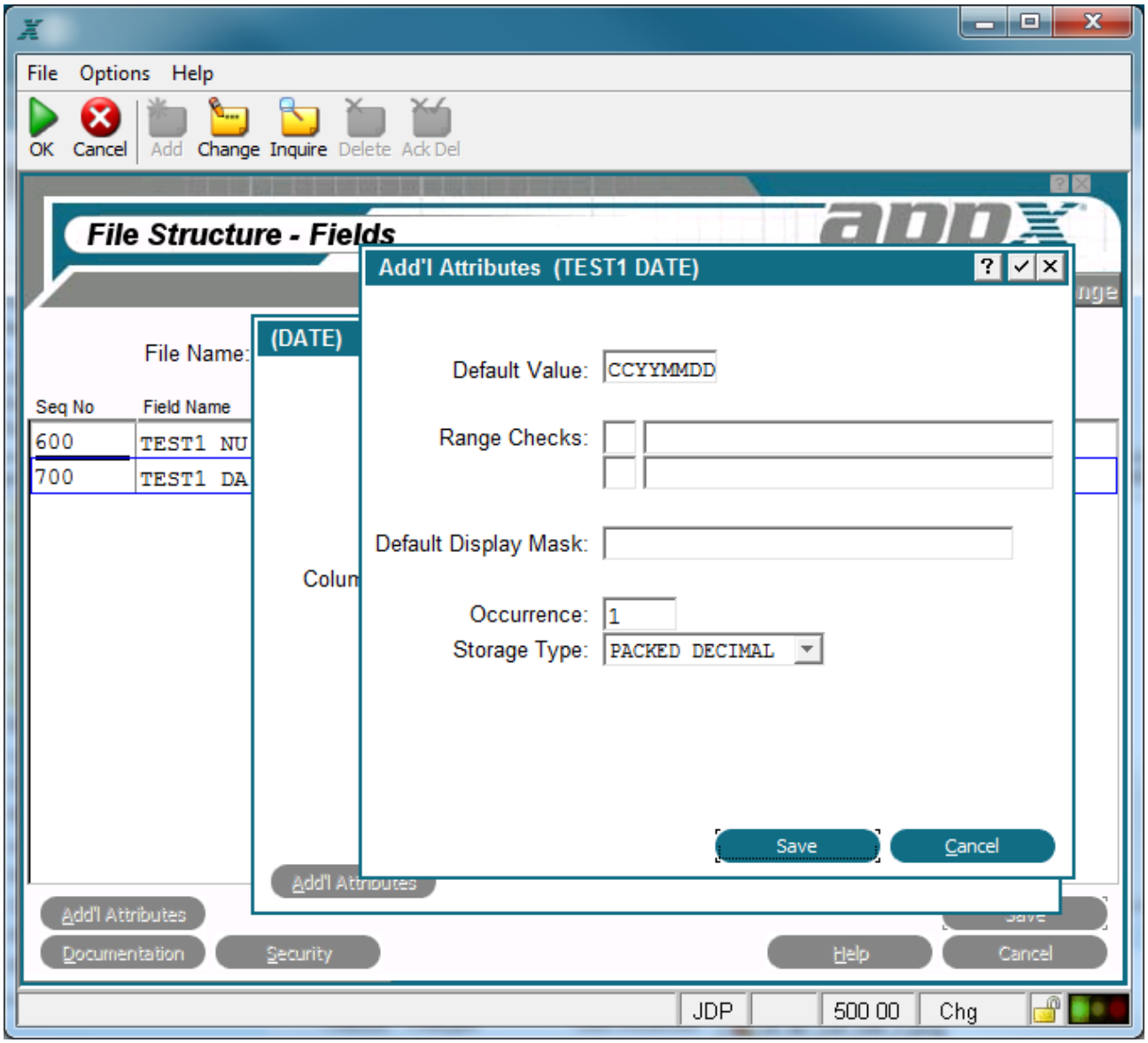
Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Additional Attributes

Date Fields Additional Attributes

You can access the Additional Attributes option, shown below, from the Date fields overlay.



Date Fields Additional Attributes Overlay

The date fields Additional Attributes overlay contains the following fields:

Default Value establishes a starting value for image items whenever they are first displayed in add mode on an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Default Display Mask controls how this field appears to a user on an APPX image, unless overridden at the image item level. If left blank, the date mask specified for the application (in Application File Maintenance in System Administration) is used or, if that is also blank, the date mask specified in System Parameters is used. Refer to the Display Mask (Date/Time)section in Using the Character Based Image Editor for additional information about this entry.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Storage Type determines the internal storage format of the date field. The *Storage Type* options are:

BINARY The date is stored in binary format.

PACKED DECIMAL stores two decimal digits for each byte.

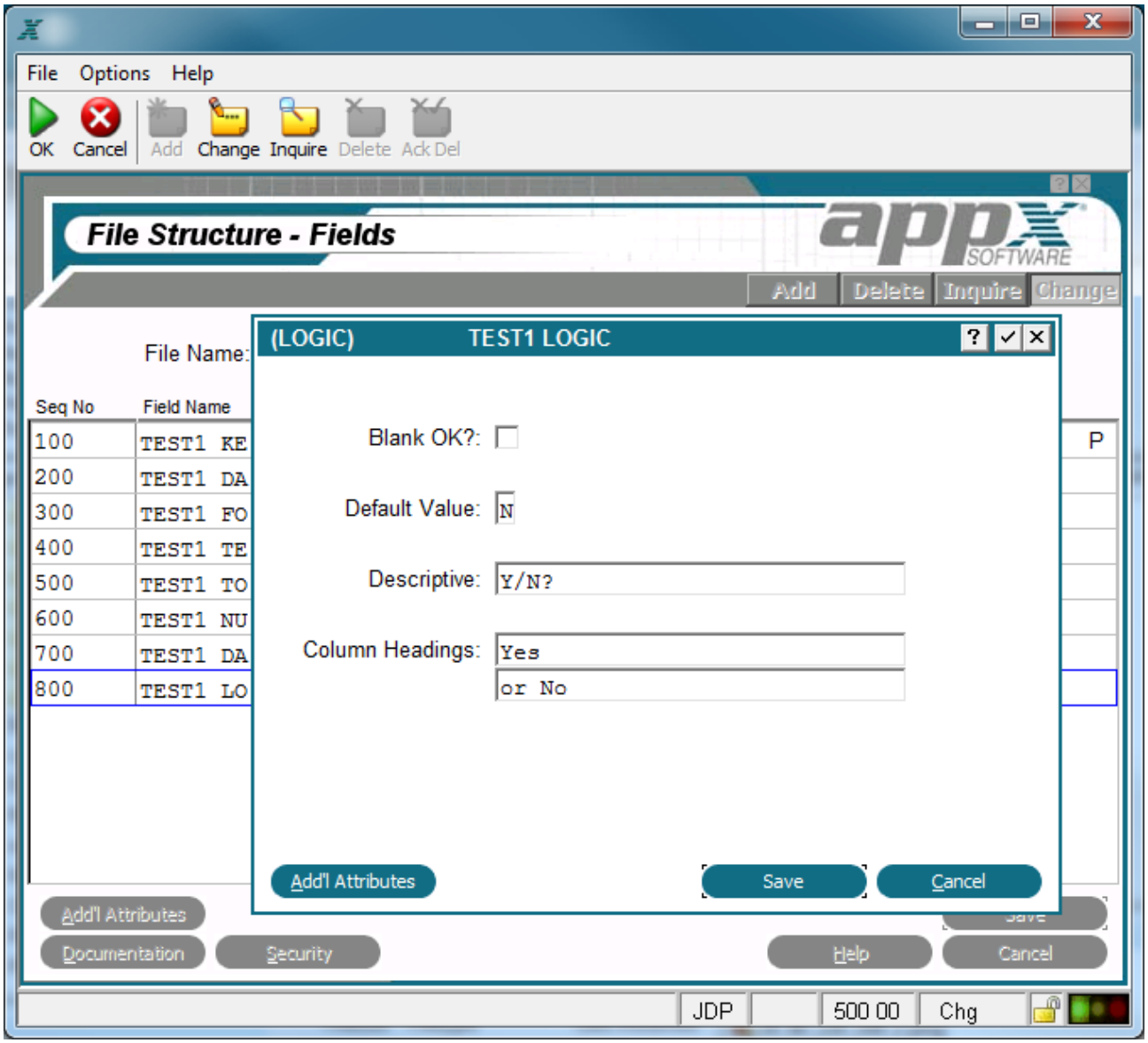
ALPHA stores the external representation of data.

The default is *PACKED DECIMAL.*

Logic Fields

A *logic* field is a checkbox with possible values of 'yes' ☑, 'no' ☐, or "unknown" ? (Y, N or blank using Character Mode). Examples include various application parameters such as whether or not to post transactions on an accrual basis, and control fields that govern the execution of subroutines based upon an *exists/does not exist* condition.

The Logic fields overlay, shown below, permits you to add logic-specific attributes to those already defined for the field. It automatically displays after you complete the entries on the Fields specifications screen if the *Field Type* you select is *LOGIC.*



Logic Fields Overlay

The Logic fields overlay contains the following attributes:

Blank OK? indicates, for information only, whether a user should be permitted to leave a field referencing this domain blank on an input image. (Whether or not such a field can actually be left blank is controlled by the image item specification 'Required?'.) The default is 'no' ☐ (N using Character Mode). Click the checkbox to toggle between 'yes' ☑ (Y using Character Mode) and 'no' ☐ (N using Character Mode) values.

Default Value establishes a starting value for image items whenever they first display in add mode on an input image, unless modified by a user. The *Default Value* options are blank (for unknown), Y or N.

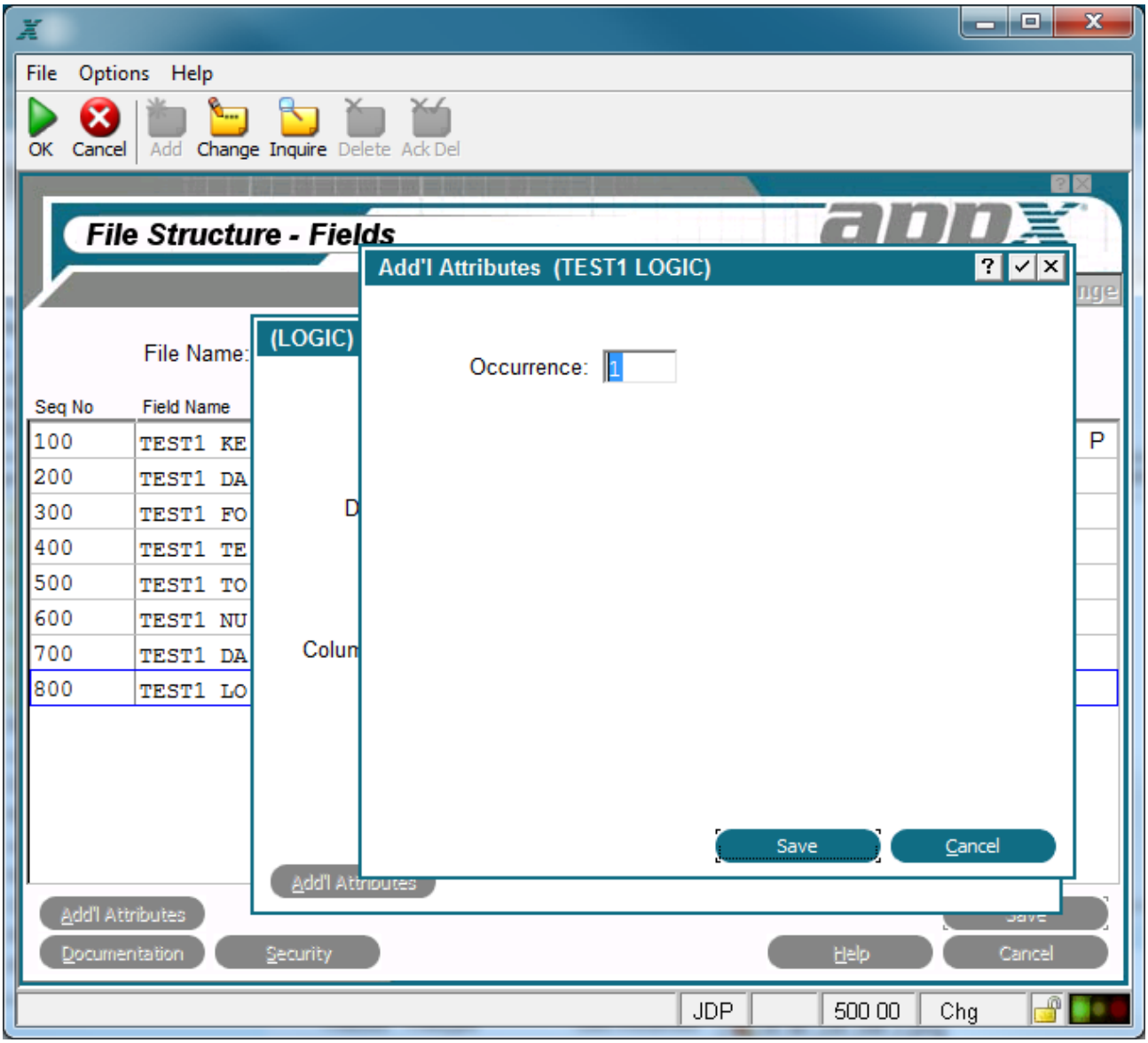
Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

The Logic fields overlay offers one option described in the following section: Additional Attributes.

Logic Fields Additional Attributes

You can access the Additional Attributes overlay, shown below, from the Logic fields overlay.



Logic Fields Additional Attributes Overlay

The logic field Additional Attributes overlay contains the following field:

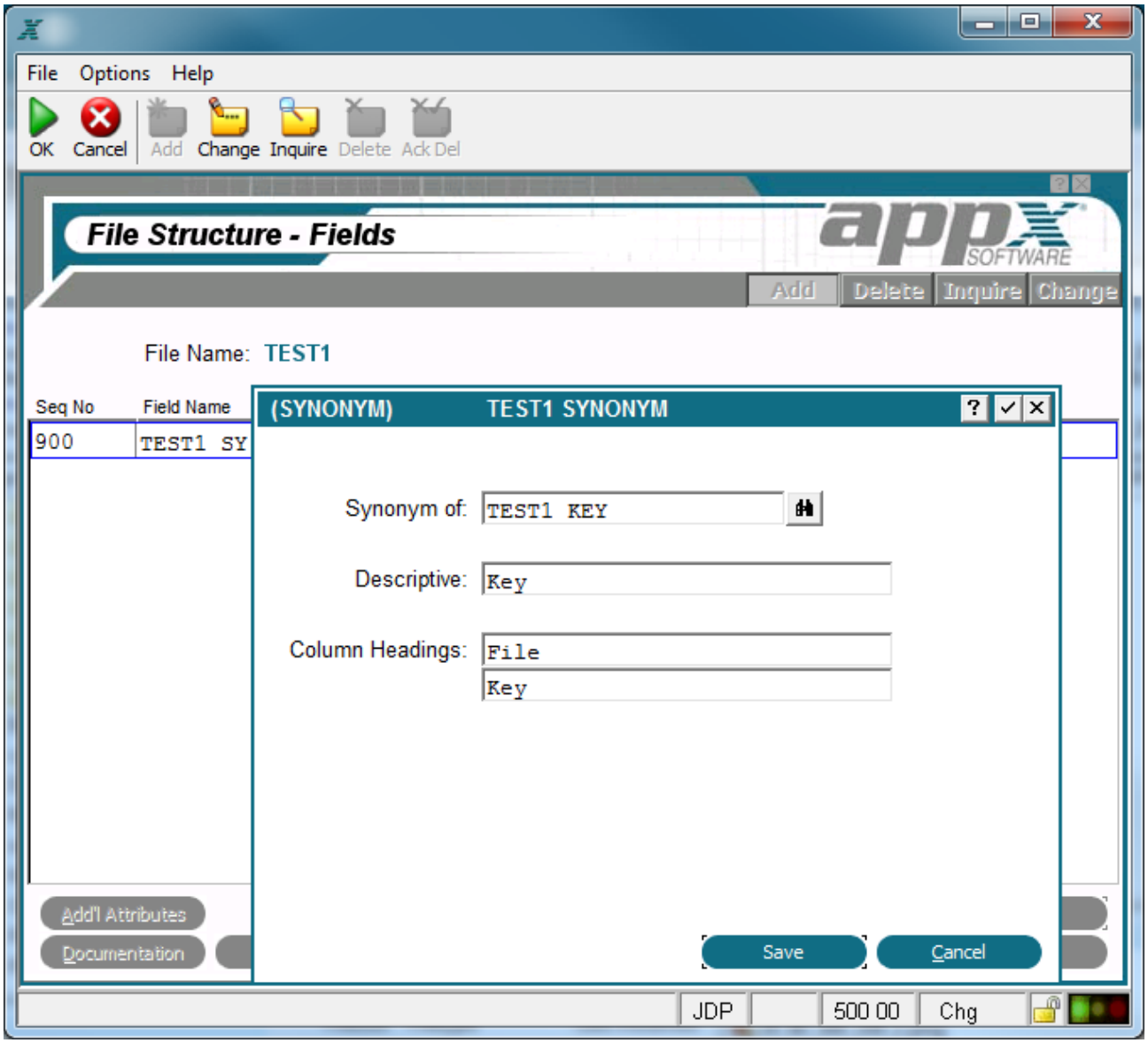
Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Synonym Fields

A synonym field provides an alternative name for referencing an existing APPX field in the same record. By using synonym fields, you can reference the same data under more than one field name, and with more than one field sequence number.

You can only establish synonyms for physical fields. Synonyms cannot reference substrings, group headers, or group trailers. The sequence number of a synonym field must be greater than the sequence number of the field it references. In addition, a field that is referenced by a synonym field must be a single-occurrence field in the same record.

The Synonym specifications overlay, shown below, automatically displays after you complete the entries on the Fields specifications screen if the *Field Typ*e you select is *SYNONYM*.



Synonym Fields Overlay

The Synonym fields overlay contains the following fields:

Synonym of identifies the physical field that is referenced by the synonym. The referenced field cannot be a substring, group trailer, group header, or another synonym field, and is limited to a single occurrence. The sequence number for this field must be smaller than the sequence number that is assigned to the synonym.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Special Uses for Synonym Fields

Because synonym fields permit you to access data in physical fields with alternative field names and sequence numbers, they provide additional capabilities. These capabilities include such things as resequencing key numbers to match those assigned by non-APPX databases, creating noncontiguous or overlapping group fields, and providing an alternative key order for online data retrieval.

Resequencing key numbers

The APPX dictionary permits you to establish one primary key and up to 16 alternate keys to a file. APPX automatically assigns key number *0* to a primary key when the data dictionary is processed. Alternate keys are assigned key numbers based upon their position in a record (their sequence number). The alternate key field with the lowest sequence number is key number *1*, the alternate key field with the next lowest sequence number is key number *2*, and so on. You cannot change the assigned key numbers. If you subsequently modify the sequence numbers of key fields, the assigned key numbers are not changed.

If an APPX data dictionary is created for an application that was developed in another third or fourth generation language, the APPX-assigned key numbers may not match the key numbers that were assigned during development. Synonym fields can be used to resequence key number assignments, forcing a match between APPX's key numbers and the key numbers that were assigned by the development software.

Creating noncontiguous groups

A group field in APPX must be comprised of fields with contiguous sequence numbers. You cannot include a field with a noncontiguous sequence number in a group field.

If for any reason you cannot change the sequence number of a noncontiguous field to satisfy this requirement, you can use a synonym field. Simply define a synonym for the noncontiguous field, and assign the synonym a sequence number that falls between the sequence number of the group header field and group trailer field. The synonym automatically becomes part of the group.

A synonym field occupies the same physical space and accesses the same data as the (noncontiguous) field it references. A synonym?s sequence number, however, is contiguous with that of other fields in the group, satisfying the group requirement.

Creating overlapping group fields

A group field cannot incorporate a field that is part of another group unless it incorporates all fields from the other group. In other words, groups can be nested but they cannot overlap.

You can circumvent this restriction by defining a synonym for a field that participates in more than one group. For example, suppose you create group A, which includes a customer number and an invoice number field. You wish to define group B, which also includes the customer number. You must first define a synonym of the customer number, and include the synonym field in group B.

A synonym field occupies the same physical space and accesses the same data as the field it references. However, because APPX considers the synonym to be a separate field, group A and group B do not share a common field and are therefore not considered as overlapping.

Providing an alternative key order for online retrieval

Many times, a group is designated as a key, solely to establish an order or sequence for online data retrieval. Under some circumstances, however, it may be necessary to provide for online retrieval of the same information by the same fields, but in different orders. (Remember that the retrieval order is deermined by the relative sequence numbers of fields within a group, and the ascending/descending specifications for those fields.)

Take, for example, a history file that contains a customer number and an annual activity amount for each customer. In one instance, you may wish to retrieve records based on customer activity, sequenced in descending order, from highest-volume customer to lowest. In another, you may wish to reverse the sequence. To provide for online retrieval in both an ascending and descending sequence, you need a synonym field.

Now, assume your application includes a Products by Customer file that identifies the range of products each customer is authorized to purchase. In one instance, you are required to retrieve, in product number order, all the products a specific customer is authorized to buy. Such an operation requires a group field key consisting of customer number and product number, in that order. In another instance, your user needs to retrieve all the customers who are authorized to buy a specific product. This operation requires a group field key consisting of product number and customer number, in that order. To establish this second key, incorporating the same fields as the first key but in a different sequence, you must first create synonyms of the customer number and product number fields. For these synonym fields, the customer synonym's sequence number must be larger than that of the product synonym.

Substring Fields

A *substring* field is a discrete portion of a longer alphanumeric field (specifically, an alpha, format, or text field or a domain-type field based on an alpha, format or text domain). For example, assume that a six-character account number field is coded so that the first four characters identify the type of account and the final two characters identify a geographic location. Processes that require the location value can access a substring field defined as the final two characters of the account number field.

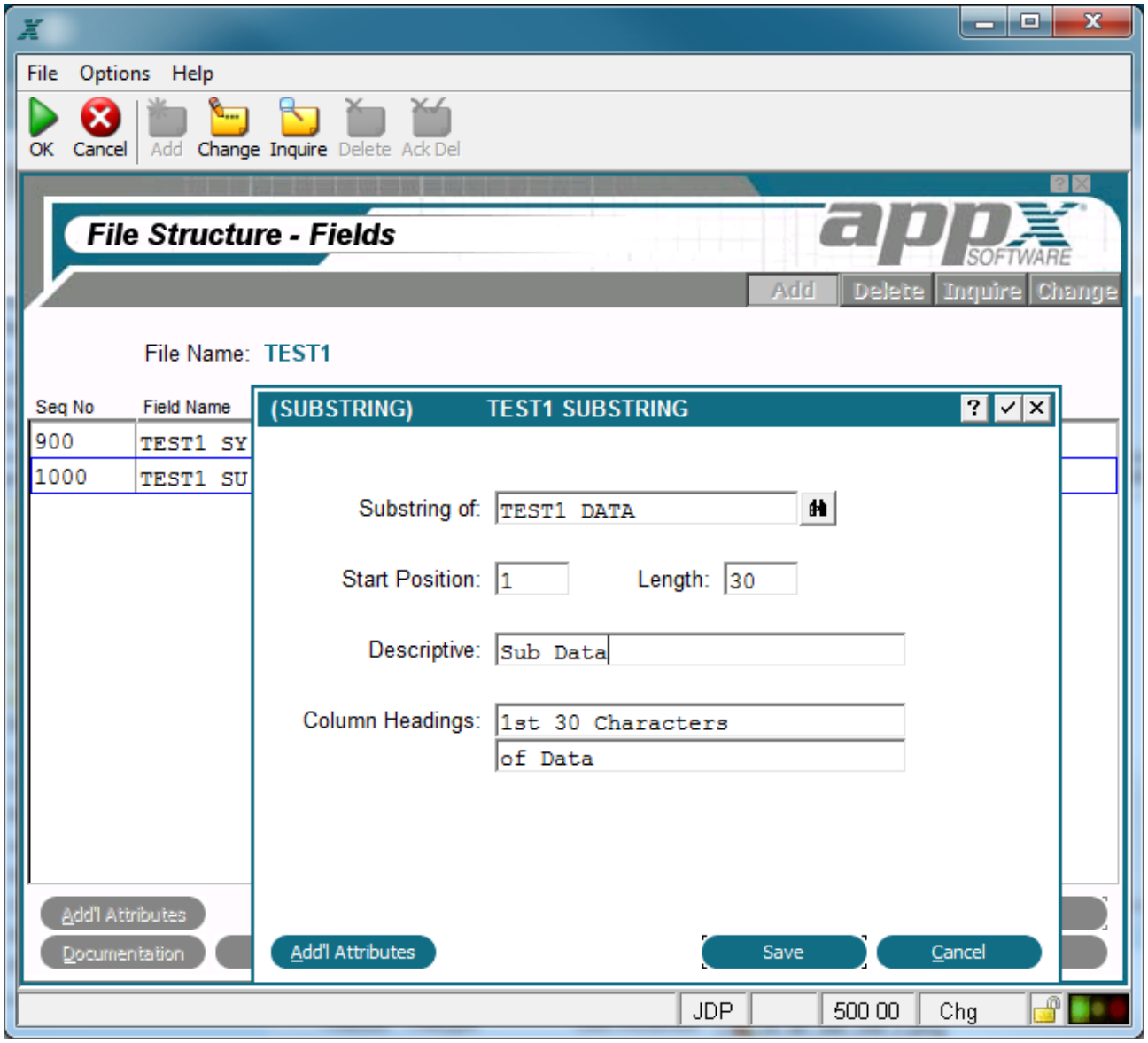
A substring is defined for those instances where it is of benefit to access both a field in its entirety and a discrete segment of the field, depending upon the specific requirements of the operation or display. If you have not defined a substring, your only option is to manipulate the contents of the field itself with statements.

You can only define substrings for alphanumeric physical fields in the same record. They cannot reference synonyms, group headers, or group trailers, and a substring cannot be included as part of a group field or be referenced by a synonym field. In addition, the sequence number of a substring field must be greater than the sequence number of the alphanumeric field it references. Substring fields are limited to a single occurrence.

A substring occupies the same physical space as the alphanumeric field it is a part of. Its data is a subset of the data contained in that alphanumeric field. Any value that is established in the alphanumeric field is automatically established in the substring. The substring's initial value is also a subset of the alphanumeric field's initial value.

You can think of a substring as the inverse of a group field. The relationship between a substring and its alphanumeric field is similar to the relationship between a component field and its group. Whether you choose to define a field and various substrings, or a group and various component fields, impacts the appearance of fields on APPX images. A substring loses many of the edit characteristics of the alphanumeric field it references when it is painted on an image. Group fields do not.APPX requires you to paint the components of a group on an image, not the group itself, thereby ensuring that all the edit characteristics are maintained.

The Substring fields specifications overlay, shown below, automatically displays after you complete the entries on the Fields specifications screen if the *Field Type* you select is *SUBSTRIN*G.



Substring Fields Overlay

The Substring fields overlay contains the following fields:

Substring of identifies the alphanumeric field that is referenced by the substring. The field referenced must be an alpha, format, or text field or a domain-type field based on an alpha, format, or text domain. The sequence number for this field must be smaller than the sequence number that is assigned to the substring.

Start Position determines the character position in the referenced field that represents the first character of the substring. For example, if phone number is defined as a format field with edit mask ###*###*####, the start position for a substring for the phone number exchange would be 5.

Length designates the number of consecutive characters that comprise a substring field. The length of a substring cannot exceed the length of the alphanumeric field it references. This means that the sum of the value that is entered in this specification and the value in *Start Position*, less one, cannot exceed the length of the referenced field.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Group Fields

A *group field* (often referred to simply as a group) is a series of one or more fields with contiguous sequence numbers, which can be referenced by a single field name. The group field's primary purpose is to simplify data assignments and comparisons between two sets of fields with matching contents, formats, and storage types. You can only reference a group field in a statement or within selection criteria, or specify it as a key.

You create a group by defining a group header and, optionally, a group trailer field.

A group header field marks the boundaries of a series of contiguous fields in a group, and provides a field name to reference the group. A specification entry on the group header overlay, *Thru Field Name*, also defines the last field in a group. The fields in a group are those with field sequence numbers that fall between the sequence numbers of the group header field and this last field. Any future additions to the group must have sequence numbers greater than the group header field and less than the *Thru Field Name*. You cannot add fields to the end of the group without modifying the *Thru Field Name* specification unless you use a group trailer field.

A group trailer field is an optional placeholder to mark the position of the final field in a group. It simplifies group maintenance by providing a streamlined mechanism to allow for future additions to the end of a group. You enter a group trailer field (rather than the final field in a group) in a *Thru Field Name* specification on the group header. When you use a group trailer to mark the end of a group, you can add new fields at the end without changing the *Thru Field Name* specification. It also provides a visual clue as to the end of the group when scanning the Data Dictionary. If a field's sequence number is between the group header and group trailer, it belongs to the group.

When defining or using a group field, you must satisfy the following requirements:

Fields that comprise a group must have contiguous sequence numbers. This restriction should not be taken to imply that fields must be contiguous in terms of physical storage. Refer to the section entitled Special Uses for Synonym Fields for additional information.

A group can be nested (entirely contained within another group). For example, assume your GL account number is a group field (main account, sub account, division, and branch, perhaps). Further assume that your application contains a key field that is composed of the account number and a year (another group field). The account number group is nested within the account number/year group.

A group cannot partially overlap the fields in another group. In other words, two groups cannot share a component field without sharing all the component fields in one of the groups. You cannot, for example, define one group consisting of a year and an account number, and another using the same account number and an amount.

A group can be disjointed (entirely outside of any other group). If you define a synonym for the account number field in the previous example and use it to establish the second group, the two groups are disjointed. Because of the use of a synonym, the groups do not contain a common field.

A group cannot include a substring field.

A group must itself be a single occurrence, and must include all occurrences of any multiple-occurrence component fields.

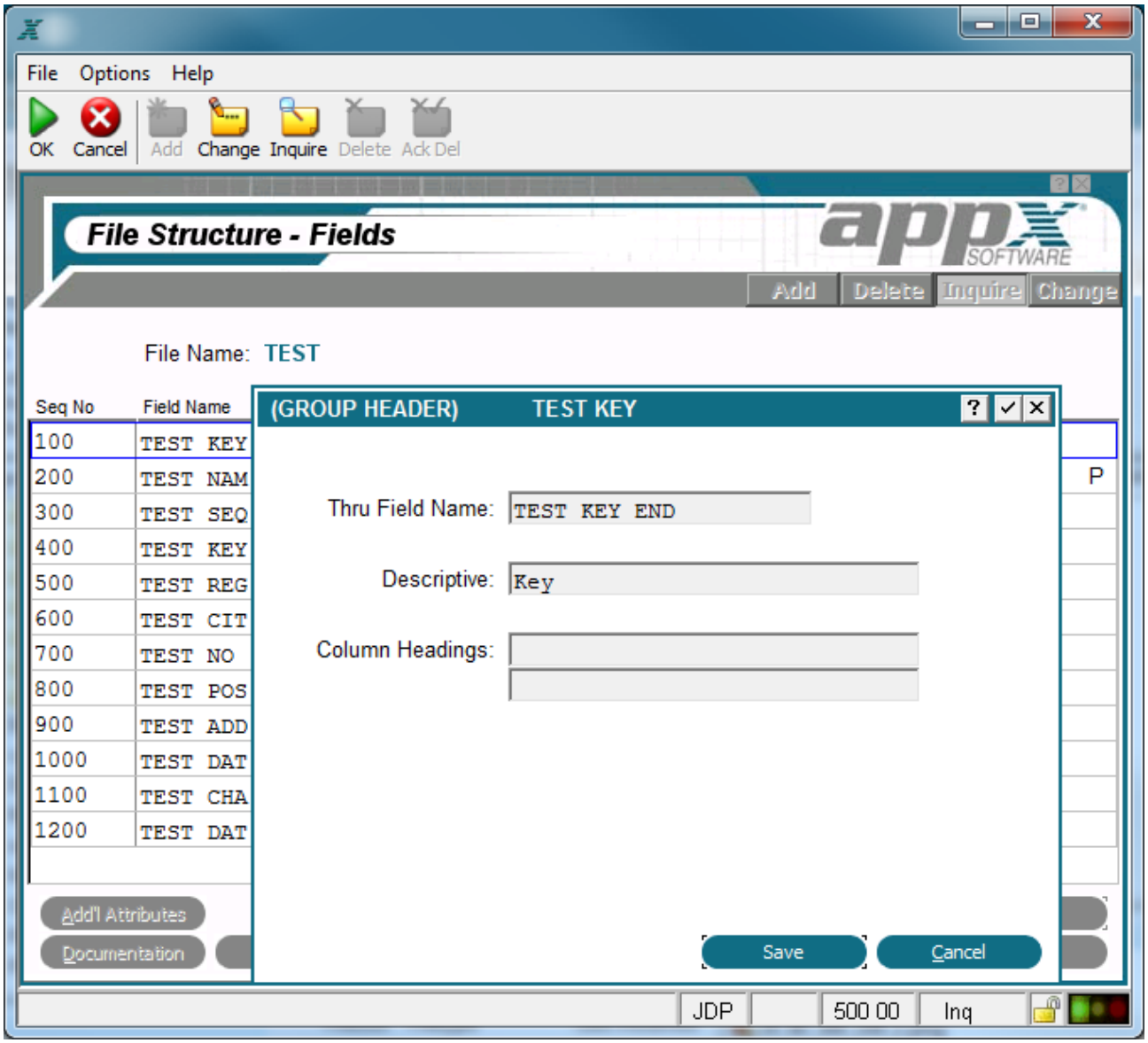
The final field in a group (or group trailer field, if used) must have a sequence number that is greater than that of the group header field.

A group cannot be painted as an item on an image. Each component field must be painted individually. For example, you cannot paint an account number group on an input screen. You must, instead, individually paint its component main account, sub account, division, and branch fields on the image.

Group Header Fields

A *group header field* defines a concatenation of fields that form a group and can be referenced together by a single field name (see the Group Fields section for a discussion of group characteristics). For example, an Account group header field may consist of three components, a Primary Account, a Corporate Division, and a Corporate Branch location, each of which are individual fields in APPX. The Account group header provides an alternative to referencing each component when you require all three for a specific process. A group header field occupies no physical space in a file.

The Group Header fields specifications overlay, shown below, automatically displays after you complete entries on the Fields specifications screen if the *Field Type* you select is *GROUP HEADE*R.



Group Header Fields Overlay

The Group Header fields overlay contains the following fields:

Thru Field Name designates the name of the final field that is included in a group field or concatenation. This field may be an actual field, or a placeholder (group trailer) field. By using a group trailer in this specification, you simplify future expansion at the end of a group field. You can add fields with sequence numbers between those of the group header and group trailer fields to a file, and they become part of the group without your having to update this specification.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Group Trailer Fields

A *group trailer field* provides an optional way to allow for future additions to the end of a group field. (A group field is a concatenation of fields that can be referenced together by a single field name: the group header field. See the Group Fields section for a discussion of group characteristics.) All fields within a group must have a sequence number that falls between the number you defined for the group header field and that of the field you entered in the *Thru Field Name* specification.

A group trailer simplifies group field maintenance by providing a placeholder to mark the end of a group. You enter a group trailer field (rather than the final field in a group) in the *Thru Field Name* specification on the group header field. In the future, any field you add with a sequence number between that of the group header and the group trailer becomes part of the group. It is not necessary to modify the *Thru Field Name* specification to include the new field.

For example, assume your account number is a group field that is currently composed of a main account, sub account, and division. If you do not use a group trailer, you must identify the division as the final field in the group (with the *Thru Field Name* specification). If you add a branch component to the end of the account number, you must change the *Thru Field Name* specification to list the branch, rather than the division, as the final field in the group. If instead, you had used a group trailer as the final field in the group, you could add a branch to the group simply by creating the branch field with a sequence number that is greater than that of the division and smaller than that of the group trailer. You would not be required to alter the *Thru Field Name* specification.

As with a group header field, the group trailer occupies no physical space in the file. There are no specifications that are unique to a group trailer field.

Special Uses for Group Fields

Because a group is treated as a single Format string, there are advantages to manipulating a group rather than its component fields. With care, you can achieve results that would not otherwise be possible. For example, group fields can be used to:

Access discrete portions (substrings) of other fields. For example, assume that you want to divide a four-byte binary number into four individual bytes (to access and manipulate each byte individually). You cannot define a substring field for the number because it is a numeric field, and APPX restricts substrings to alphanumeric fields. You can, however, define a one-byte numeric field with four occurrences, a group field for the four-byte field, and another group field for the one byte/four-

occurrence field. You set the value of the one-byte/four-occurrence group field equal to the value in the four-byte group field. Once the numeric values are copied into the one-byte group field, you can manipulate an individual occurrence (equal to a single byte in the original binary number).

Simplify statements definition. By using a group, you can manipulate two or more fields with a single statement, rather than a statement for each field. You can even manipulate entire records with a single statement. For example, if you have two files with record structures that contain the same 15 fields, and you combine all 15 into a single group field, you can compare the values in any two records by comparing the values in their respective group fields. If you do not define a group, an IF, SET, or some other statement must be repeated 15 times, once for each field on the record.

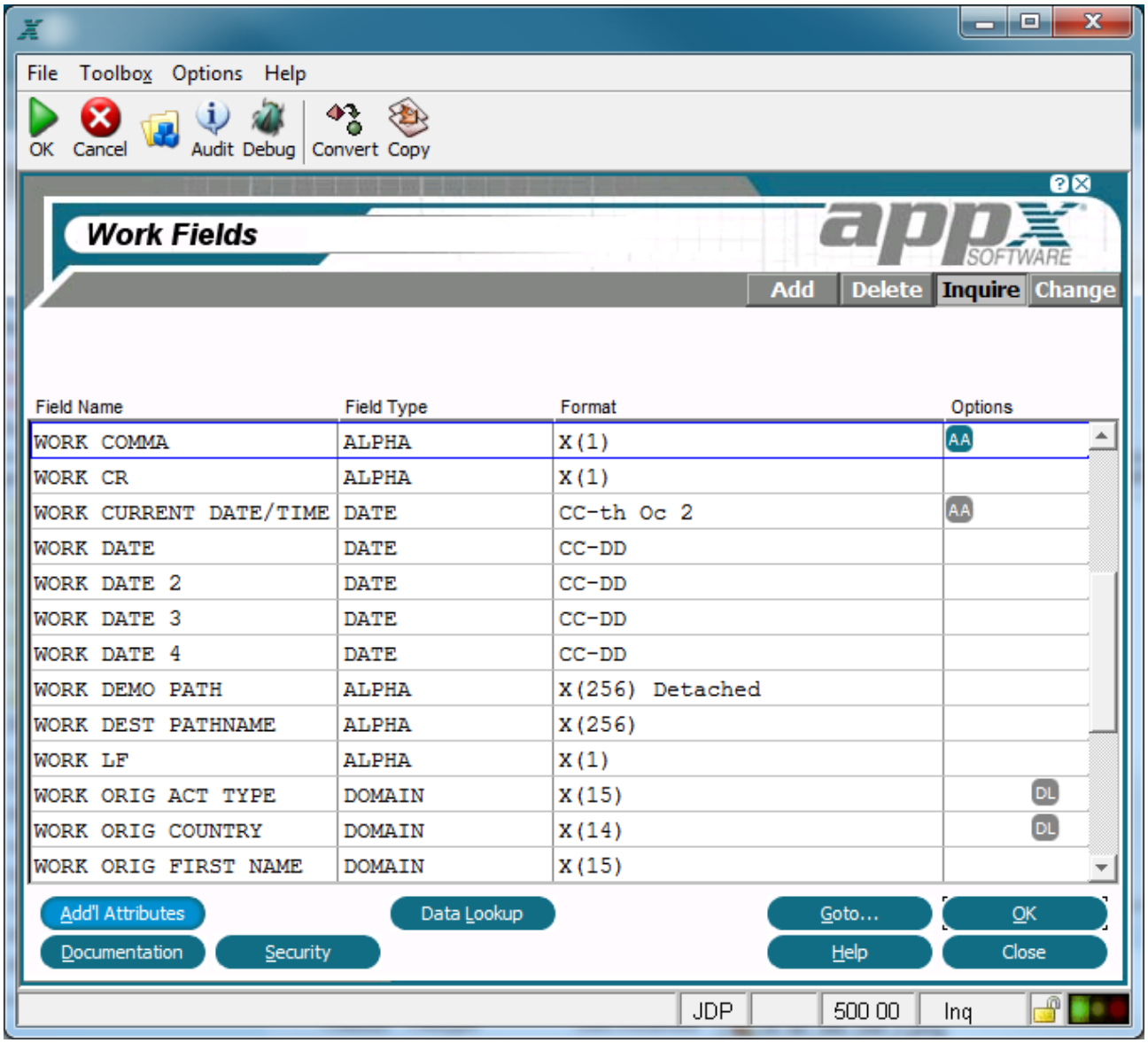
CHAPTER 2-5

Work Fields

Introduction to Work Fields

Work fields are temporary fields that are not maintained in a file, but can be manipulated by processes in APPX (usually through the use of statements). They are used to display values that are not stored, such as a calculated line item amount (quantity multiplied by price) or a constant value like **p** (pi). A work field value is available in memory to a user.

The Work Fields screen, shown below, displays attributes that are common to all work fields, regardless of type (alphanumeric or date, for example). You access this screen by selecting the work fields option from the Application Design menu.



Work Fields Screen

The Work Fields screen contains the following fields:

Field Name uniquely identifies individual work fields within an APPX application. Work fields are referenced by their *Field Name* throughout application design.

Field Type categorizes fields according to their function within APPX. The specifications that are presented on subsequent screen overlays depend on the *Field Type* entered here. The *Field Type* options are:

Domain assumes the attributes that are defined for an alpha, date, logic, or numeric work field.

Alpha work fields may contain numbers, letters, and special characters (-, #, or &, for example).

Format work fields may contain an edit mask.

Text work fields may contain text.

Token work fields use specific values that are stored as corresponding numbers.

Numeric work fields are restricted to number, decimal (.), and sign (-) entries.

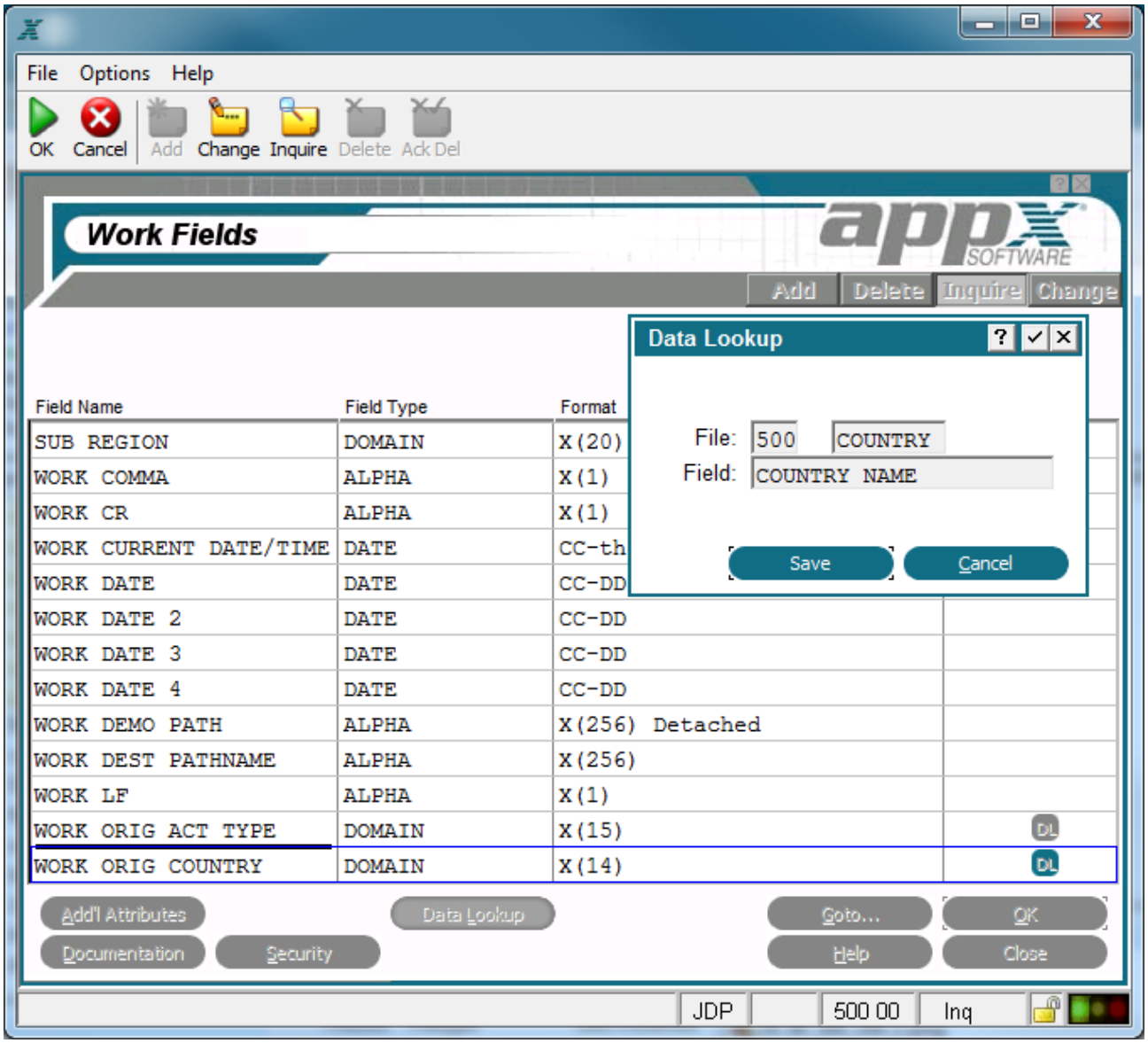
Date work fields may contain dates and/or times, from a hundredth of a second through a century.

Logic work fields have possible values of yes ☑, no ☐, or ? to represent an unknown value (Y, N or blank using Character Mode).

There are four options available from the Work Fields screen: Additional Attributes, Data Lookup, Documentation, and Security.

Work Fields Data Lookup Option

Data Lookup accesses the Data Lookup Overlay, shown below, where you can identify the application, file, and key field that can be accessed by users when selecting the scan option. The field you specify must be a primary or alternate key to the file you specified. Upon completion, you are returned to the Work Fields screen.



Work Fields Data Lookup Overlay

Work Fields Additional Attributes Option

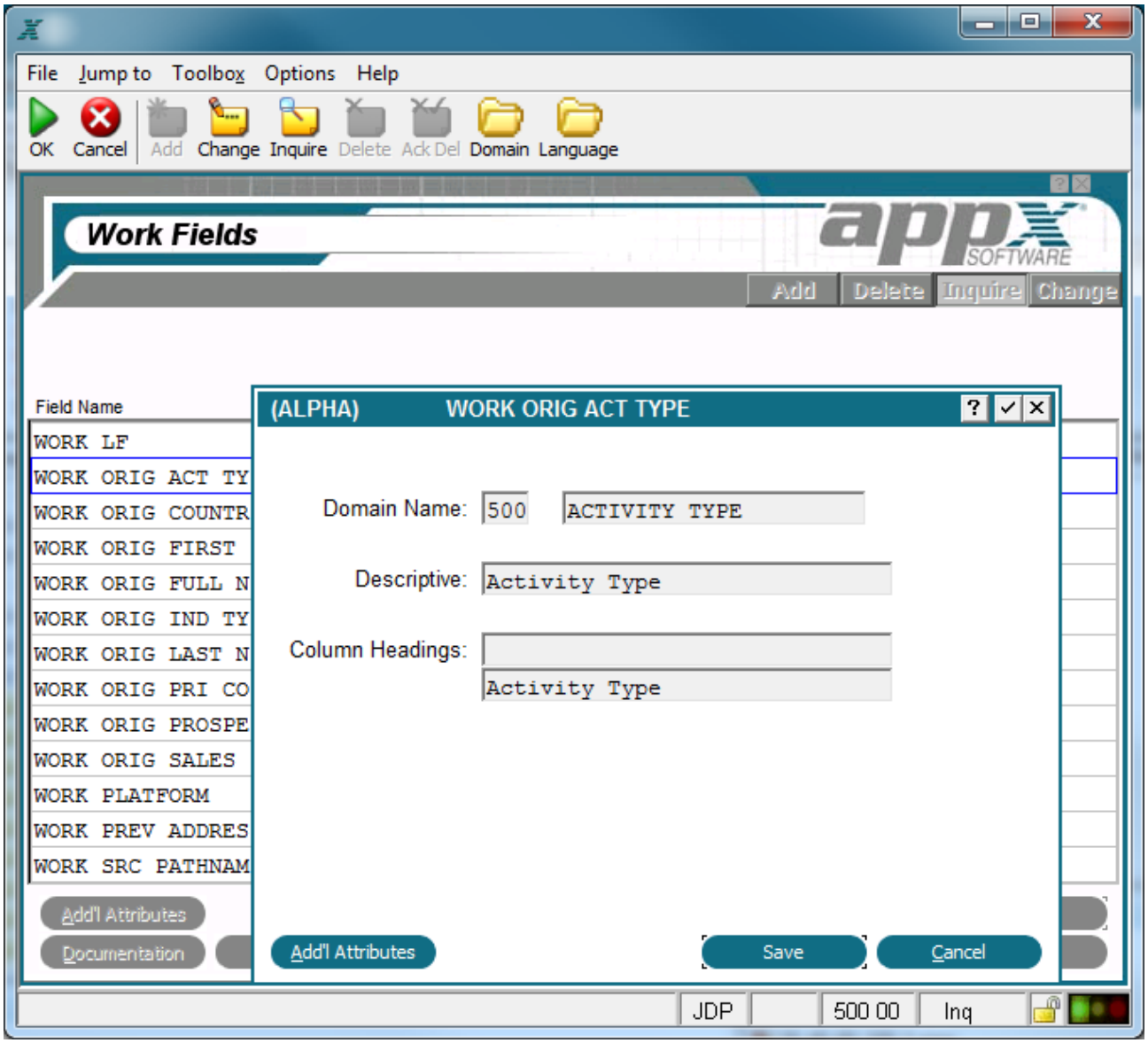
Additional Attributesaccesses the work fields Additional Attributes overlay, from which you can enter additional parameters for this work field. The specific parameters vary according to the type of work field, and are presented later in the sections pertaining to each type. Upon completion, you are returned to the Work Fields screen.

Common Work Fields Specifications

When you select Enter ☑ from the Work Fields screen, the work field specifications overlay displays. This overlay displays differently depending on the type of work field that is currently selected. For information about type-specific Work Field Specifications overlays, refer to the following sections which discuss each type in detail.

Domain Work Fields

A domain-type work field assumes the attributes that are defined for any type of domain in the same or an outside application. To use an assumed value from a domain definition, leave the specification blank. The Domain-Type Work field Specifications overlays, such as the one shown below, automatically display after you complete the entries on the Work fields specifications screen if the *Field Type* youselect is *DOMAIN.*



Domain Work Field Specification Overlay (Alpha Domain)

The following fields are contained on the Domain Type Work field Specifications overlay for Alpha, Format, Text, Token, Date, and Logic Domain-Type Work fields:

Domain Name links a domain-type work field to a specific domain in the same or another APPX application.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used. Because *Descriptive* is less cryptic and can be more flexibly formatted than *Field Name*, it is easier to understand. As a result, the system uses *Descriptive* when communicating with users. *Descriptive* is used, for example, when the value of a field displays to a user on a standard image, such as the *Select Access Path* display or an APPX-generated subheading. We suggest that you use a singular entry for *Descriptive,* and avoid appending the word 'field'.

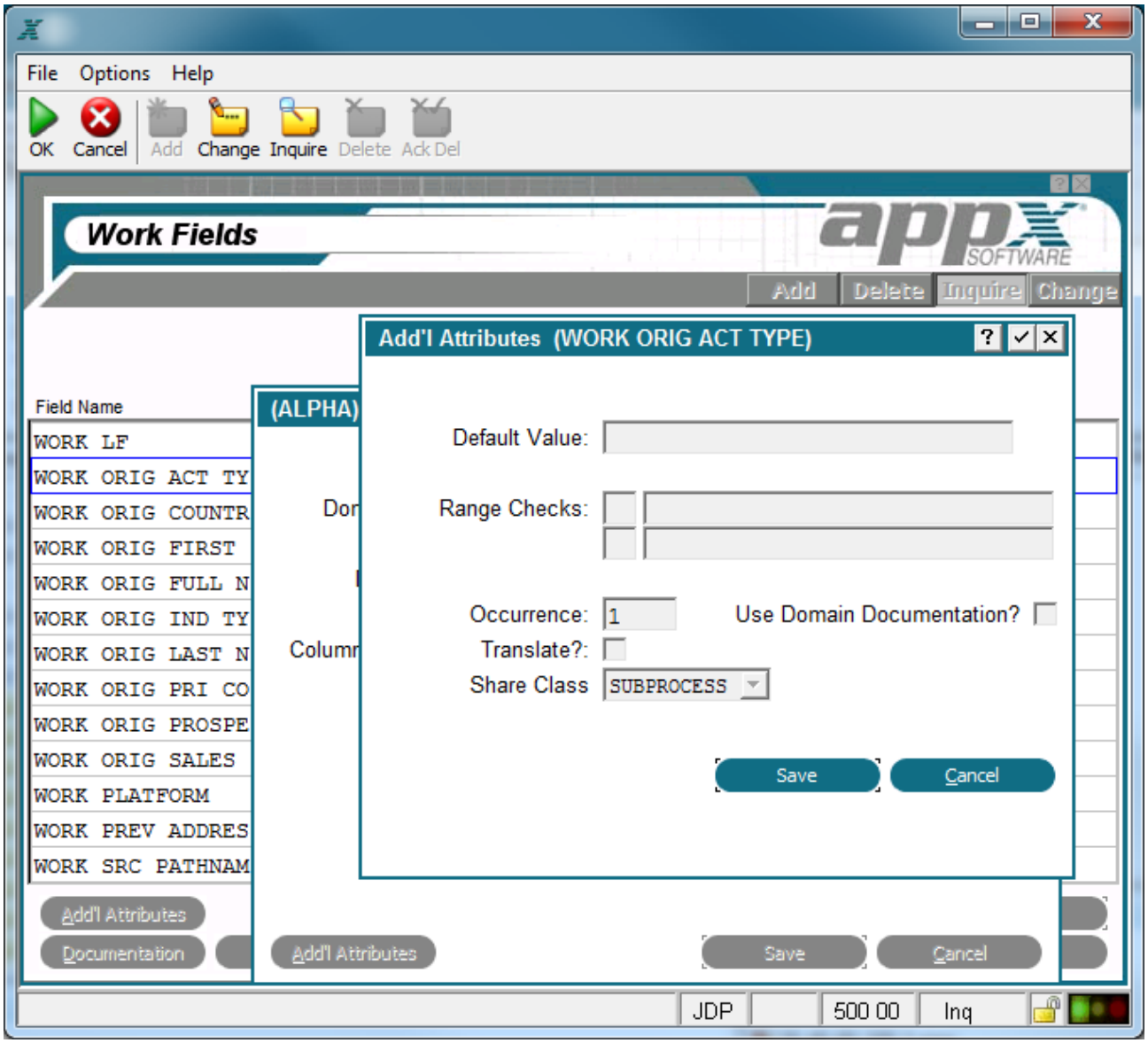
Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

The Domain Type Work field Specification overlays for Alpha, Format, Text, Token, Date, and Logic Domains contain the option Additional Attributes described in the next section.

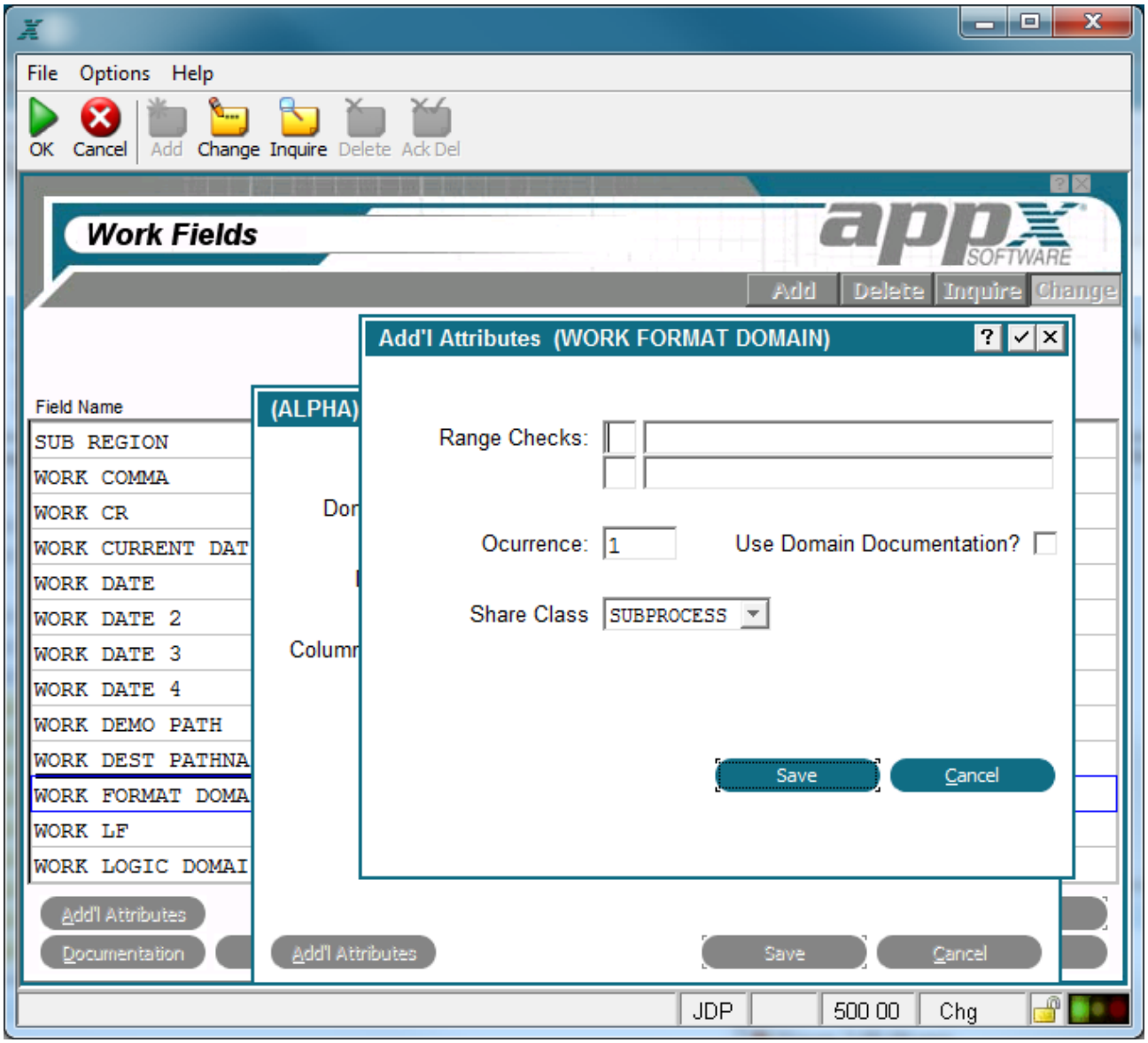
The Domain Work field overlay offers one option described in the following section: Additional Attributes.

Domain Work Fields Additional Attributes

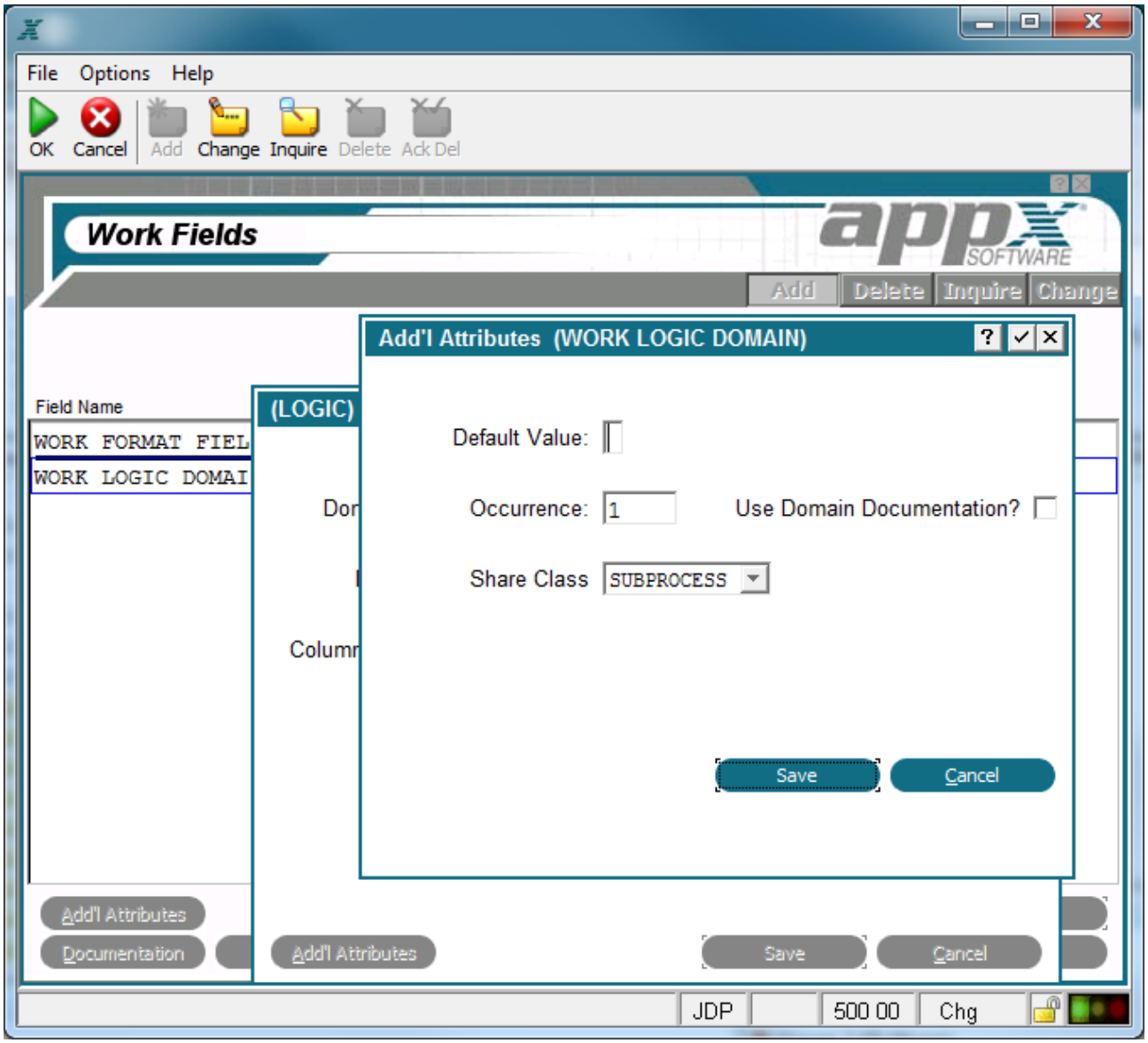
Additional Attributes accesses the domain-type work field Additional Attributes overlay, from which you can enter additional parameters for this domain-type work field. The Domain-Type Work field Additional Attributes overlay for *alpha*, *text*, *token* and *date* Domains is shown in Domain Work Field Additional Attributes Overlay for Alpha, Text, Token and Date Domains. The Domain-Type Work field Additional Attributes overlay for Format Domain is shown next. The Domain-Type Work field Additional Attributes overlay for the Logic Domain is shown last. Upon completion, you are returned to the Domain-type work field specifications overlay.



Domain Work Field Additional Attributes Overlay for Alpha, Text, Token and Date Domains



Domain Work Field Additional Attributes Overlay for Format Domain



Domain Work Field Additional Attributes Overlay for Logic Domains

Some or all of the following Work fields are contained on the Domain-Type Work field Additional Attributes overlays for *alpha*, *format, logic, text*, *token* and *date* Domain types:

Default Value establishes a modifiable starting value for all referenced work fields whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Use Domain Doc? Click the checkbox to toggle between 'yes' ☑ if you want APPX to use the documentation from the domain as Help text and 'no' ☐ if you plan to enter Help text unique to this field.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

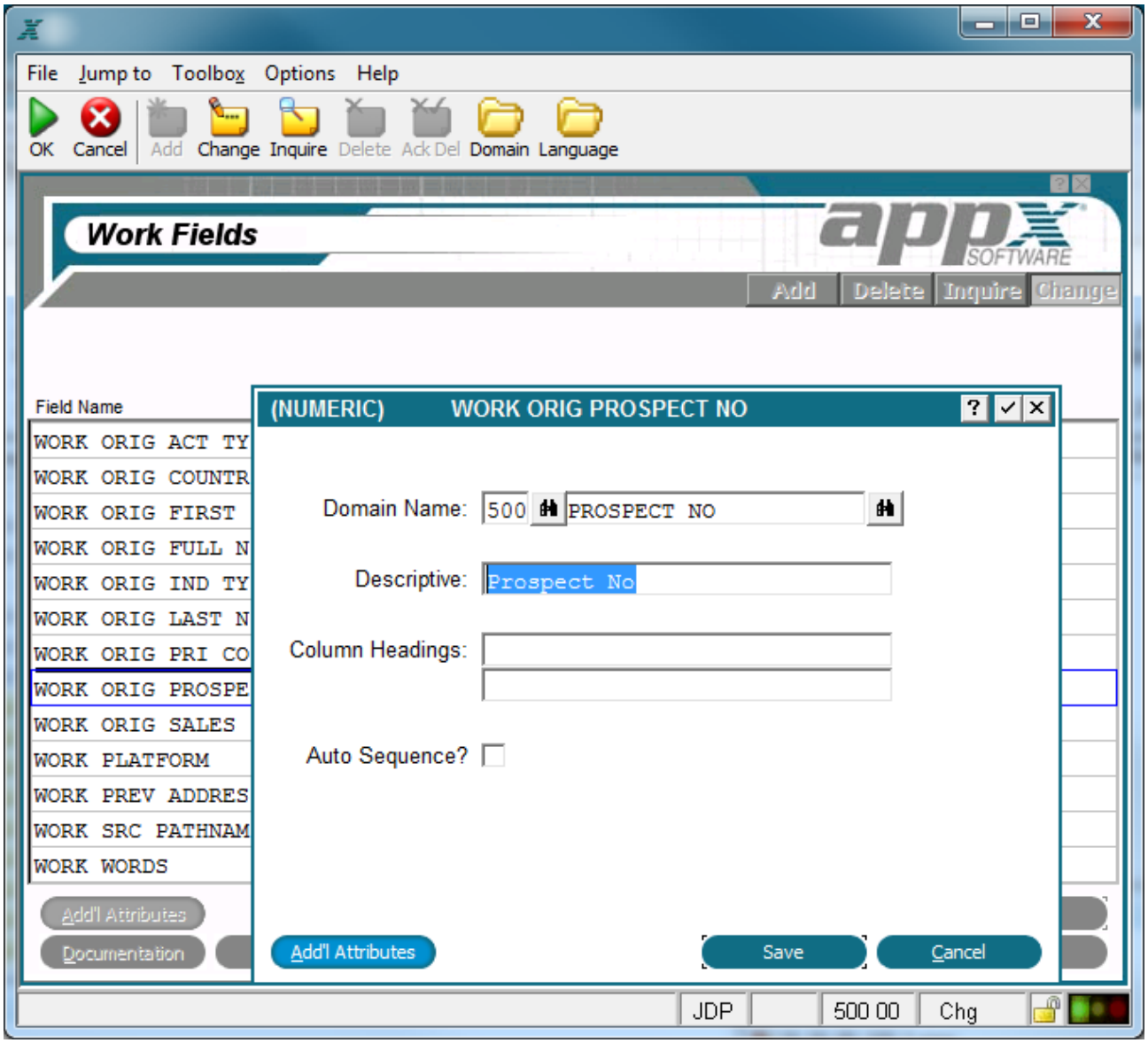
DETACHED The values are available until the user logs off.

NOT SHARED The values are available only for the current process.

The default is *SUBPROCESS*.

Domain Work Fields (Numeric Domain)

The Domain type work field specification overlay, shown Domain Work Field Additional Attributes Overlay for Alpha, Text, Token and Date Domains, displays after you select Enter ✓ from the work fields screen if the *Field Type* you select is *DOMAIN* and the domain type is *NUMERIC*.



Domain Work Field Specification Overlay (Numeric Domain)

The following fields are contained on the specifications overlay for Numeric Domain-Type Work fields:

Domain Name links a domain-type work field to a specific domain in the same or another APPX application.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

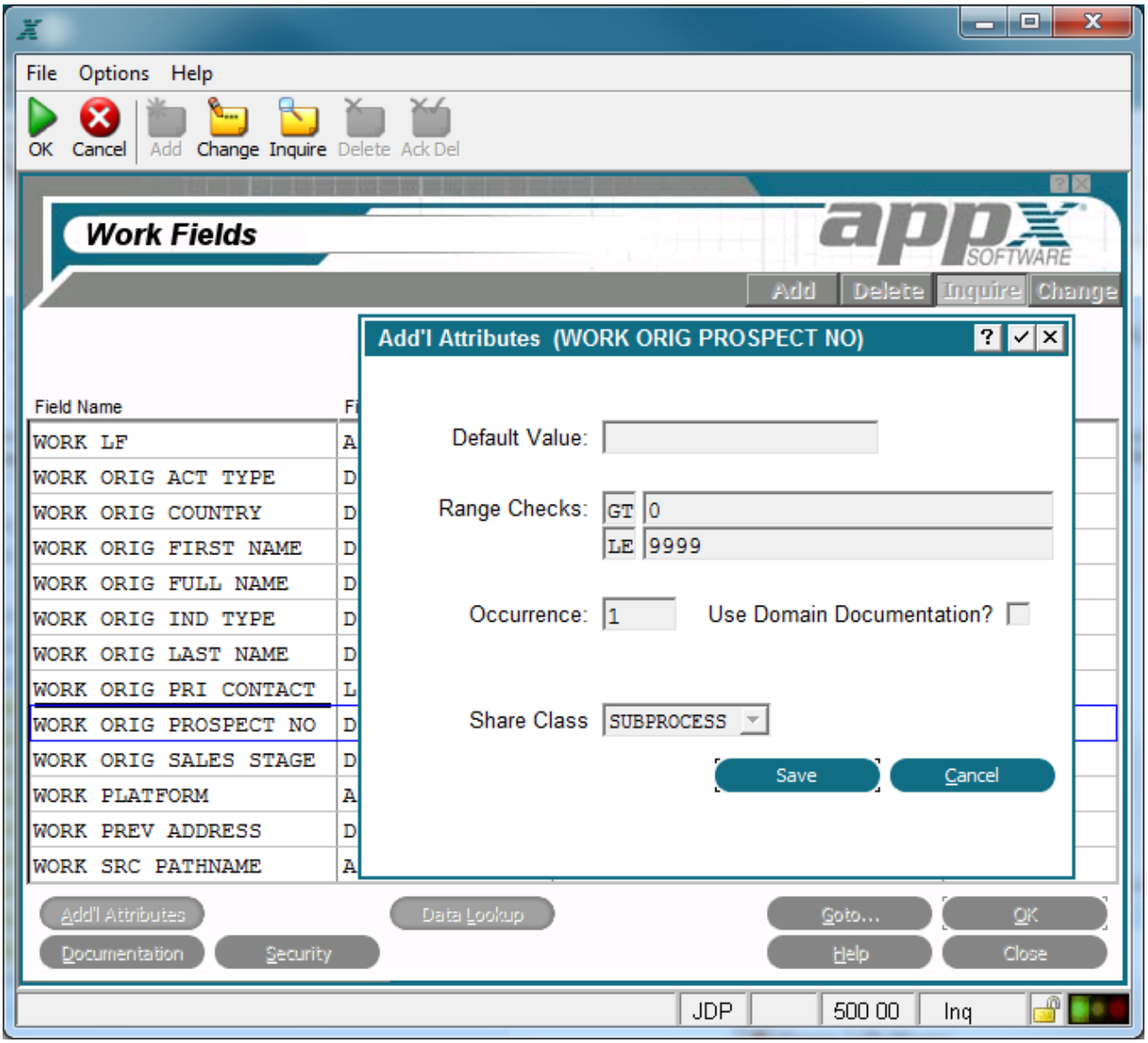
Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

The Domain Type Work field Specification overlay for Numeric Domains contains the following option as described in the corresponding section:

Additional Attributes

Domain Work Fields (Numeric Domain) Add'l Attributes

The Domain-Type Work field Additional Attributes overlay for *numeric* Domains is shown Domain Work Field Additional Attributes Overlay for Alpha, Text, Token and Date Domains. Upon completion, you are returned to the Numeric Domain-type work field specifications overlay.



Domain Work Field Additional Attributes Overlay for Numeric Domains

The Additional Attributes overlay contains the following fields:

Default Value establishes a modifiable starting value for all referenced fields whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation.. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

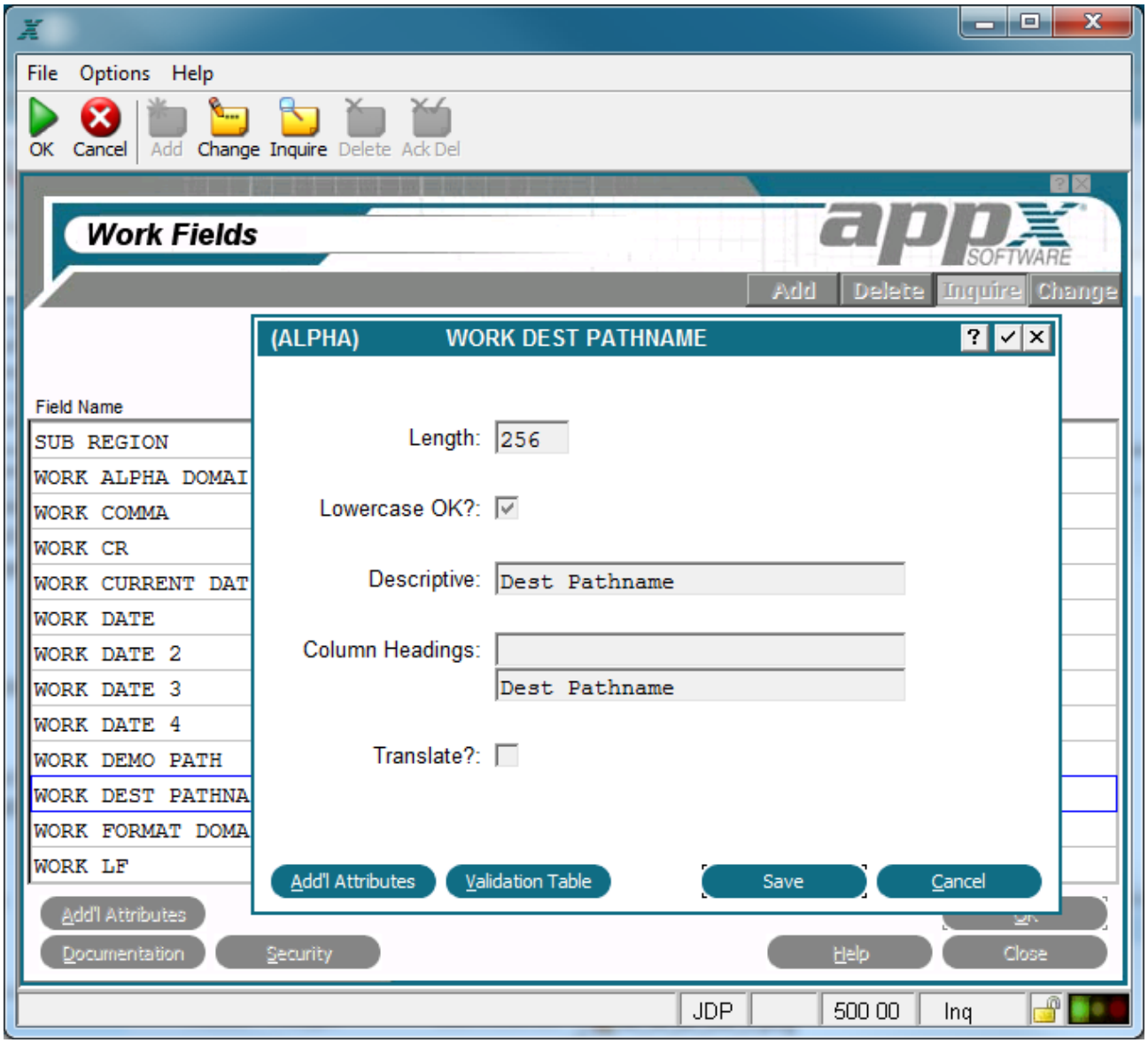
NOT SHARED The values are available only for the current process.

The default is *SUBPROCESS*.

Alpha Work Fields

An Alpha work field can contain numbers, letters, and special characters, such as *#, $,* and *&.* Examples include names, addresses, certain account numbers or serial numbers, and text.

The Alpha work field overlay, shown Domain Work Field Additional Attributes Overlay for Alpha, Text, Token and Date Domains, displays after you complete the entries on the work fields screen if the work *Field Type* you select is *ALPHA*.



Alpha Work Fields Overlay

The Alpha Work field Specifications overlay contains the following fields:

Length designates the number of character positions, or length, of this field.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Translate? Indicates if this domain or field is eligible for language translation. Currently the following field types may be translated (others will have the field protected). It's currently the designer's responsibility to insure that translatable work fields without a validation table are read only.

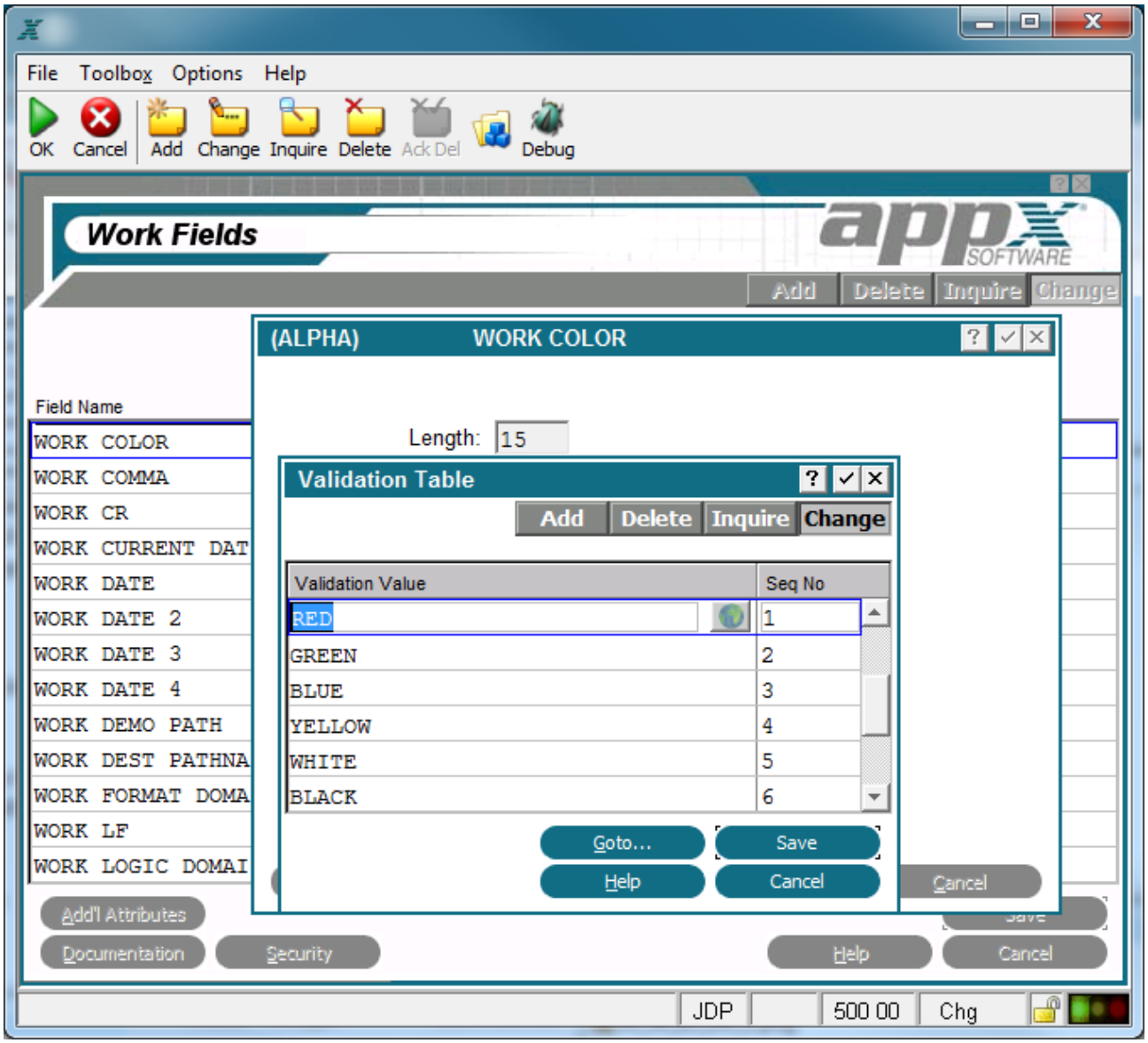
For Alpha work field type, the following options are available as described in the corresponding sections:

Validation Table

Additional Attributes

Alpha Work Fields Validation Table

The Validation Table option from the Alpha Work Fields overlay accesses the Validation Table overlay, shown below. A validation table provides a more powerful alternative to the use of range checks for data validation when there is a known set of values. Through the list feature, it provides the user with visibility of all the possible field values as well as the ability to select the desired value.



Alpha Work Fields Validation Table Overlay

You can establish a validation table for any Alpha work field in the data dictionary. The entries in the table are case-sensitive. If you enter a validation value in all capital letters, an application user must enter the value in all capital letters.

Validation table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, validation does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application. All validation values are available for review and selection by the end user through the list ▼ feature.

The Validation Table overlay contains the following fields:

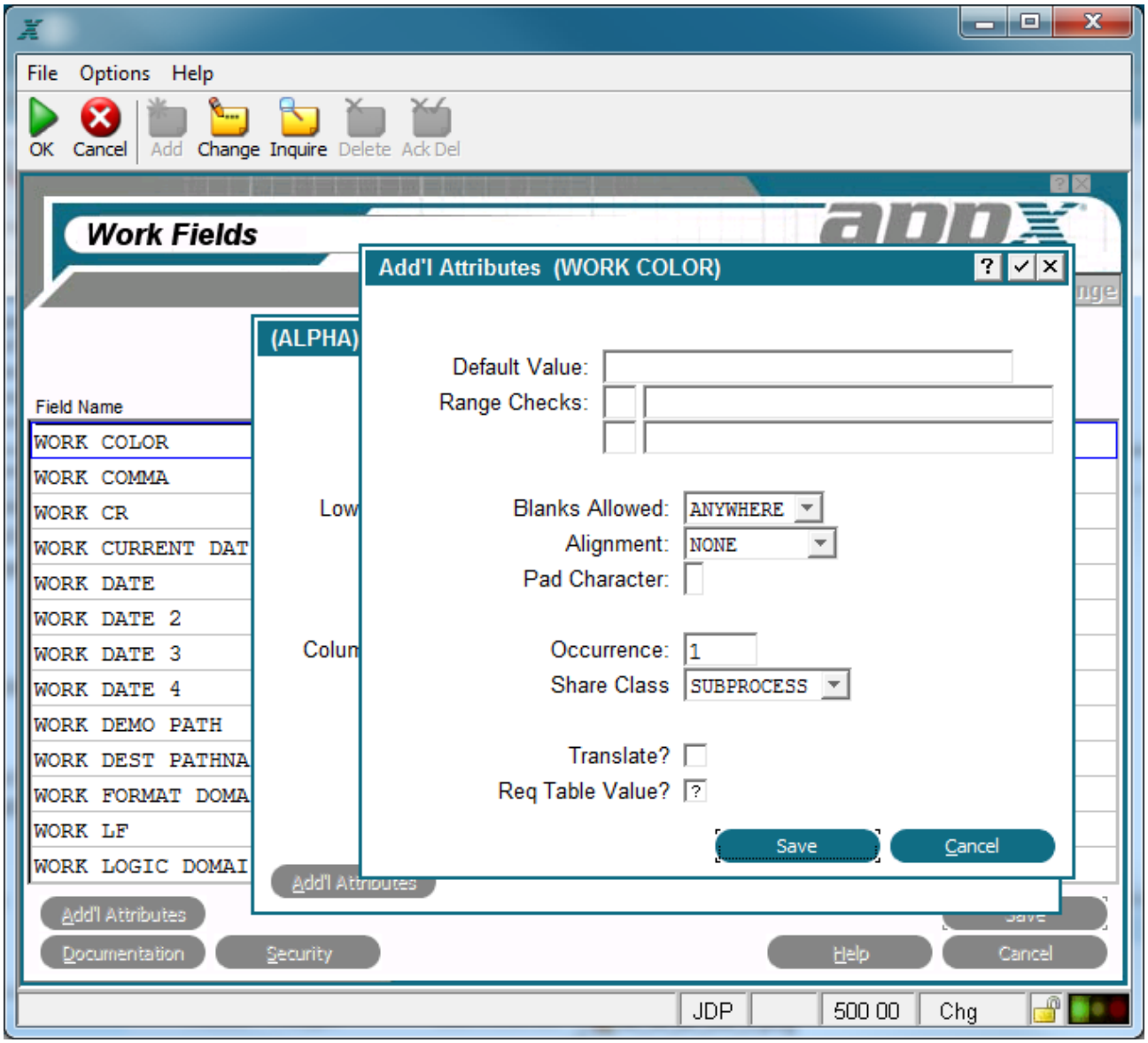
Validation Value provides a valid field value. It is case-sensitive and is used for online review, selection, and validation. Note that validation values newly added to the data dictionary are not available to a current APPX user until the user exits and re-enters APPX.

Seq No provides an identifying number for the associated validation value. It is defaulted by APPX and can be overridden, but it must be unique within a table.. It determines the order in which validation values are presented, both for selection by the user and for editing in application design. APPX assigns the first validation value a number of *1*, with additional values assigned a number that is equal to the highest existing sequence number plus *1*. APPX does not require that sequence numbers be contiguous within a table.

Goto... button will allow you to enter the Seq No for finding specific table entries quickly.

Alpha Work Fields Additional Attributes

From the Alpha work field overlay, you have an Additional Attributesoption. The Alpha work field Additional Attributes overlay is shown below.



Alpha Work Field Additional Attributes Overlay

The Alpha Work field Additional Attributes Overlay contains the following fields:

Default Value establishes a modifiable starting value for all image items whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Blanks Allowed indicates whether or not blanks are permitted and, if so, where they can be placed. The *Blanks Allowed* options are ***NONE, TRAILING,*** and ***ANYWHERE***.The default is *ANYWHERE*.

Alignment determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** The default is *NONE*.

Pad Character indicates the character to be used instead of leading and trailing spaces in a field.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

NOT SHARED The values are available only for the current process.

The default is *SUBPROCESS*.

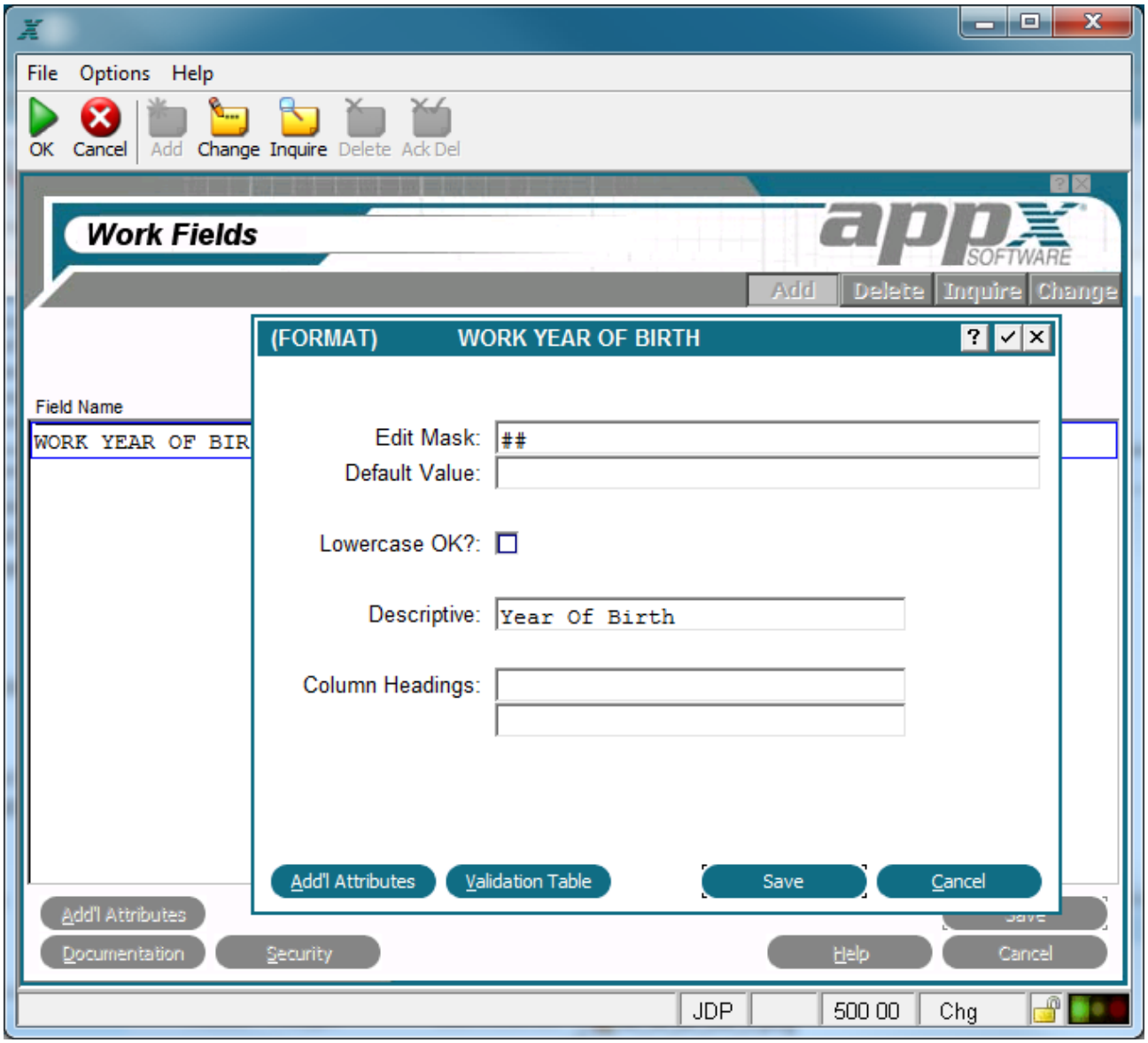
Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Require Table Value? indicates whether or not to require one of the validation table values to be entered. To force the user to enter one of the defined values, click the checkbox to toggle it to 'yes' ☑ (Y using Character Mode). If a 'no' ☐ (N using Character Mode) value is selected, the validation table shown when the user selects the list feature, is advisory only and the user can enter a value not listed in the table. If there is no validation table defined, this option does not apply and cannot be selected. If there is a validation table and *Translate?* is ☑, this option should also be ☑ (Y using Character Mode).

Format Work Fields

A format work field is like an alpha work field except that its primary characteristic is an edit mask.

The Format Work Field overlay, shown below, displays after you complete the entries on the Work Fields screen if the work *Field Type* you select is *FORMAT*.



Format Work Field Overlay

The Format Work Field overlay contains the following fields:

Edit Mask establishes format requirements for data validation. A mask character representing the allowable values is entered for each position in a field. The mask characters are:

(numbers only)

@ (letters only)

& (numbers and letters only)

! (any characters)

* (use default value character) - The valid character for this position in a mask is defined by referencing the same position in the default value.

For example, you can mask a phone number field with the following entry: ###*###*####.

Default Value establishes a starting value for all referenced fields whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image. The positioning of constant characters in the default value must correspond to the positions of *s, if any,in the edit mask. For example, a possible default value for the phone number mask indicated in *Edit Mask* earlier is: _ _ _ - _ _ _ - _ _ _ _ (the underlines are blanks).

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the value is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement overrides a 'no' entry in this field and displays as lowercase. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

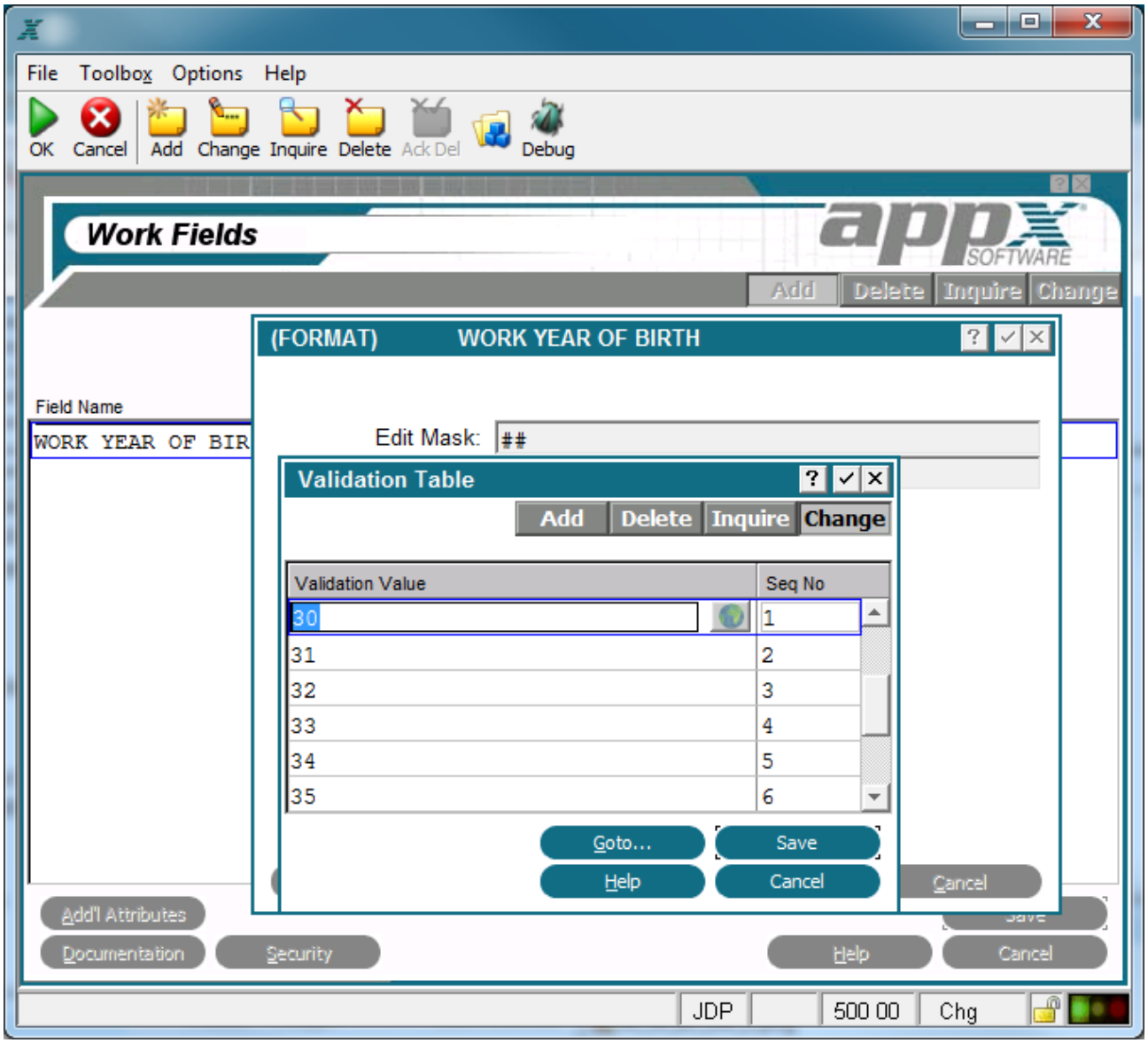
For Format work field type, the following options are available as described in the corresponding sections:

Validation Table

Additional Attributes

Format Work Fields Validation Table

The Validation Table option from the Format Work Fields overlay accesses the Validation Table overlay, shown below. A validation table provides a more powerful alternative to the use of range checks for data validation when there is a known set of values. Through the list ▼ feature, it provides the user with visibility of all the possible field values as well as the ability to select the desired value.



Format Work Fields Validation Table Overlay

You can establish a validation table for any Format work field in the data dictionary. The entries in the table are case-sensitive. If you enter a validation value in all capital letters, an application user must enter the value in all capital letters.

Validation table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, validation does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application. All validation values are available for review and selection by the end user through the list ▼ feature.

The Validation Table overlay contains the following fields:

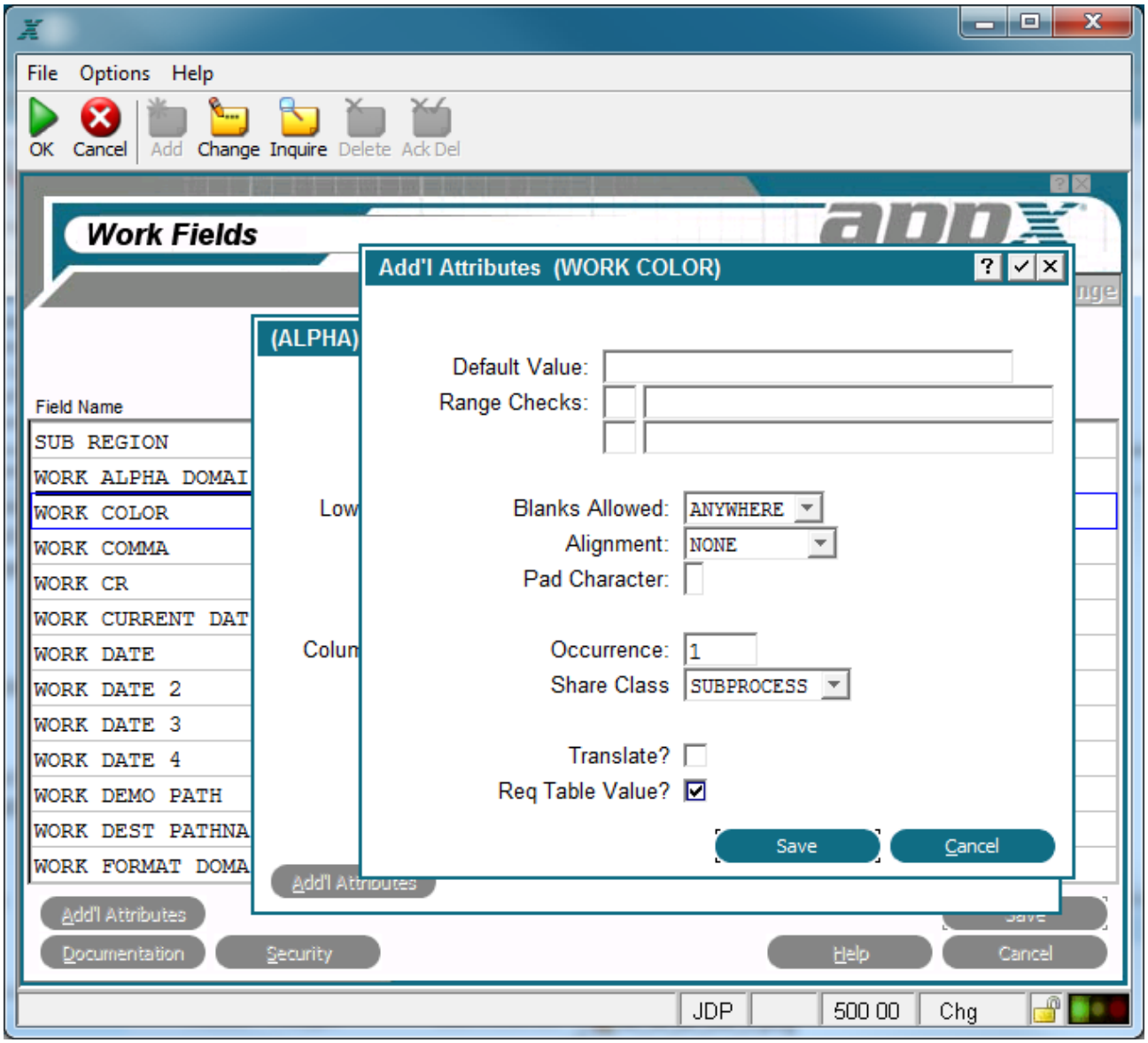
Validation Value provides a valid field value. It is case-sensitive and is used for online review, selection, and validation. Note that validation values newly added to the data dictionary are not available to a current APPX user until the user exits and re-enters APPX.

Seq No provides an identifying number for the associated validation value. It is defaulted by APPX and can be overridden, but it must be unique within a table.. It determines the order in which validation values are presented, both for selection by the user and for editing in application design. APPX assigns the first validation value a number of *1*, with additional values assigned a number that is equal to the highest existing sequence number plus *1*. APPX does not require that sequence numbers be contiguous within a table.

Goto... button will allow you to enter the Seq No for finding specific table entries quickly.

Format Work Fields Additional Attributes

From the Format work field overlay, you have an Additional Attributesoption. The Format work field Additional Attributes overlay is shown below.



Format Work Field Additional Attributes Overlay

The Format Work field Additional Attributes Overlay contains the following fields:

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Blanks Allowed indicates whether or not blanks are permitted and, if so, where they can be placed. The *Blanks Allowed* options are ***NONE, TRAILING,*** and ***ANYWHERE***.The default is *ANYWHERE*.

Alignment determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** The default is *NONE*.

Pad Character indicates the character to be used instead of leading and trailing spaces in a field.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

NOT SHARED The values are available only for the current process.

The default is *SUBPROCESS*.

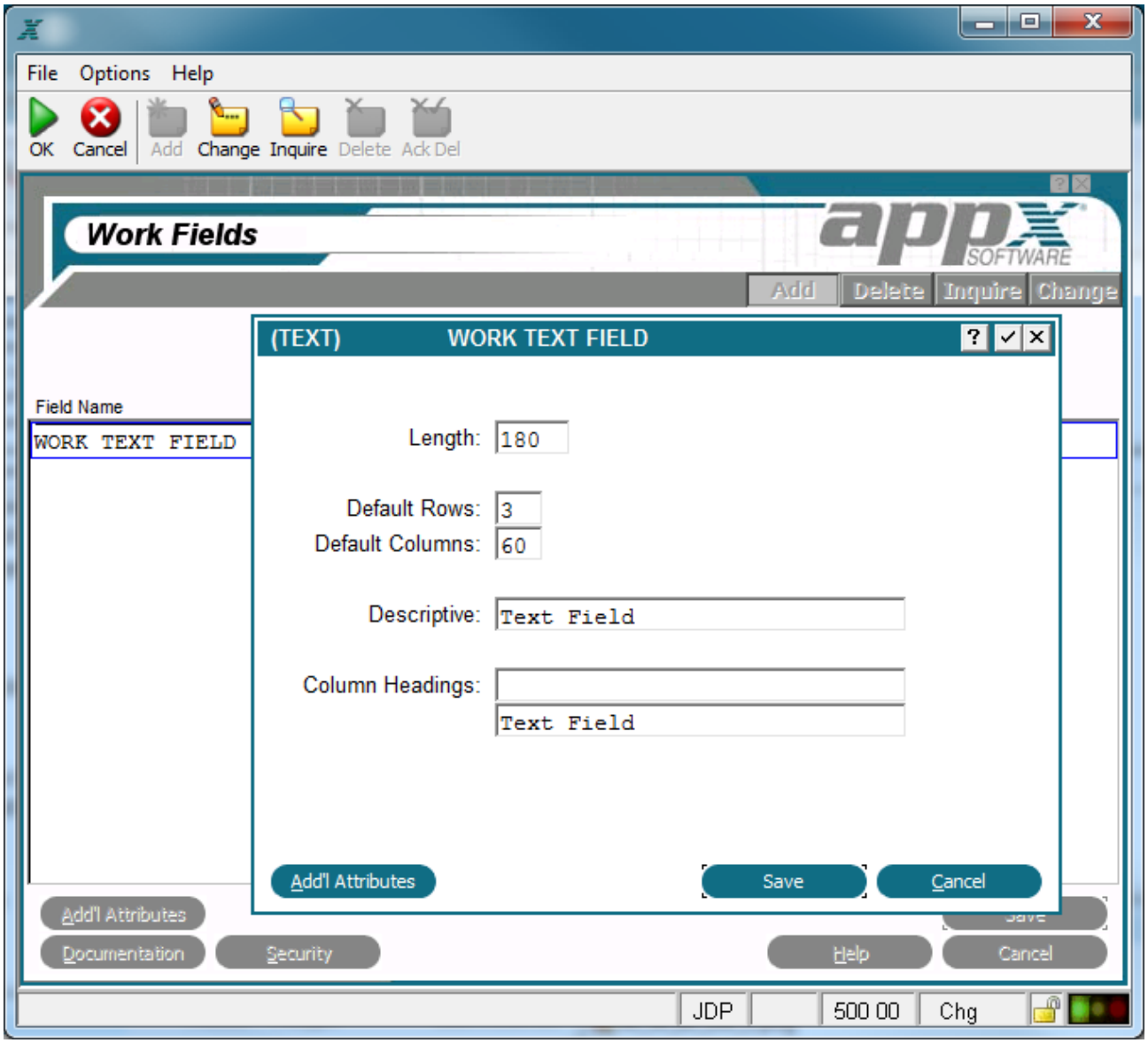
Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Require Table Value? indicates whether or not to require one of the validation table values to be entered. To force the user to enter one of the defined values, click the checkbox to toggle it to 'yes' ☑ (Y using Character Mode). If a 'no' ☐ (N using Character Mode) value is selected, the validation table shown when the user selects the list feature, is advisory only and the user can enter a value not listed in the table. If there is no validation table defined, this option does not apply and cannot be selected. If there is a validation table and *Translate?* is ☑, this option should also be ☑ (Y using Character Mode).

Text Work Fields

A text work field allows a user to enter a block of text on the data entry screen.

The text work field overlay, shown below, allows you to add text specific attributes to those already defined for work fields. The text work field specifications overlay displays after you complete the entries on the work fields screen if the work *Field Type* you select is *TEXT*.



Text Work Field Overlay

The Text Work field Specifications overlay contains the following fields:

Length designates the number of character positions, or length, of this field.

Default Rows/Cols determines the default number of rows and columns to be used when specifying a field on an image.

Descriptive provides a longer, more easily understood alternative to *Domain Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Domain Name* is used.

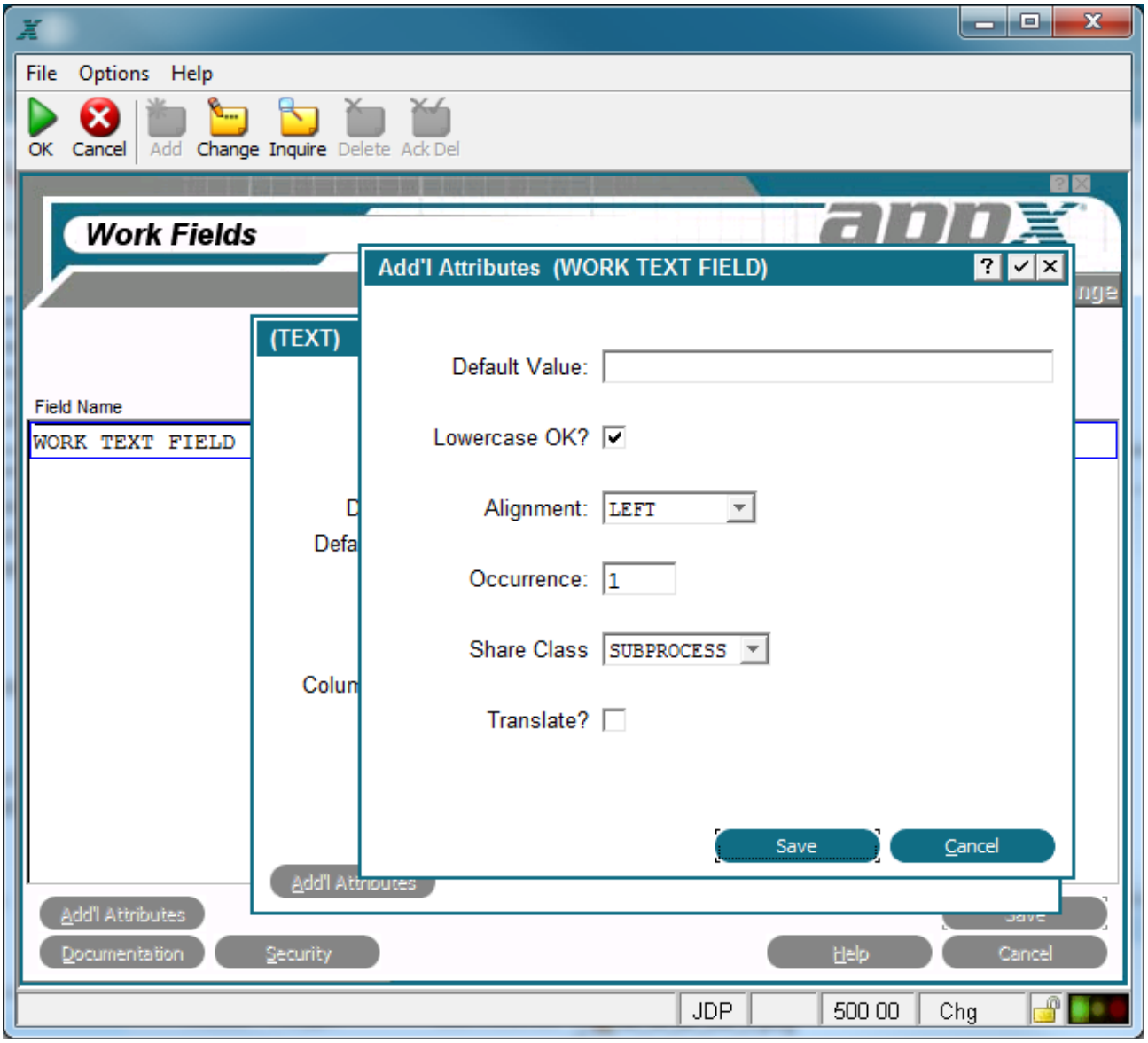
Col Headings designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a domain itself. Refer to Standard Column Heading Image for additional information.

For Text work field type, the following option is available as described in the corresponding section:

Additional Attributes

Text Work Fields Additional Attributes

From the Text work field overlay, you have an Additional Attributesoption. The Text work field Additional Attributes overlay is shown below.



Text Work Field Additional Attributes Overlay

The Text Work field Additional Attributes Overlay contains the following fields:

Default Value establishes a modifiable starting value for all image items whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐ (N using Character Mode), the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement displays as lowercase, even if this specification prohibits lowercase entries. The default is 'yes' ☑ (Y using Character Mode).

Alignment determines whether or not data in a field is aligned for storage and/or display and, if so, the type of alignment. The *Alignment* options are***NONE, LEFT, JUSTIFIED, RIGHT*** and ***CENTERED.*** The default is *NONE*.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Share Class defines the level values contained in this work field can be shared. Options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

NOT SHARED The values are available only for the current process.

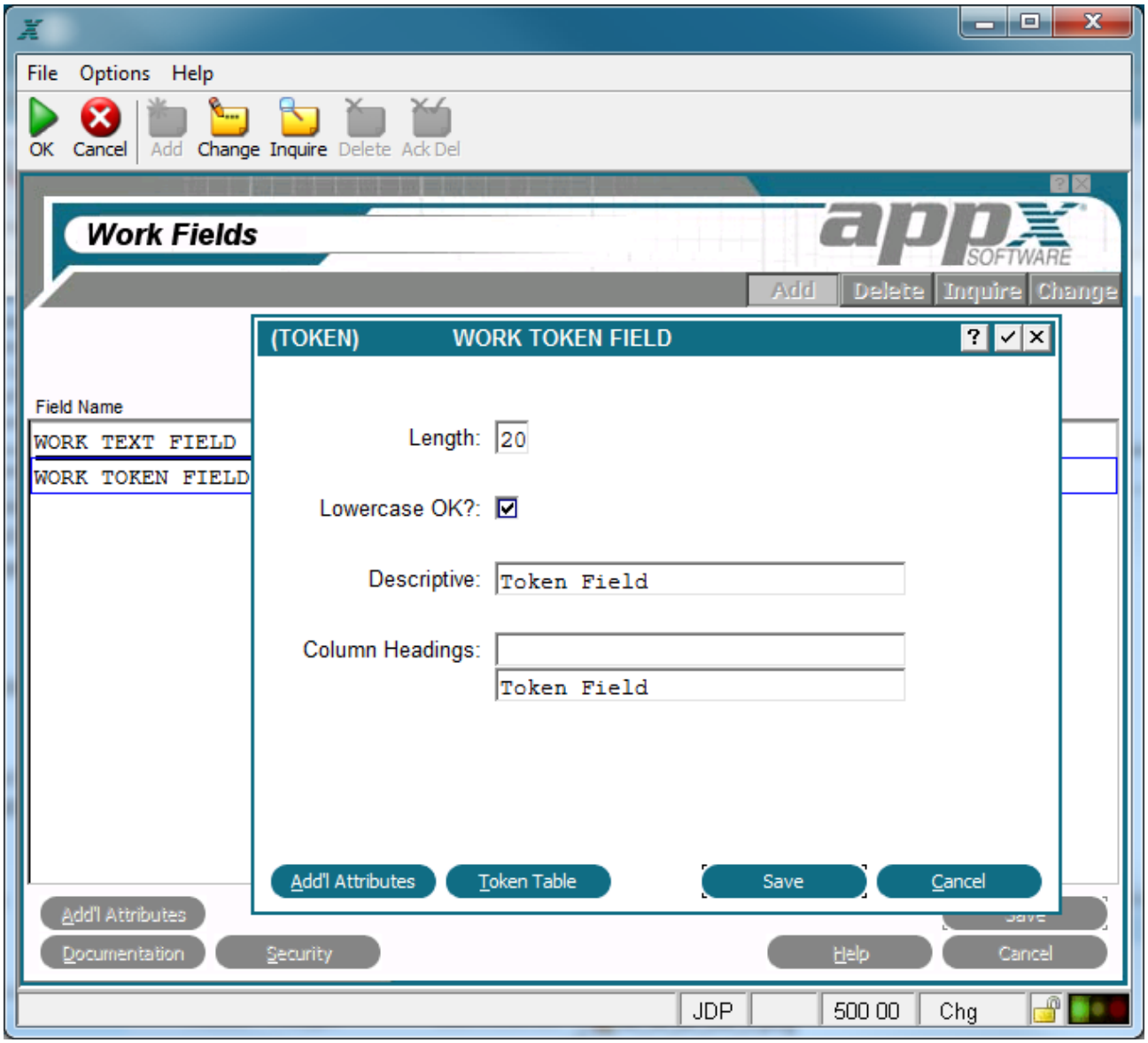
The default is *SUBPROCESS*.

Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. Since this option does not require a validation table for a work field (unlike a file field), it is the designer's responsibility to ensure that a translatable work field without a validation table is read only. Click the checkbox to toggle between 'yes' ☑, 'no' ☐, and unknown ? (Y, N, or blank using Character Mode) values. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Token Work Fields

A token work field is like an alpha work field but it has specific values that are stored as corresponding numbers.

The token work field overlay, shown below, allows you to add token specific attributes to those already defined for work fields. The token work fields specification overlay displays after you complete the entries on the work fields screen if the *Field Type* you select is *TOKEN*.



Token Work Field Overlay

The Token Work field Specifications overlay contains the following fields:

Length designates the number of character positions, or length, of this field.

Lowercase OK? indicates whether or not a modifiable item on an interactive screen can be entered in upper- and lowercase letters. If 'no' ☐, the entry is stored and displayed exclusively as uppercase, regardless of how a user enters the information. This entry does not affect statements. A lowercase value established with a statement overrides an 'no' in this field and displays as lowercase.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

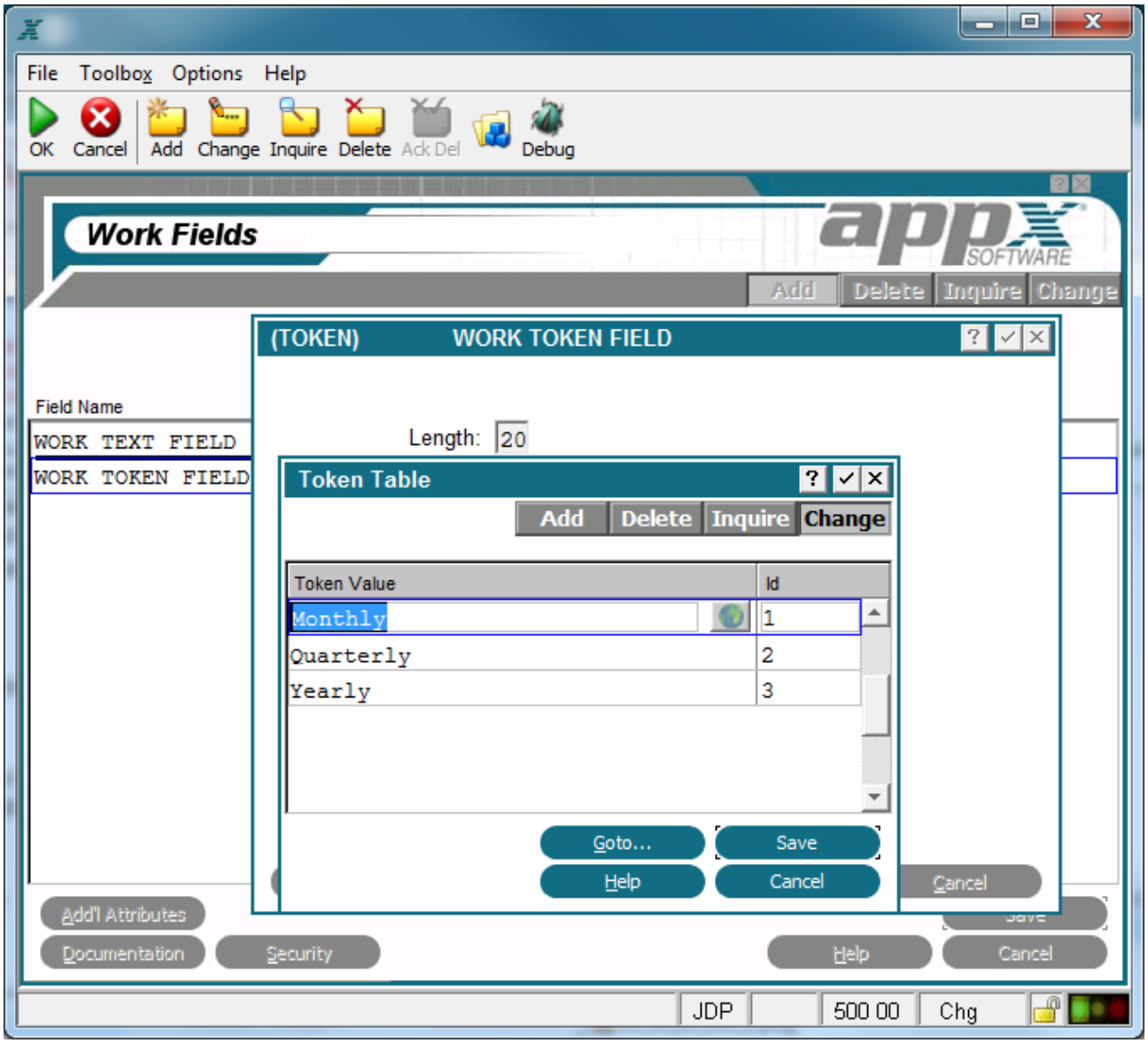
For Token work field type, the following options are available as described in the corresponding sections:

Additional Attributes

Token Table

Token Work Fields Token Table

token table accesses the Token Table overlay, shown below. A token table provides an alternative to the use of range checks for data token.



Token Work Fields Token Table Overlay

You can establish a token table for any Token work field in the data dictionary. The entries in the table are case-sensitive. If you enter a token value in all capital letters, an application user must enter the value in all capital letters.

Token table operations are database-independent. They access a designer-defined table in application design, not data contained in a file in a database, for the range of possible values. As a result, token does not vary from database to database. It is automatically available to, and exactly the same for, every database that is associated with an application.

The Token Table overlay contains the following fields:

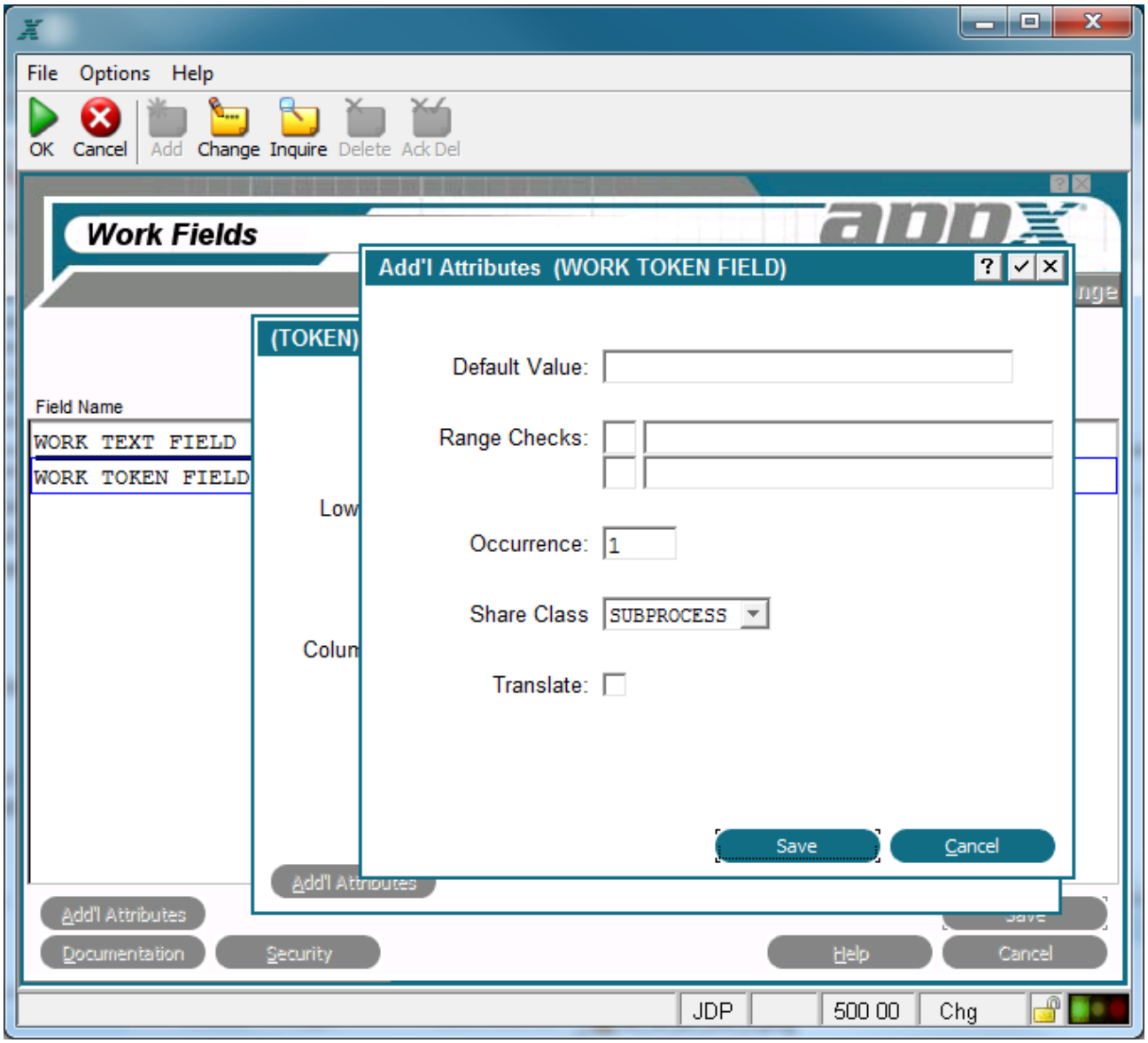
Token Value is the alphanumeric value associated with the token ID. APPX automatically translates between token values and ID's whenever necessary. This entry is case-sensitive. If entered in capital letters, an application user must also enter the value in capital letters.

ID displays a unique number that is defaulted by APPX. This specification establishes the binary value that APPX stores in place of the associated token value. APPXassigns the first token value an ID of *1*, with additional values assigned an ID that is equal to the highest existing ID plus *1*. The default can be overridden, but must be unique within a table. APPX does not require that ID's be contiguous within a table.

Goto... button will allow you to enter the Seq No for finding specific table entries quickly.

Token Work Fields Additional Attributes

From the Token field overlay, you have an Additional Attributesoption. The Token work field Additional Attributes overlay is shown below.



Token Work Field Additional Attributes Overlay

The Token Work field Additional Attributes Overlay contains the following fields:

Default Value establishes a modifiable starting value for all image items whenever they are first displayed in add mode in an input image, unless modified by a user. If blank, there is no starting value displayed on the image.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

NOT SHARED The values are available only for the current process.

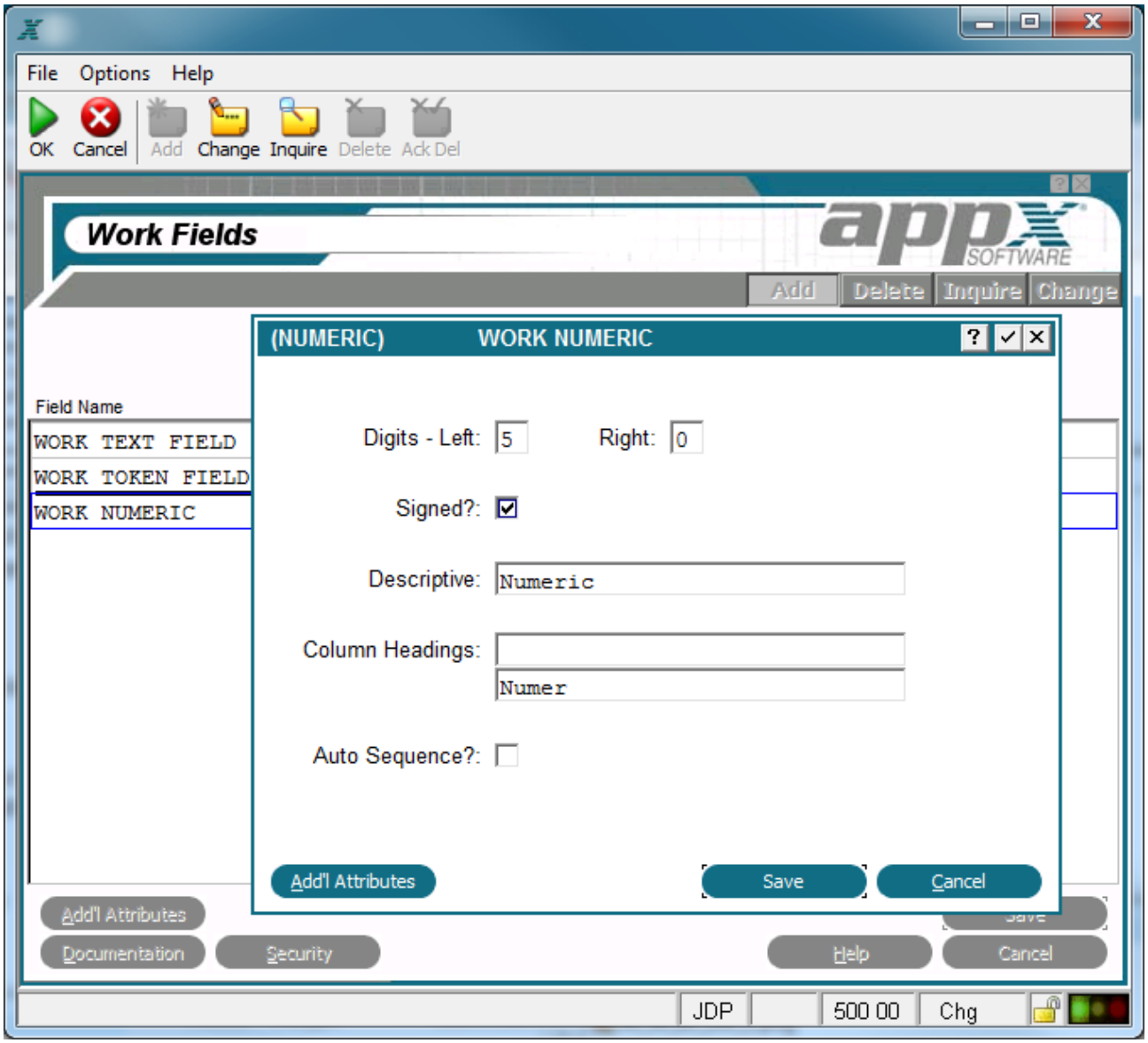
The default is *SUBPROCESS*.

Translate? indicates if the value of the work field should be translated into a designated language if APPX's Language Translation feature is being used. If the translation feature is not in use, retain the default value of ? (blank using Character Mode).

Numeric Work Fields

A *numeric* work field is restricted to number, decimal, and sign (-) entries. Examples include amounts, prices, and quantities.

The Numeric work fields overlay, shown below, permits you to add numeric-specific attributes to those already defined for the work field. It automatically displays after you complete the entries on the Work fields specifications screen if the *Field Type* youselect is *NUMERIC*.



Numeric Work Fields Overlay

The Numeric work fields overlay contains the following fields:

Digits Left. Enter the number of digits to the left of the decimal.

Digits Right. Enter the number of digits to the right of the decimal.

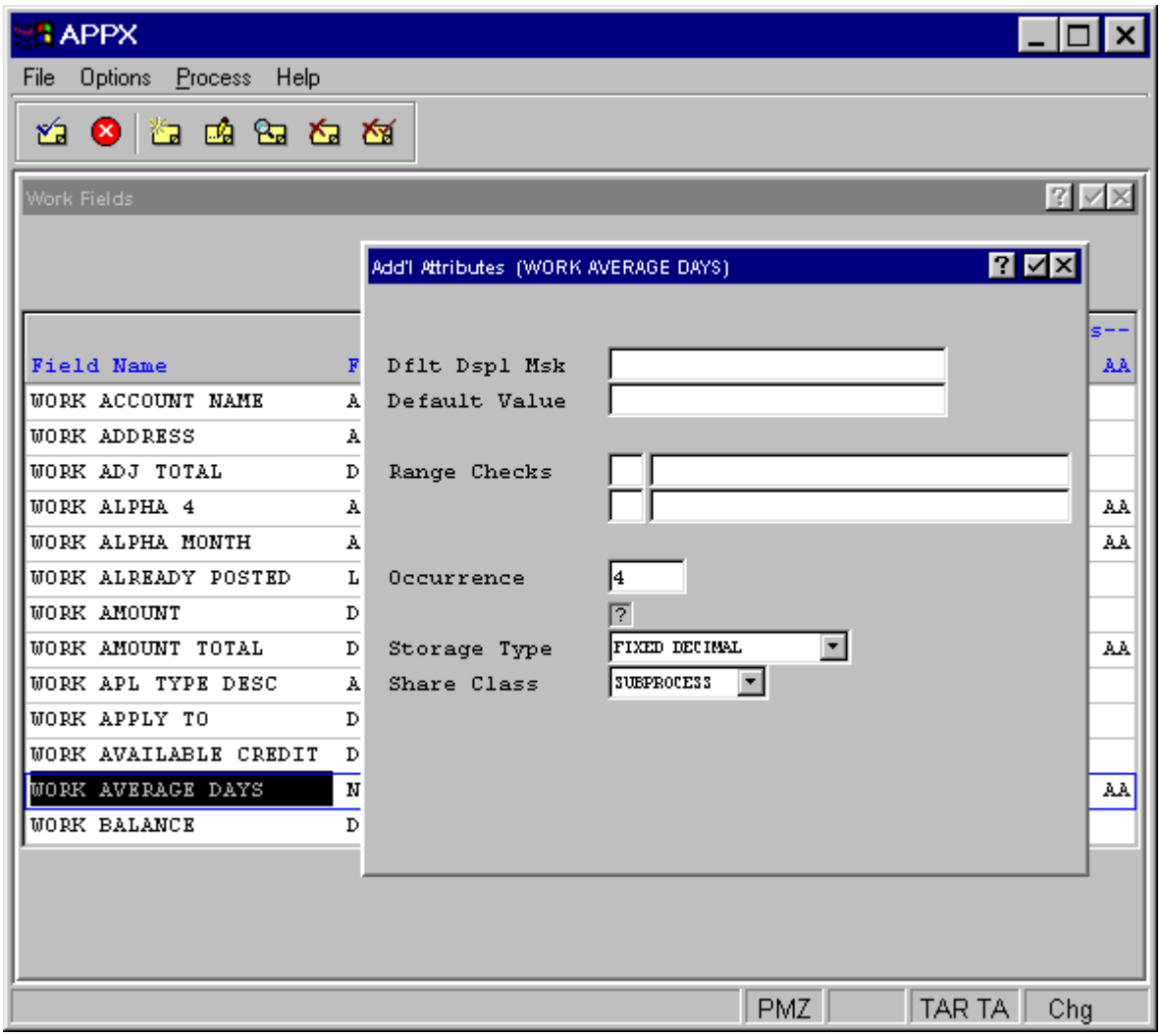
Signed? specifies whether the numbers entered in this field are positive or negative. A 'no' ☐ would ensure that only positive numbers are entered. The default is 'no'.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

Auto Seq? Select 'yes' ☑ if this numeric field represents a sequence number with a value that should be maintained by APPX. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐. Note that *Auto Seq?* only appears if the numeric field has no decimal places.

From the Numeric work fields overlay, you can select the Additional Attributes overlay, shown below.



Numeric Work Fields Additional Attributes Overlay

The numeric work fields Additional Attributes overlay contains the following fields:

Dflt Display Msk designates the format that the data displays to a user in an APPX image. This entry establishes the *Display Mask* default for all image items that reference the numeric field. If blank, APPX uses a display of nonfixed leading spaces with one significant digit. Refer to *Numeric Domains* for additional information about this entry.

Default Value establishes a starting value for all image items whenever they first display in add mode in an input image, unless modified by a user. If blank, the starting value is assumed to be the null value.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Storage Type determines the internal storage format for data. The *Storage Type* options are:

BINARY The number is stored in binary form. The high order bit determines the sign: on or *1* for positive, and off or *0* for negative. The decimal position is established by the *Decimals Left/Right* entries. The maximum field length is 10 digits for non-decimal numbers or 9 digits for decimal numbers.

FIXED DECIMAL employs a packed decimal format that stores two decimal digits for each byte with the exception of the last bit, which is the sign bit. The decimal position is established by the *Decimals Left/Right* entries. The maximum field length is 31 digits.

FLOATING DECIMAL employs a combination of binary and packed decimal formats that always requires a total of nine bytes of storage. Although the field definition allows for 15 digits to the left of the decimal point plus 15 digits to the right of the decimal point, only the first 15 digits of the actual number are stored. These 15 digits are stored as packed decimal with two decimal digits for each byte (for a total storage requirement of eight bytes). The final byte (binary) determines the maximum number of digits that currently appears to the right of the decimal.

The default is *FIXED DECIMAL*. For a comprehensive discussion of these options, see Numeric Storage Types.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

NOT SHARED The values are available only for the current process.

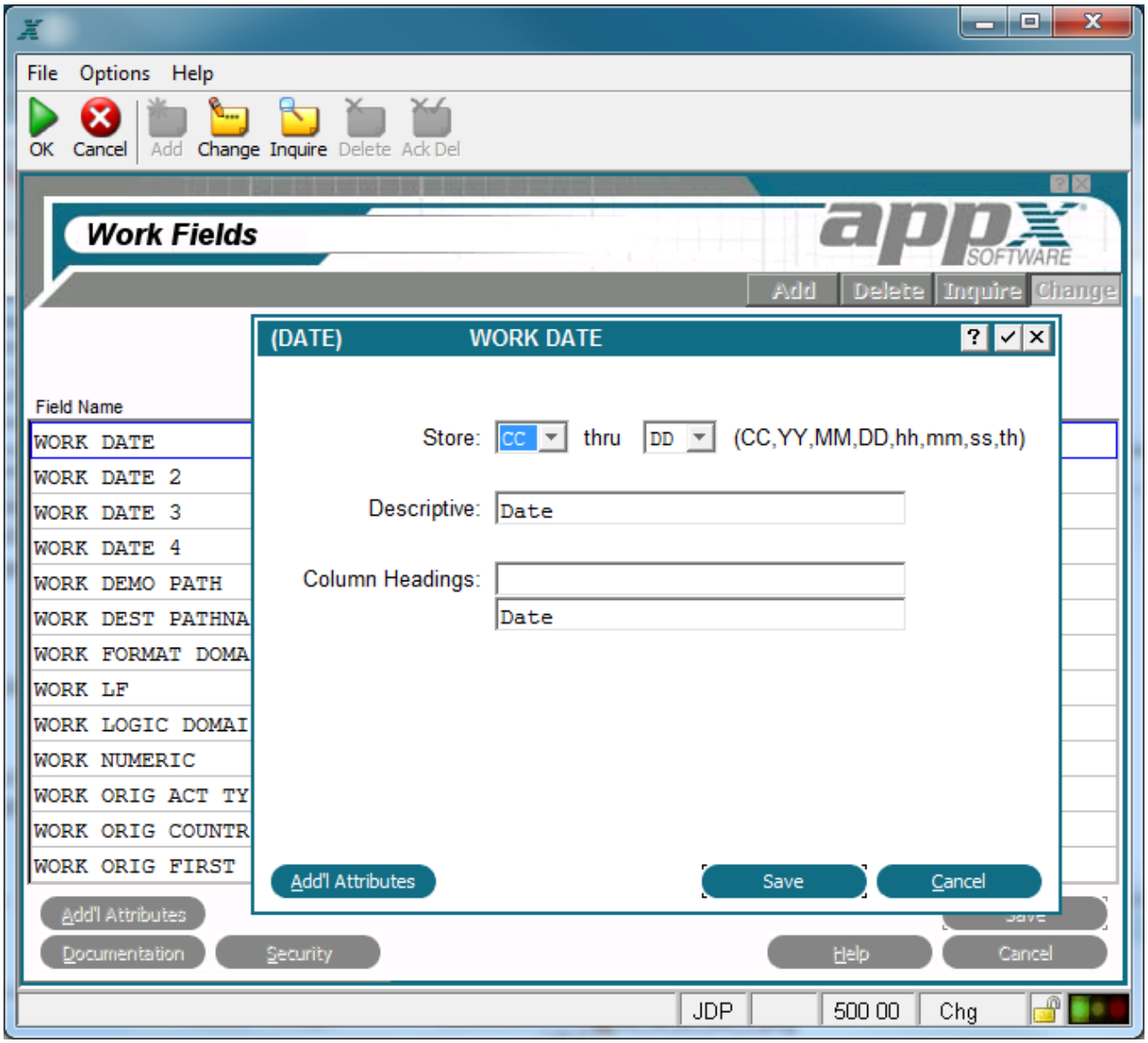
The default is *SUBPROCESS*.

Date Work Fields

A date work field contains date and/or time information. This information may, at your option, range from a century through a hundredth of a second. A work field definition may also include separator characters (such as */*, -, or :) and text, including the day of the week and the name of the month.

Examples of date/time work fields include invoice dates, order dates, elapsed time data, date/time stamps used to uniquely identify records, and audit trail work fields such as date-added and date-changed.

The Date work fields overlay, shown below, permits you to add date/time-specific attributes to those already defined for the work field. It automatically displays after you complete the entries in the Work fields specifications screen if the *Field Type* you select is *DATE*.



Date Work Fields Overlay

The Date work fields overlay contains the following fields:

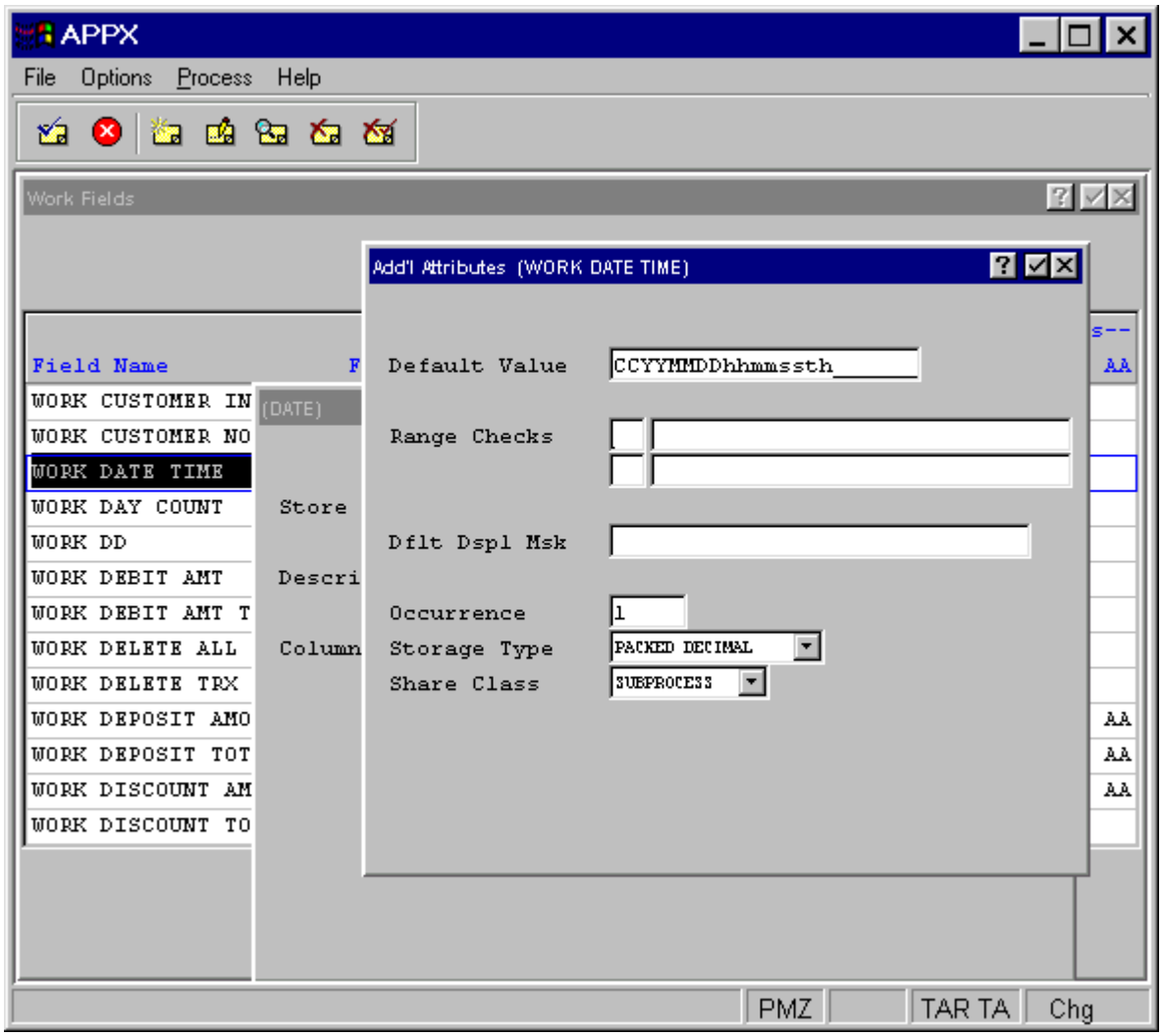
Store thru designates the parts of a date that are physically stored.Valid entries are:

CC	(Century)
YY	(Year)
MM	(Month)
DD	(Day)
hh	(Hour)
mm	(Minute)
ss	(Second)
th	(Tick (hundredth of a second))

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

The Additional Attributes overlay, shown in below, is accessible from the Date work fields overlay.



Date Work Fields Additional Attributes Overlay

The date work fields Additional Attributes overlay contains the following fields:

Default Value establishes a starting value for image items whenever they are first displayed in add mode on an input image, unless modified by a user. If blank, there is no starting value displayed.

Range Checks defines a series of allowable values that APPX uses for online data validation. The first component represents the relation. The options are ***EQ*** (equal to), ***NE*** (not equal to), ***GT*** (greater than), ***LT*** (less than), ***GE*** (greater than or equal to), and ***LE*** (less than or equal to). The second component represents the value that is assigned to the relation. If you enter two relations, APPX infers an AND relationship.

Dflt Dspl Msk controls how this field appears to a user on an APPX image, unless overridden at the image item level. If left blank, the date mask specified for the application (in Application File Maintenance in System Administration) is used or, if that is also blank, the date mask specified in System Parameters is used. Refer to the Display Mask (Date/Time) section in Using the Character Based Image Editor for additional information about this entry.

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Storage Type determines the internal storage format of the date field. The *Storage Type* options are:

BINARY ? The date is stored in binary format.

PACKED DECIMAL stores two decimal digits for each byte.

ALPHANUMERIC stores the external representation of data.

The default is PACKED DECIMAL.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

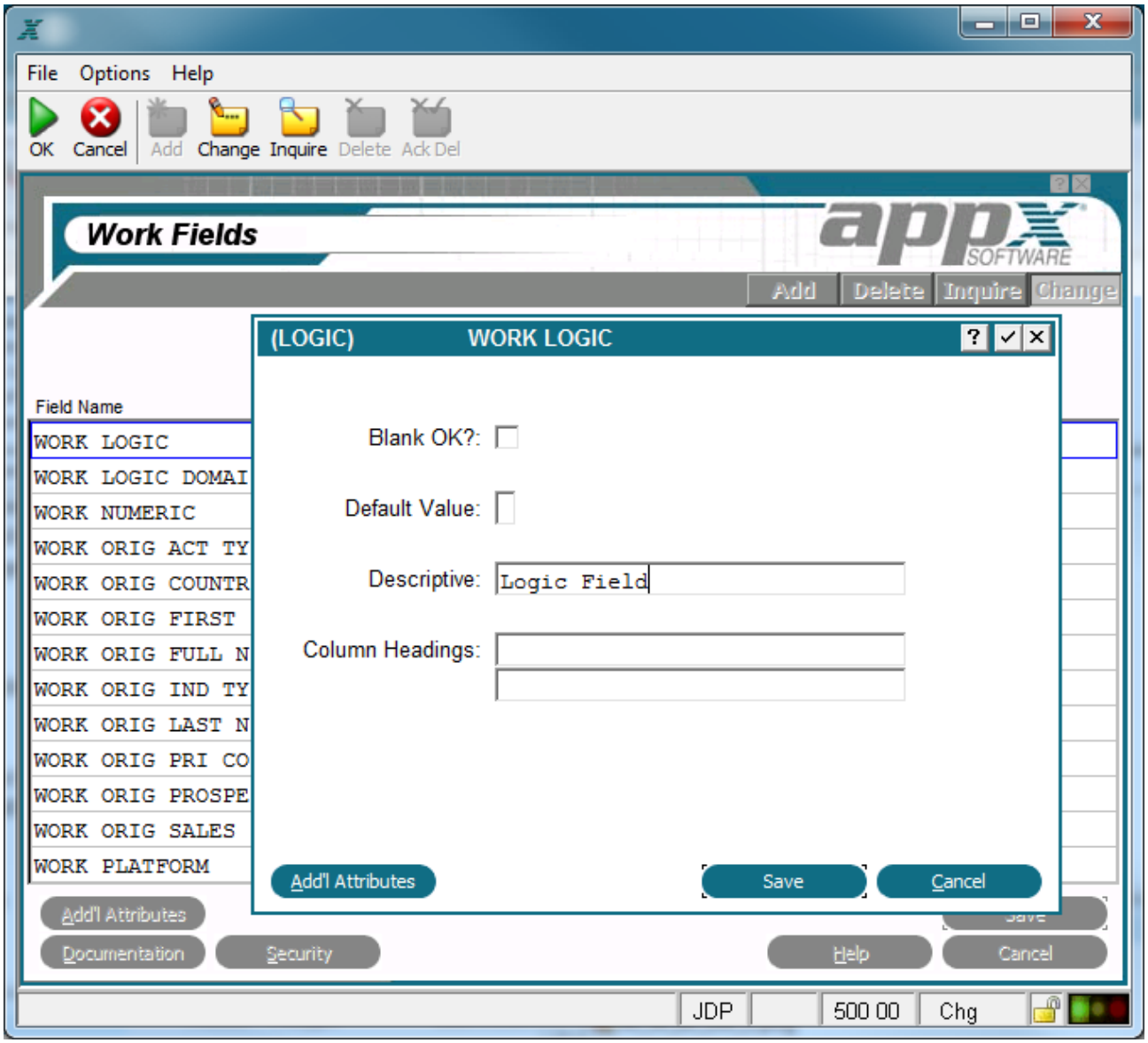
NOT SHARED The values are available only for the current process.

The default is SUBPROCESS.

Logic Work Fields

A *logic* work field has possible values of 'yes' ☑, 'no' ☐, or "unknown" ? (Y, N or blank using Character Mode). Examples include various application parameters such as whether or not to post transactions on an accrual basis, and control work fields that govern the execution of subroutines based upon an *exists/does not exist* condition.

The Logic work fields overlay, shown below, permits you to add logic-specific attributes to those already defined for the work field. It automatically displays after you complete the entries on the Work fields specifications screen if the *Field Type* you select is *LOGIC*.



Logic Work Fields Overlay

The Logic work fields overlay contains the following attributes:

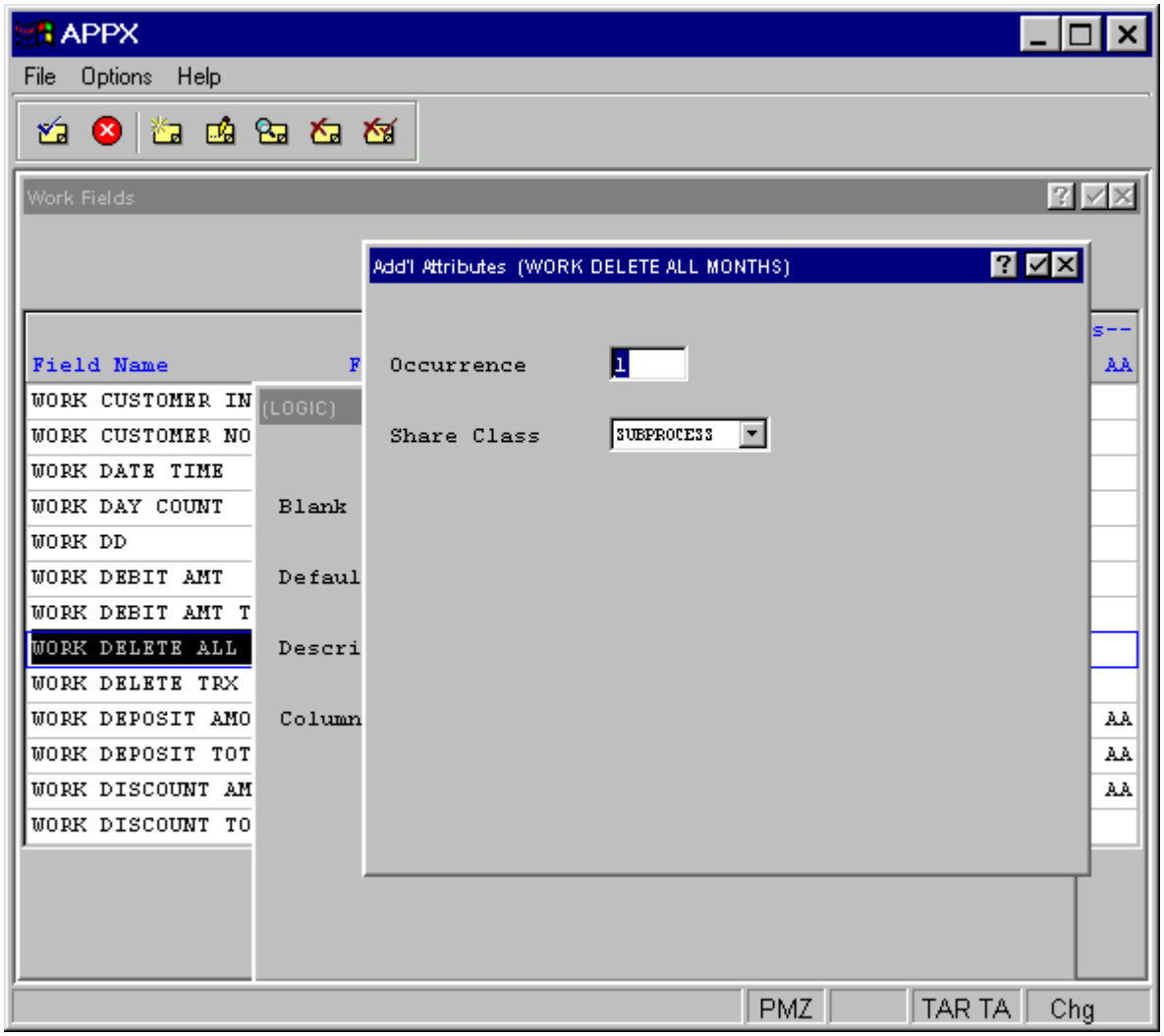
Blank OK? indicates, for information only, whether a user should be permitted to leave a field referencing this domain blank on an input image. (Whether or not such a field can actually be left blank is controlled by the image item specification 'Required?'.) The default is 'no' ☐ (N using Character Mode). Click the checkbox to toggle between 'yes' ☑ (Y using Character Mode) and 'no' ☐ (N using Character Mode) values.

Default Value establishes a starting value for image items whenever they first display in add mode on an input image, unless modified by a user. The *Default Value* options are blank (for unknown), Y or N.

Descriptive provides a longer, more easily understood alternative to *Field Name,* one that is *not* required to be unique within an application. If blank at all default levels, *Field Name* is used.

Column Hdgs designates up to two lines of column heading text. The APPX output process facility uses this text to generate standard column heading images for *Start of Page* and *Start of Range* class frames. For cosmetic reasons, the length of headings should not exceed the length of a field itself. Refer to Standard Column Heading Image for additional information.

The Additional Attributes overlay, shown below, is accessible from the Logic work fields overlay.



Logic Work Fields Additional Attributes Overlay

The logic work field Additional Attributes overlay contains the following fields:

Occurrence determines the number of times a field is present in a record. If blank, APPX assumes a value of 1. This field may contain up to five numeric characters and is restricted to a maximum of 32,767. See the Occurrence section for a more comprehensive discussion of this field.

Share Class defines at what level the values contained in this work field can be shared. The *Share Class* options are:

SUBPROCESS The values can be shared between a process and its subprocesses.

RELATED The values can be shared among related processes in a job.

DETACHED The values are available until the user logs off.

NOT SHARED The values are available only for the current process.

The default is *SUBPROCESS*.

CHAPTER 3-1

Overview of APPX Processes

Overview of Chapters 3-1 thru 3-16

Overview

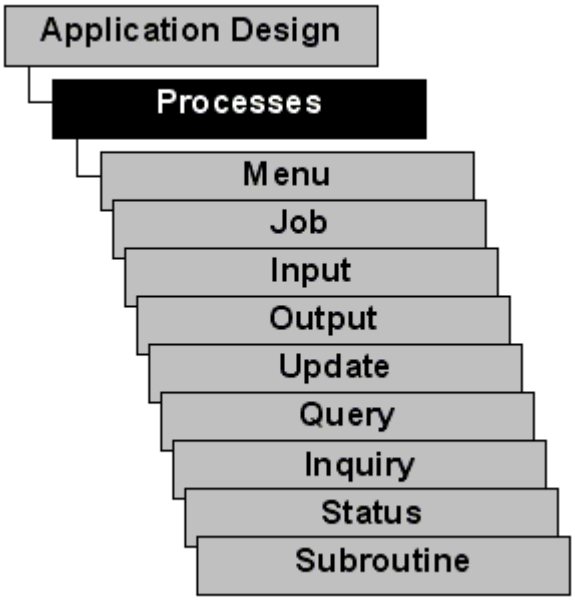
Processes are reusable software building blocks for constructing APPX applications. In the next several chapters of this manual provide a conceptual overview of APPX's process facility and detailed instructions for completing the specifications on process screens and overlays.

Before attempting to define a process, you should be thoroughly familiar with the information contained in both the *User Manual* and the introduction to the process facility in Understanding Process Design of thismanual.

Navigation Aids

To help you navigate the APPX process facility, refer to the schematic diagram below. Each block represents a single screen or overlay, with stacked groups of blocks indicating mutually exclusive screen presentations. Each path indicates a menu option or an implied option, based upon the specifications you enter on a previous screen, the key you press, or the mode you select.

You will see relevant parts of this diagram repeated throughout the manual to aid you with process navigation.



Process Definition Facility

The APPX Process Facility

Processes are the reusable software building blocks that, taken together and in conjunction with the data dictionary, comprise APPX applications. Each consists of the specifications, painted formats (images), and procedural routines (statements) that are required to perform a specific activity.

A process is similar to a program in traditional data processing systems in that it is:

Executed to perform one or more related functions or activities.

Comprised of a series of detailed instructions that are performed in a specified sequence.

The smallest unit of an application that can execute separately.

Accessing the Process Facility

You access the APPX process facility from the Application Design menu, shown below.

Application Design Menu

When you choose *Process Management* from the Application Design menu, APPX displays the menu for process definition.

Process Types

To streamline the definition of a process, APPX categorizes the various activities that you can reasonably expect an application to perform into two groups.

Form Based Objects

Menu processes, which provide an on-screen display from which to execute selected processes. For example, a screen that lists the reports that are available in an application and from which you select a specific report is a menu process. Refer to Menu Processes for a discussion of menu specifications.

Input processes, which permit you to enter or maintain data in one or more files from designer-formatted screens and overlays. A sales order entry function and a customer file maintenance function are both input processes. Refer to Input Processes for a discussion of input specifications.

Inquiry processes, which extract a record or a specific set of records from the database, and display the information on the screen. Refer to Inquiry Processes for a discussion of inquiry specifications.

Output processes, which convey information from a database, either on the screen or in hard copy. Trial balances, product purchase history reports, and customer lists are all examples of output processes. Refer to Output Processes for a discussion of output specifications.

Processing Objects

Query processes, which determine the records that are available to a subsequent input, update, or output process, and/or establish the data?s sort hierarchy. Refer to Query Processes for a discussion of query specifications.

Update processes, which alter the database by adding records, deleting records, or changing information based on designer-established criteria. Refer to Update Processes for a discussion of update specifications.

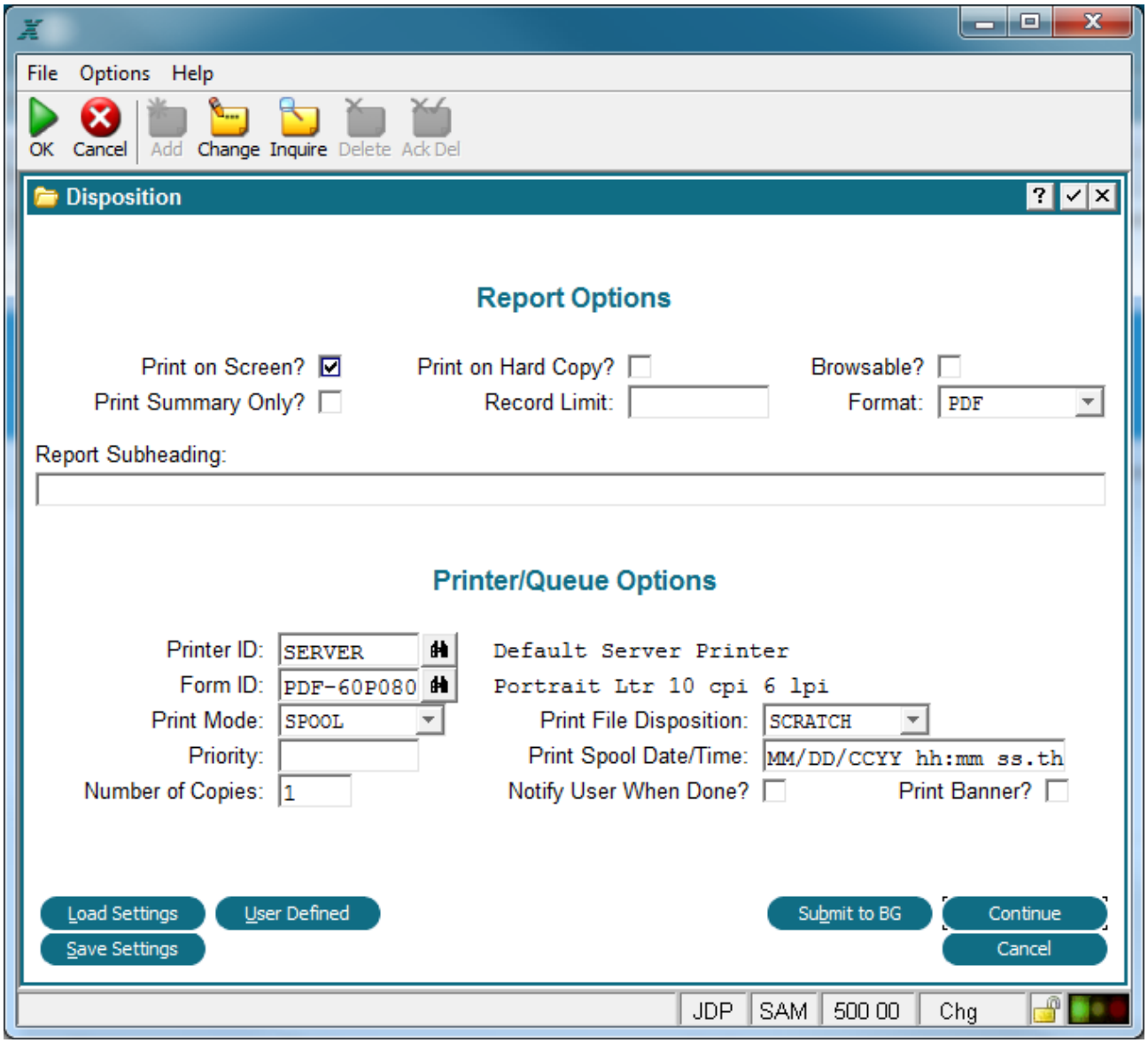
Subroutine processes, which define reusable procedural programs that can be executed from other APPX processes. A program that converts one unit of measure to another, for example, can be written as a subroutine. Refer to Subroutine Processes for a discussion of subroutine specifications.

Job processes, which control the sequencing of other related processes. Refer to Job Processes for a discussion of job specifications.

Status processes, which interrogate the database and warn the operator of possible error conditions. Refer to Status Processes for a discussion of status specifications.

Predefined Processes

In addition to creating your own processes, you can employ any of a number of *predefined processes*. A predefined process is an already-developed process, made available to you in the *runtime* application. Examples of predefined processes include APPX's standard DISPOSITION screen (shown below and SELECT DATABASE screen.



Disposition Predefined Process

You can invoke a predefined process at any time, and in much the same fashion as a designer-defined process. Predefined processes are located in the runtime application (application ID ---).

Each process is comprised of one or more of the following components:

A *frame* is a control structure for the sequencing of multiple events, which can occur within a single process.

An *image* is a designer-painted format that displays to the user as a menu, input screen, or an output (presented either on the screen or as hard copy). This image may be *optional, repeating,* or *scrolling*.

A *process control file (PCF)* is an APPX file that is automatically managed by a specific process. For example, the PCF for a process that permits you to input sales orders is the orders file. The PCF is the only file that APPX automatically reads, writes, rewrites, and deletes records for during process execution.

A *child process invocation* is a set of specifications that link execution of another APPX process to a process. If the invocation of the child process is discretionary, based upon selection of a screen option, the process is an *optional child*. If the invocation is not discretionary, the process is an *automatic child*. Refer to Automatic and Optional Children for more information.

An *event point* provides an opportunity to insert designer-defined procedural code (statements) into the execution of a process. There are a variety of APPX event points, each providing access to a process at a specific point in its execution sequence.

Not all process types, however, include all of these components. Valid component and process-type combinations are outlined in the table below.

Component	Menu	Job	Input	Output	Update	Query	Inquiry	Status	Subr
Process Contol File			Yes	Yes	Yes	Yes	Yes		
Frame		Yes	Yes	Yes	Yes	Yes	Yes		
Image			Yes	Yes			Yes		
Automatic Child Invoc		Yes	Yes	Yes	Yes		Yes		
Optional Child Invoc	Yes		Yes						
Event Points	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Process Components

Frames

A *frame* is a control structure for the sequencing of events within a process. Each process consists of one or more frames, executed according to their relative sequence number.

Each frame defines a specific activity, or set of actions, that are performed as part of a process. These actions include such things as the display of information to a user, retrieval of information from a user, execution of procedural code, and the invocation of other processes. For example, a single input process may require several screens to enter all of the necessary data, each of which represents a separate frame in the process.

If a process has a related process control file (PCF), the sequence of frames is executed once for each PCF record that is processed. For example, a transaction report program, with a transaction file PCF, executes its frame sequence once for every record in the transaction file. If the process does not have a PCF, the sequences of frames executes once, and the process ends.

The frame chronology is modified slightly for the following types of frames:

An ***optional frame,*** containing an image that conditionally displays based upon the value in the predefined field ALTERNATE IMAGE NUMBER. APPX does not display the image for an optional frame if the value is *0*.

A ***repeating frame,*** containing an image that continues to display repeatedly until the value in the ALTERNATE IMAGE NUMBER predefined field is *0*.

A ***scrolling frame,*** which is a type of input or output frame that displays more than a single image (one for each record, up to a maximum number of images) and formats those images into rows and columns. Refer to The Effect of Scrolling Frames on Screen and Page Positioning section for a detailed discussion of scrolling frames.

The functions of a frame vary slightly from one process type to another. In general, a frame:

Sequences multiple activities (including the invocation of automatic child processes), which occur within the confines of a single process.

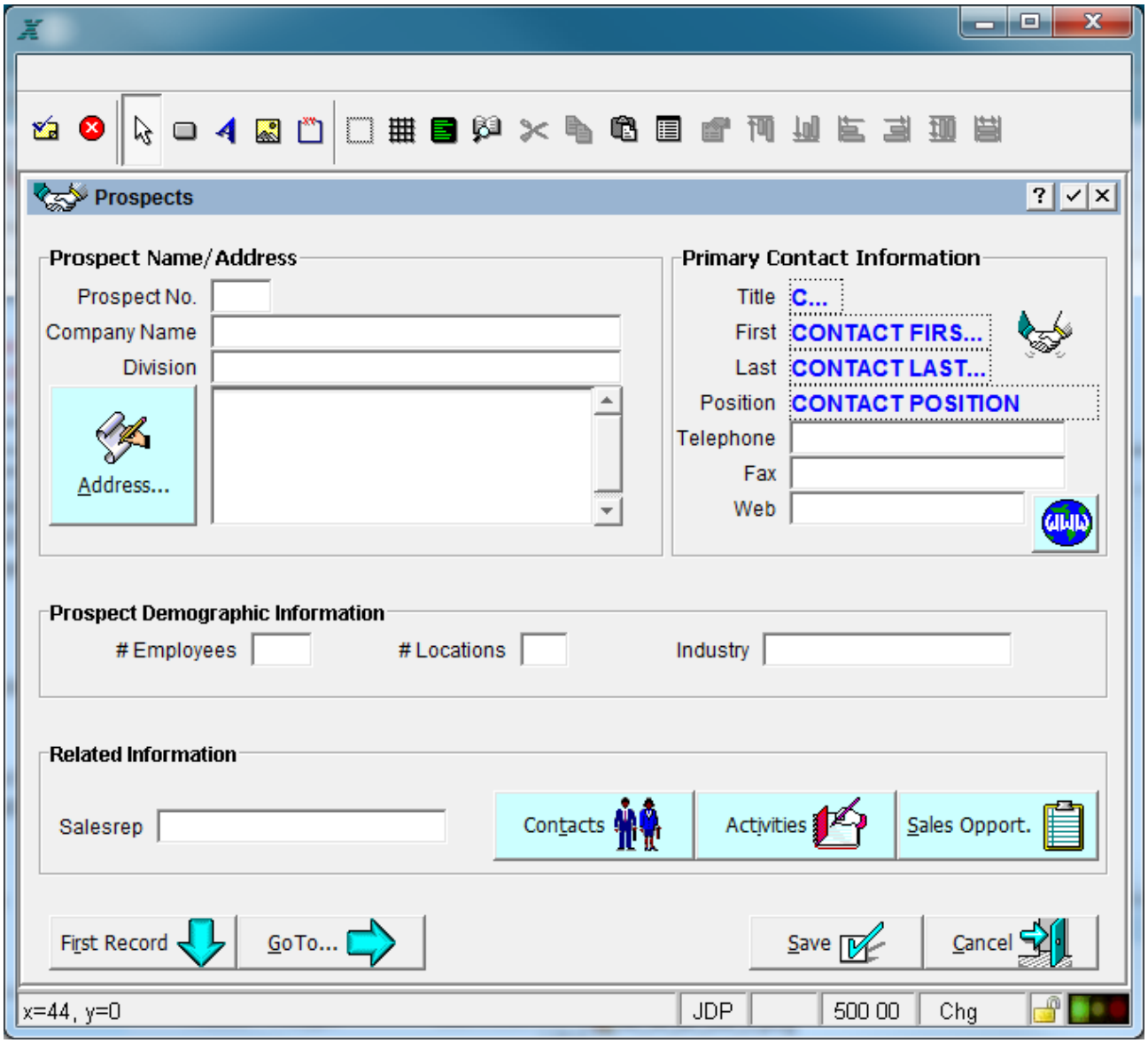
Defines a region of the screen or printed output that images can display on.

Groups alternate images.

The frame itself incorporates both the image component of a process and a subset of the process event points. In addition, each frame may invoke one or more automatic child processes.

Images

An *image* is a designer-painted format that presents information and options to a user, or retrieves information and option requests from a user. Menu, input, inquiry, and output processes all utilize images. An example of an input image is shown below.



An APPX Input Process Image

Images consist of four primary components:

Items,which are individual appearances of a field from the data dictionary, as painted on an image. An item's appearance is affected by the specifications you enter in the dictionary, the display characteristics you define when the item is painted, and any graphical attributes assigned to the item.

Text consists of descriptions and identifying labels that are added to an image. Option names on menus, and column headings and field labels on input screens, are examples of background text.

Characteristics are specifications that correspond to display attributes for items and text. Characteristics such as underlining apply to both screen displays and hard copy output. Other characteristics such as inverse/normal presentation, blinking, and bright/dim controls apply only to a screen image.

Graphical attributes are components such as wallpapers, titlebars, menu bar items, toolbar items, icons, and other features that are not part of the actual "image" you paint. These are applicable only if you are using the APPX Client for a GUI-enabled environment.

Alternate Images:

An image may be the only image for a frame, or one of a number of *alternate images*. An alternate image is one of a group of mutually exclusive images, the display of which is dependent upon the number that is assigned to the image and the value in the predefined field ALTERNATE IMAGE NUMBER.

For example, you might create a customer input process that requires a user to complete specifications on two screens. The first screen contains basic customer information, including a customer type field that indicates whether a customer is domestic or international. Since different information is needed for the two types of customers, the image presented on the second screen depends upon the customer type entry. In other words, the frame definition for the first screen has only one image whereas the frame definition for the second screen has two alternate images (one domestic and one international), with image selection based upon the value in the customer type field.

Process Control Files

A process can operate on the data that is contained in any number of files through use of ILF routines, but it can *automatically manage* only one file. This automatically managed file is referred to as the *process control file (PCF) and it applies to input, output, update, query, and inquiry processes*. For example, the PCF for a customer maintenance input process is the customer file. APPX automatically reads the PCF while executing the process. In addition, for input processes only, APPX automatically writes, rewrites, and deletes records in the PCF as a function of process execution.

If you want to automatically maintain more than one file, such as entering sales order header information and line item information together, create a separate process for each file and link them together. For example, invoke the line item process as an *automatic child*from the sales order header process. APPX also provides for updating the child PCF for automatic children of input processes to ensure relational integrity. See the following sections, Automatic and Optional Child Invocation and Process Lineage, for additional information on parent and child processes.

A PCF is *optional* for input and output processes. An input process that does not include a PCF will execute once, and then automatically end (as opposed to executing once for every record). Output processes that do not specify a PCF can be used, for example, to produce standardized page headings and page footers.

Update, query, and inquiry processes must have a process control file. Menu, job, status, and subroutine processes *cannot* have a PCF.

Automatic and Optional Child Invocations

A *child* process is the process that is invoked from another process (the parent). The invocation of a child process from the parent process can be *automatic* or *optional*.

If invocation of a child is not discretionary on the part of the application user, the child process is an automatic child. Automatic children are related to a frame, and are always invoked by APPX after processing the images for that frame. Input, output, update, job, and inquiry processes are the only process types that support automatic children. Menu, query, status, and subroutine processes do not.

If invocation of a child is discretionary on the part of the application user, the child is an optional child. Optional children can only be invoked from interactive images in menu and input processes. They are related to an image, and only invoke if a user selects the options that identify them. A traditional menu image, for example, contains one option for each process you can select from the menu, as shown below.

A Menu's Optional Children

The table below illustrates the types of processes that can be used to invoke children. As shown, optional children can be invoked from menu and input processes while automatic children can be invoked from job, input, output, update, and inquiry processes. Query, status, and subroutine processes cannot be used to invoke children of any kind.

Process Type	Optional Children ?	Automatic Children ?
Menu	Yes	
Job		Yes
Input	Yes	Yes
Output		Yes
Update		Yes

Process Type	Optional Children ?	Automatic Children ?
Query		
Inquiry		Yes
Status		
Subroutine		

Combinations of Process Type/Child

You can establish selection criteria to restrict the PCF records that APPX accesses for an automatic or optional child. For example, you can use selection criteria to constrain a line item process, so only those line items that belong to the current order are accessed. In this case, the selection criteria require that the line item order number in the child process is equal to the order number in the parent process. See Automatic and Optional Children for a detailed discussion of various options.

Invocation Types

The way a child process is invoked from its parent establishes the boundaries of shared information between the two processes. In other words, the *parent process* uses the value in an *Invocation Type* specification to define how tightly coupled the child is to the parent. It governs the information that can be passed and shared between processes. Whether or not a specific item of information *is* passed or shared depends upon pass and share specifications entered in the data dictionary, or defined explicitly with statements.

There are three distinct invocation types: *subprocess, related,* and *detached* (in order from most to least tightly coupled). If you use the data dictionary default values and do not explicitly pass information with statements, the various invocation types function as follows:

A child invoked as a *subprocess* shares record areas, file position information (for READNEXT operations, among others), and the contents of both permanent and temporary files with the process it was invoked from.

A child invoked as a *related* process shares the contents of permanent and temporary files with the process it was invoked from. It does not share file position information, and it maintains its own record area in memory.

A child invoked as a *detached* process shares only the contents of any permanent files.

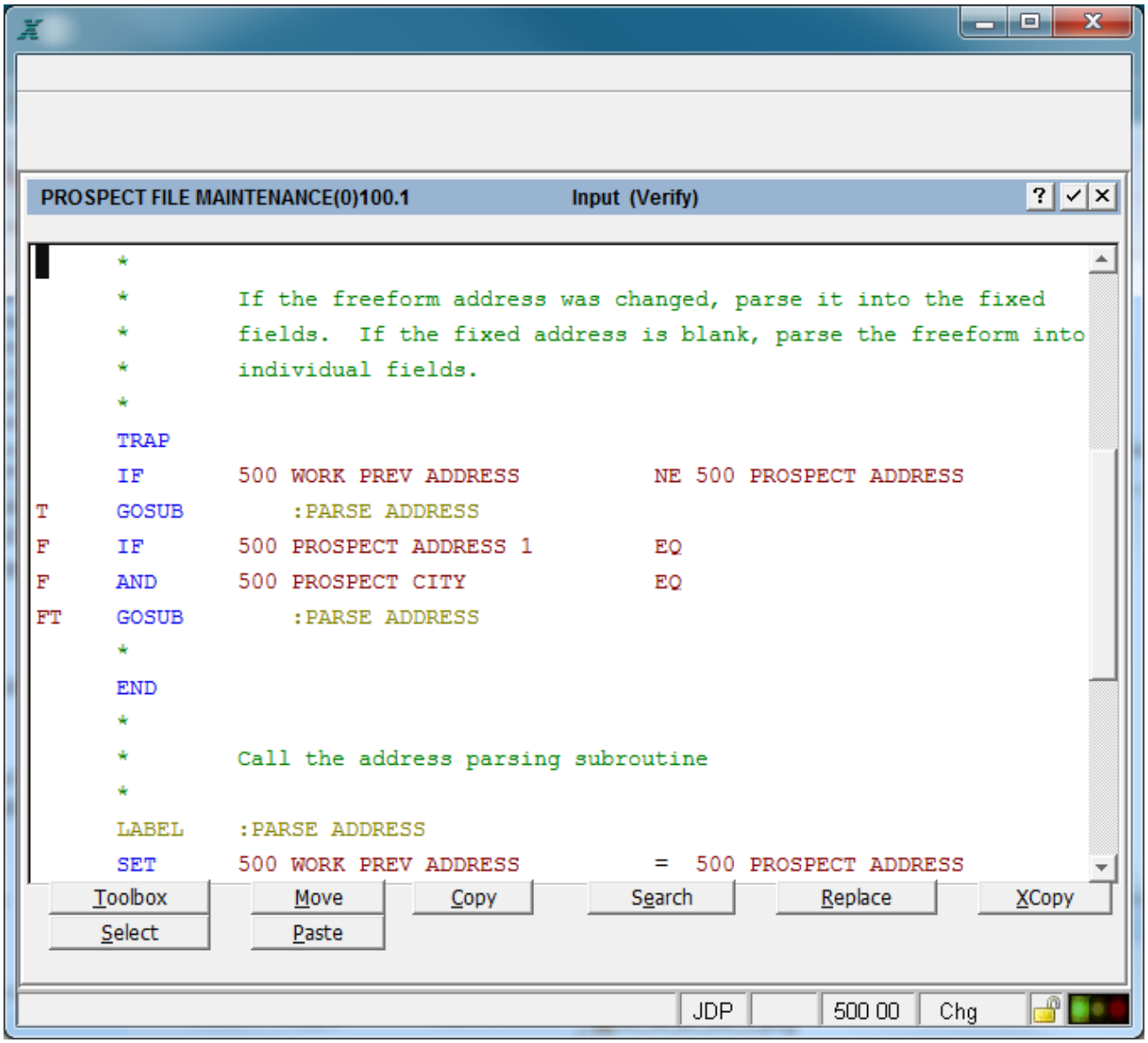
Refer to Interprocess Communication for a complete discussion of detached, related, and subprocess files and processes.

Event Points

Defining an APPX application is essentially non-procedural; you complete specifications to determine *what* is to be accomplished, not *how* it is accomplished. Non-procedural specifications can be said to satisfy the data processing requirements that are imposed by routine business operations.

To respond effectively to nonstandard requirements, APPX integrates high-level procedural code, or *statements,* located in the *integrated language facility (ILF)*. APPX's statements are a set of keywords entered through a specialized editor to enforce syntax. Refer to this manual for a complete discussion of APPX's integrated procedural language.

You can insert this procedural code into the execution sequence of a process at various times through *event points.* The event point, an example of which is shown below, provides an opportunity to insert procedural code into the execution of the process. Each event point can contain a sequence of statements that are executed at a specific, predetermined point within each APPX process to address the required specialized task. Commonly used groups of statements can also be defined once in a subroutine process, and then accessed by an event point or executed as an optional or automatic child.



An Event Point

There are a number of APPX event points, each of which provides access to a process at a specific point in its execution sequence. They exist at four levels: process, frame, image, and child invocation. In addition, each type of process has a slight variation in the specific event points it includes at each level. The following table summarizes the event points that execute for each process type.

Refer to Using Event Points for general information about each event point, including a definition and the chronology according to which it executes.

Event Point

Process Level	Menu	Job	Input	Output	Update	Query	Inquiry	Status	Subr
Start of Process	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Process Level	Menu	Job	Input	Output	Update	Query	Inquiry	Status	Subr
Set Run-Time Defaults			Yes						
Post PCF Read			Yes	Yes			Yes		
Pre-PCF Update			Yes						
Post-PCF Update			Yes						
Start of Query Execution						Yes			
Establish PCF Range						Yes			
Pre-User Selection						Yes			
Post User Selection						Yes			
End of Query Execution						Yes			
End of Process	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
File Level EP's			Yes	Yes	Yes	Yes	Yes		

Frame Level	Menu	Job	Input	Output	Update	Query	Inquiry	Status	Subr
Select Image			Yes	Yes			Yes		
Global Start of Frame			Yes	Yes			Yes		
Global Pre-Display			Yes	Yes			Yes		
Global Option Intercept			Yes				Yes		
End of Frame			Yes	Yes			Yes		

Image Level	Menu	Job	Input	Output	Update	Query	Inquiry	Status	Subr
Pre-Display	Yes		Yes	Yes			Yes		
Pre-Display Verify;			Yes				Yes		
Option Intercept	Yes		Yes				Yes		
Verify			Yes				Yes		

Child Level	Menu	Job	Input	Output	Update	Query	Inquiry	Status	Subr
Pre-Invocation;	Yes	Yes	Yes	Yes	Yes		Yes		
Post Invocation	Yes	Yes	Yes	Yes	Yes		Yes		

Process Event Points for Rules

Process Lineage

The term *process lineage* refers to the specific relationship between two or more processes in an APPX application. You can describe relationships between processes in much the same fashion as relationships between individuals in an extended family. As with family lineage, where relationship terms (such as parent or grandfather) are relative to a particular individual, process terms are relative to a specific process. The lineage concepts in this section are relevant to all APPX processes.

The Process Tree

A *process tree* is a schematic of the interconnections between processes that are in any fashion related to one another. The process facility diagram at the beginning of this chapter is an example of a process tree.

The Parent

A *parent* process is the process another process (the child) invokes from. A parent process is commonly used in situations where you require APPX to automatically manage more than one file (PCF). The first file is the PCF for a parent process, and the other files are PCFs for child processes. For example, an invoice entry process is actually operating on the data that is maintained in two files: an invoice header file and a line items file. To automatically manage both files, APPX requires two processes. An invoice header input process is a parent to an invoice line item input process.

Children

A *child* process is the process that invokes from another process (the parent). In the previous example, the line item input process is the child of the invoice header parent.

As previously indicated, the invocation of a child process from the parent process can be automatic or optional. If invocation of the child is not discretionary on the part of the user, the child process is an automatic child. If invocation of the child is discretionary on the part of the application user, the child is an optional child.

Siblings

Two processes with the same parent are *sibling* processes. For example, an employee file maintenance process might be established as the parent for two child processes: an earnings process and a deductions process for each employee. The earnings and deductions processes are siblings because they both have the same parent process: employee file maintenance.

Ancestors and Descendents

Ancestor processes include parent processes, *grandparent* processes (the parent's parent), if any, etc.

Descendent processes include child processes, the child's children (if any), and so on.

Families

A *family* is a group of processes that include a *patriarch* process and a set of descendents linked by a common attribute (a specific invocation type, for example). The term patriarch refers to the first process that exhibits the identified attribute; it begins the process family. By definition, the patriarch will not share the attribute with its parent process.

The use of the term *family* is generally further qualified by including the name of the specification that is shared (or the specification value). These terms include:

Subprocess family, which is a group of processes that are invoked with an *Invocation Type* (on the Child specification screen) of *SUBPROCESS*. The first process in a process tree that is invoked as a subprocess begins this family, and the first process that is invoked as a related or a detached process marks the end of this family.

Related process family, which is a group of processes that are invoked with an *Invocation Type* (on the Child specification screen) of *SUBPROCESS* or *RELATED*. The first process in a process tree that is invoked as a subprocess or a related process begins this family, and the first process that is invoked as a detached process marks the end of this family.

Report family, which is a group of output processes in a subprocess family that share a common print file (the *Report File Name* on the Output Processes specification screen).

Log family, which is a group of update processes in a subprocess family that share a common log file (the *Log File Name* on the Update Processes? Additional Attributes specification screen).

The Process Cycle

A single execution of an entire sequence of frames, images, event points, and children for one record in the process control file is referred to as a *process cycle*. For example, assume you created a process with a single frame, a single image, and one automatic child. In addition, you defined statements in Start of Frame and End of Frame, Pre-Display and Option Intercept, and Pre-Invocation and Post Invocation event points. For each record, the process cycle consists of the following APPX actions:

Read a record in the process control file.

Invoke the Start of Frame event point.

Perform image processing.

Invoke the Pre-Display event point.

Display the image to the screen.

User completes the entry.)

Invoke the Option Intercept event point.

Invoke the End of Frame event point.

Perform automatic child processing.

Invoke the Pre-Invocation event point.

Perform processing as specified for the child process.

Invoke the Pre-Display event point.

Invoke the Post Invocation event point.

Design Audit History

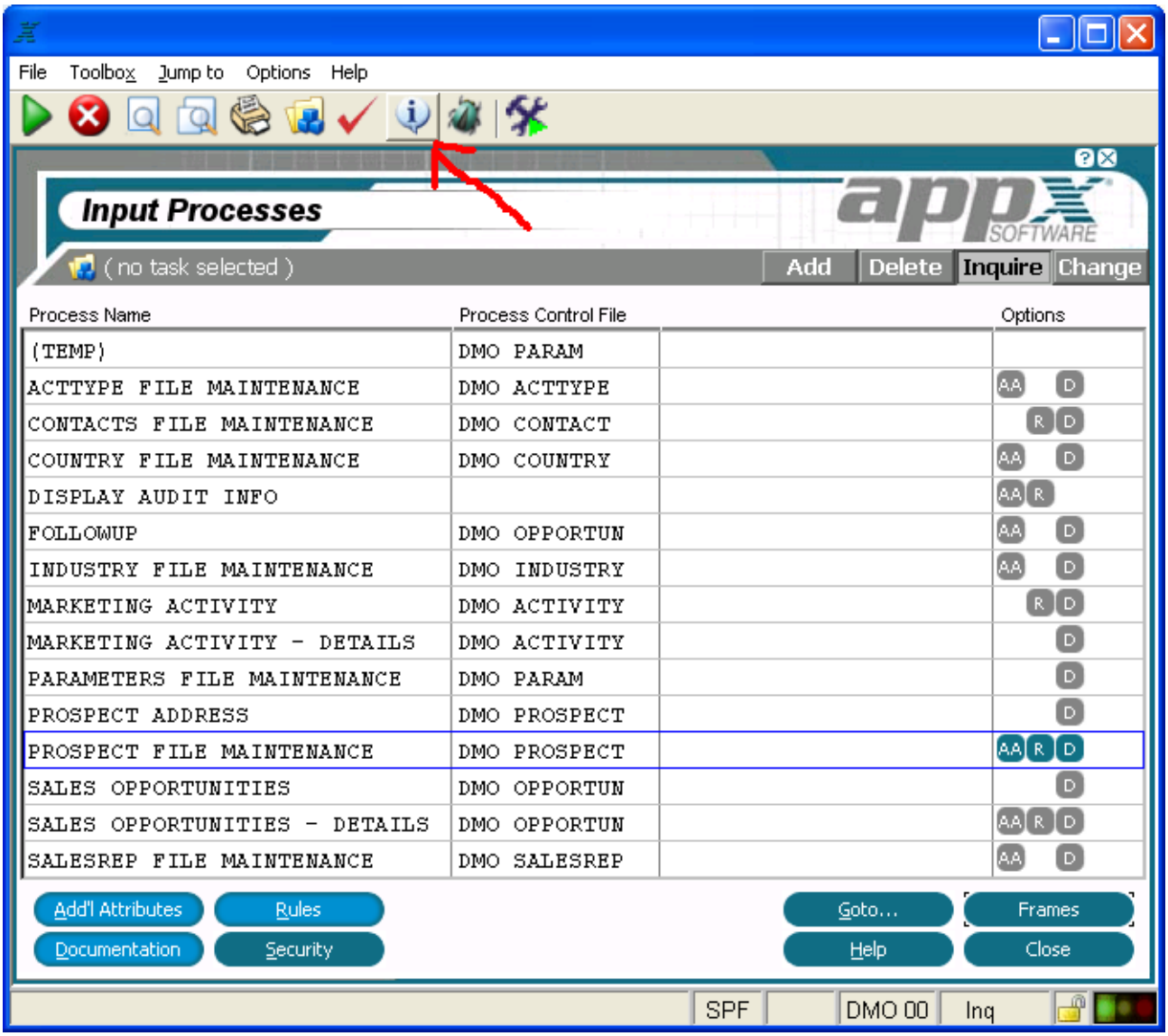
Application Design Audit History

Each APPX application has an Audit History design file (AUDTHIST) which is used to record a history of each change made within an application.

An audit history record is written each time a change is made or when a design element is added to a file or process while in APPX Application Design. Each audit history record contains the date and time the change was made, the user ID of the designer who made the change, the mode the designer was in when the change was made, the design level, a message indicating the event point in which the change was made, and a note entered by the designer describing the nature of the change. The audit history records represent a chronological record of changes made to an application over time.

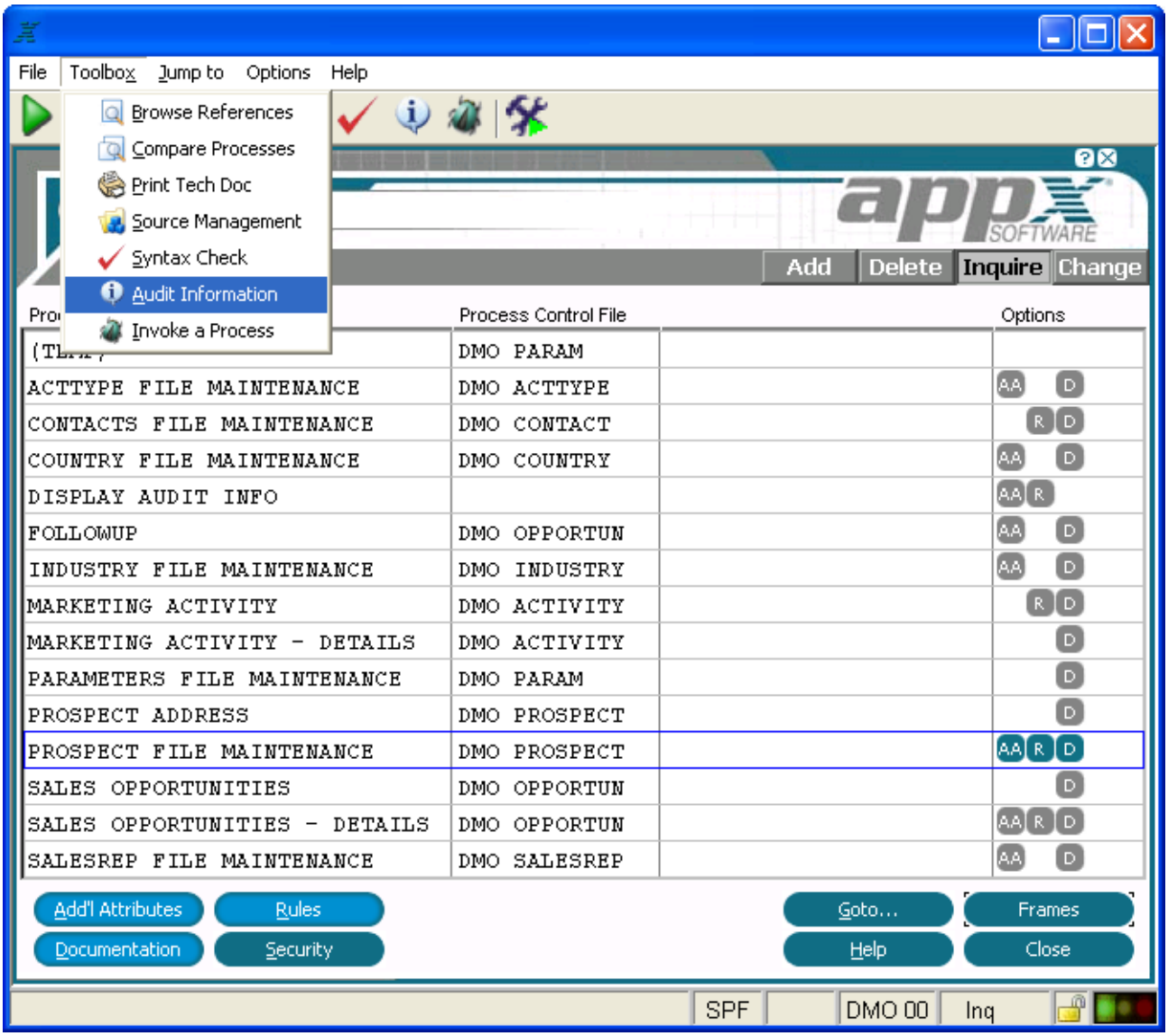
Object History

When designing an object, the Audit Information toolbar button can be used to view the audit history of the current object. See below.



Audit Information Button

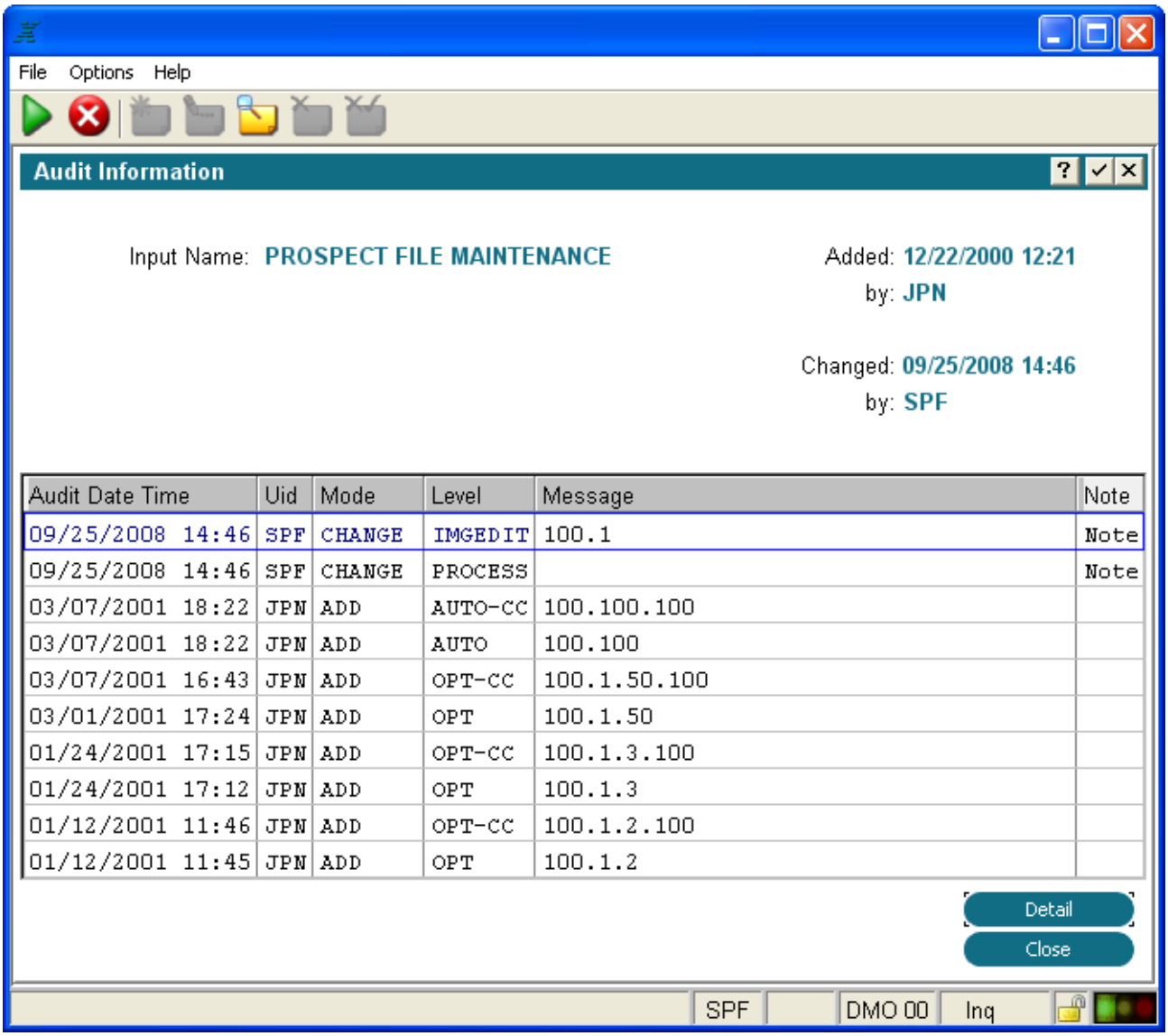
The audit history for the current object can also be accessed by invoking the Audit Information menu item on the Toolbox pull-down menu. See below.



Audit Information Button Toolbox Option

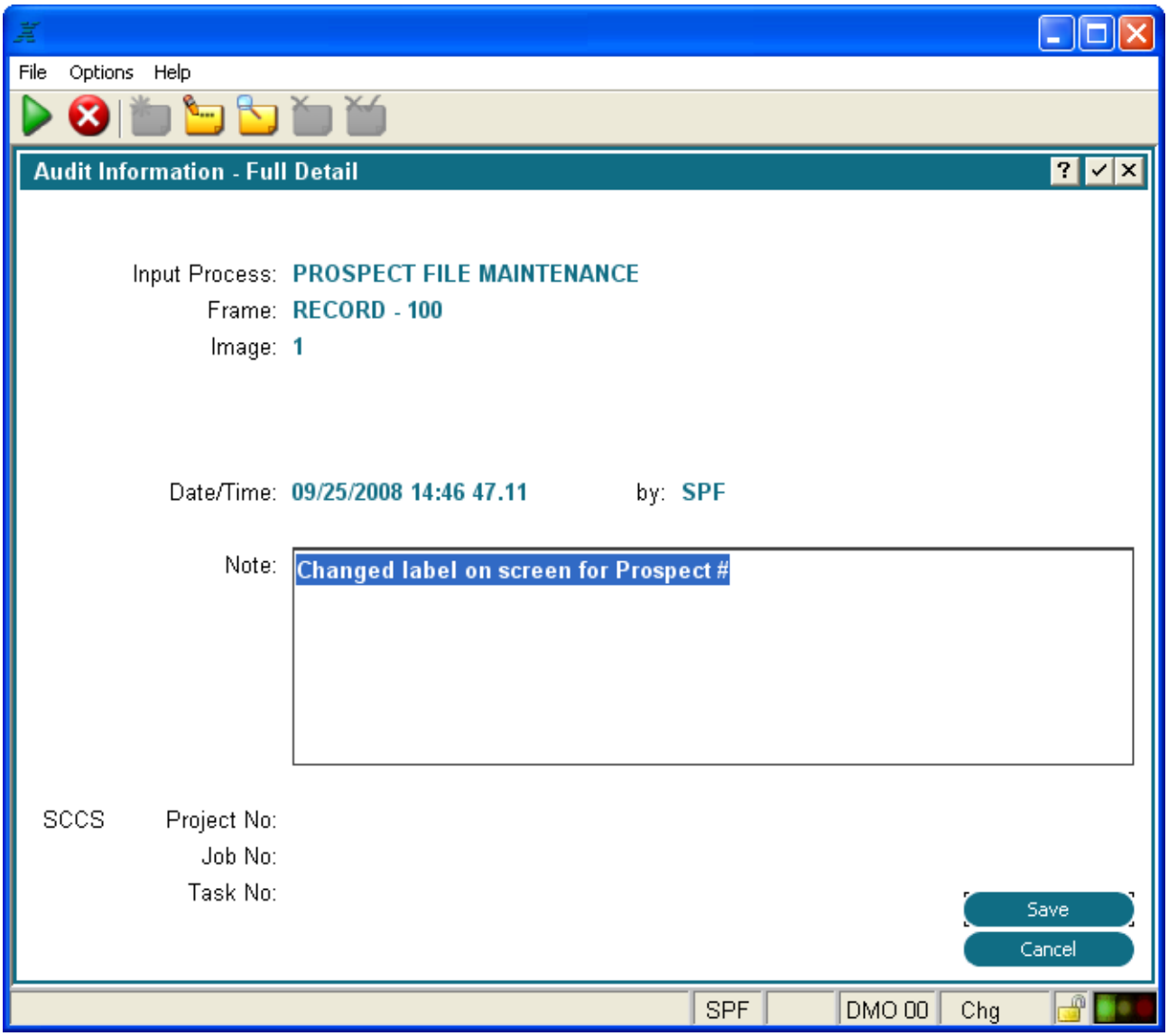
The audit history for the current object can also be accessed by entering Option 98 with the keyboard.

When the audit history for an object is displayed, a list of all changes is displayed with the most recent changes at the top. The full detail for an audit record can be displayed by selecting the desired change record and pressing RETURN or by selecting the Detail button on the bottom of the screen. See below.



Audit History Information

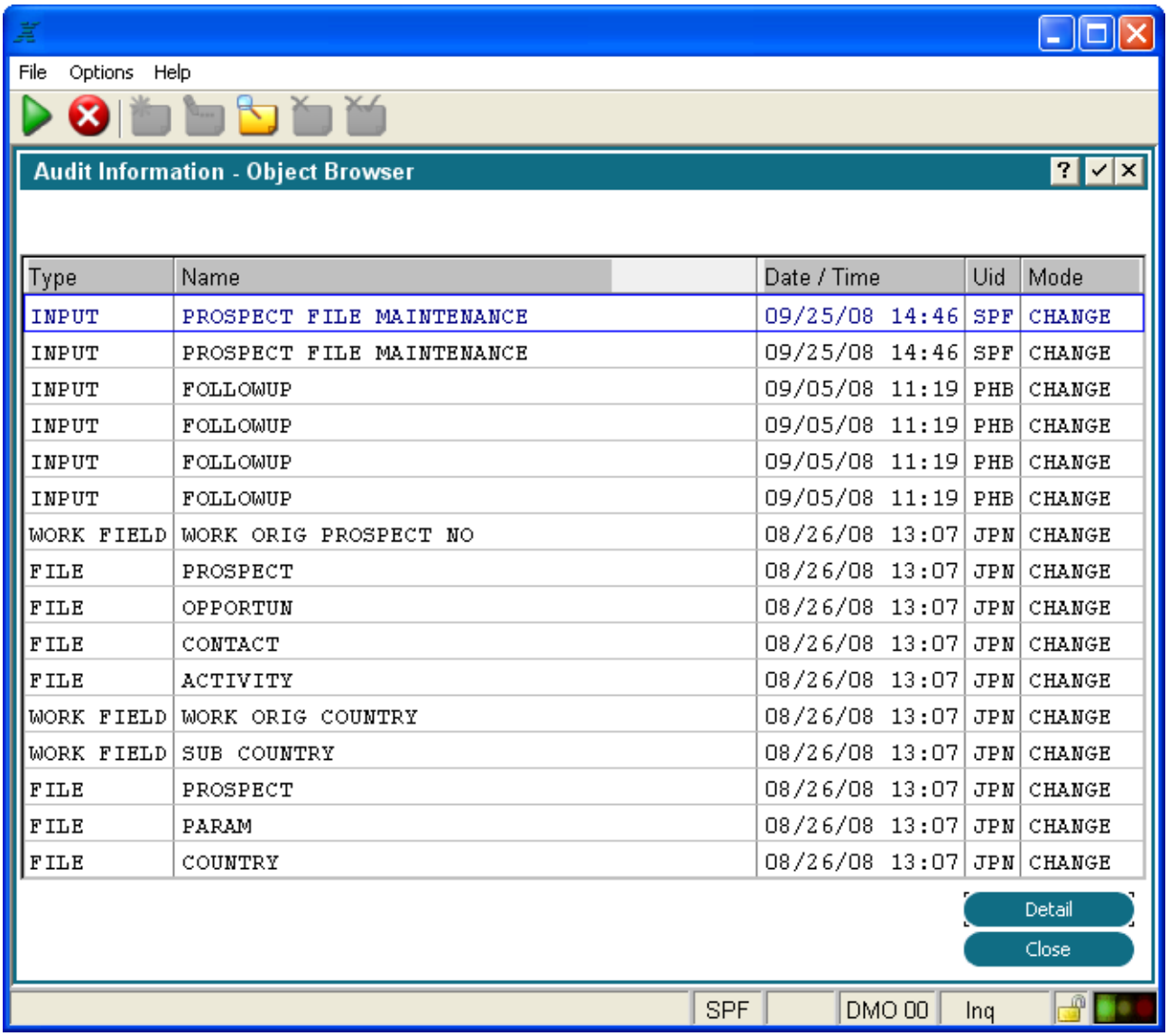
While viewing the full detail of an audit record, a designer may enter or edit a note to provide additional information regarding the nature of the change. See below.



Full Audit Detail

Object Browser

The Audit History Audit Browser can be found on the Tools menu within Application Design. The Audit Browser lists all changes to the application in reverse date order. Consequently, the most recently changed objects will appear at the top of the scrolling list. See below.

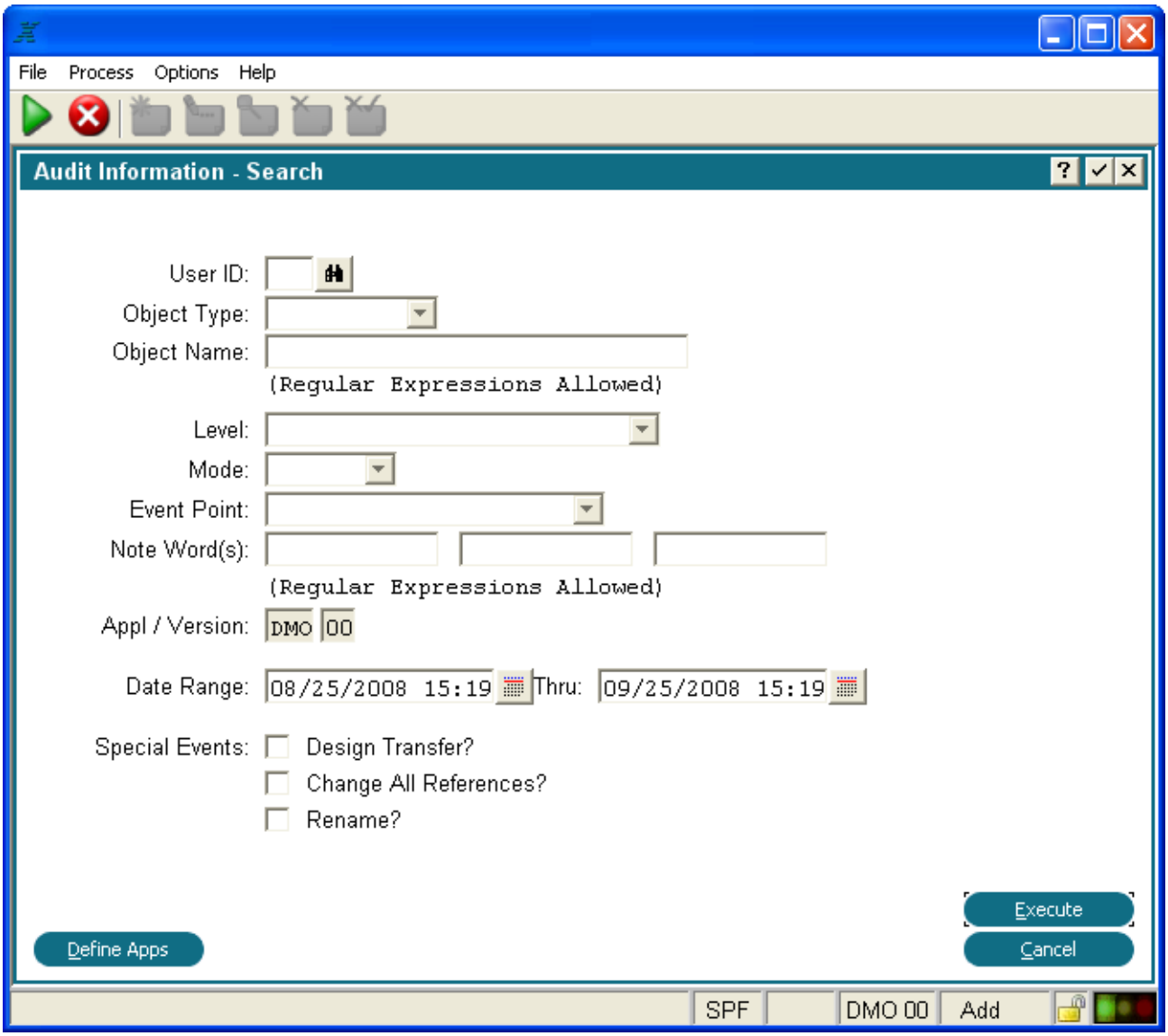


Object Browser

From the Object Browser display, you can select an Audit History record and press RETURN or click on the Detail button to display the full detail screen for the selected Audit History record.

Audit Search

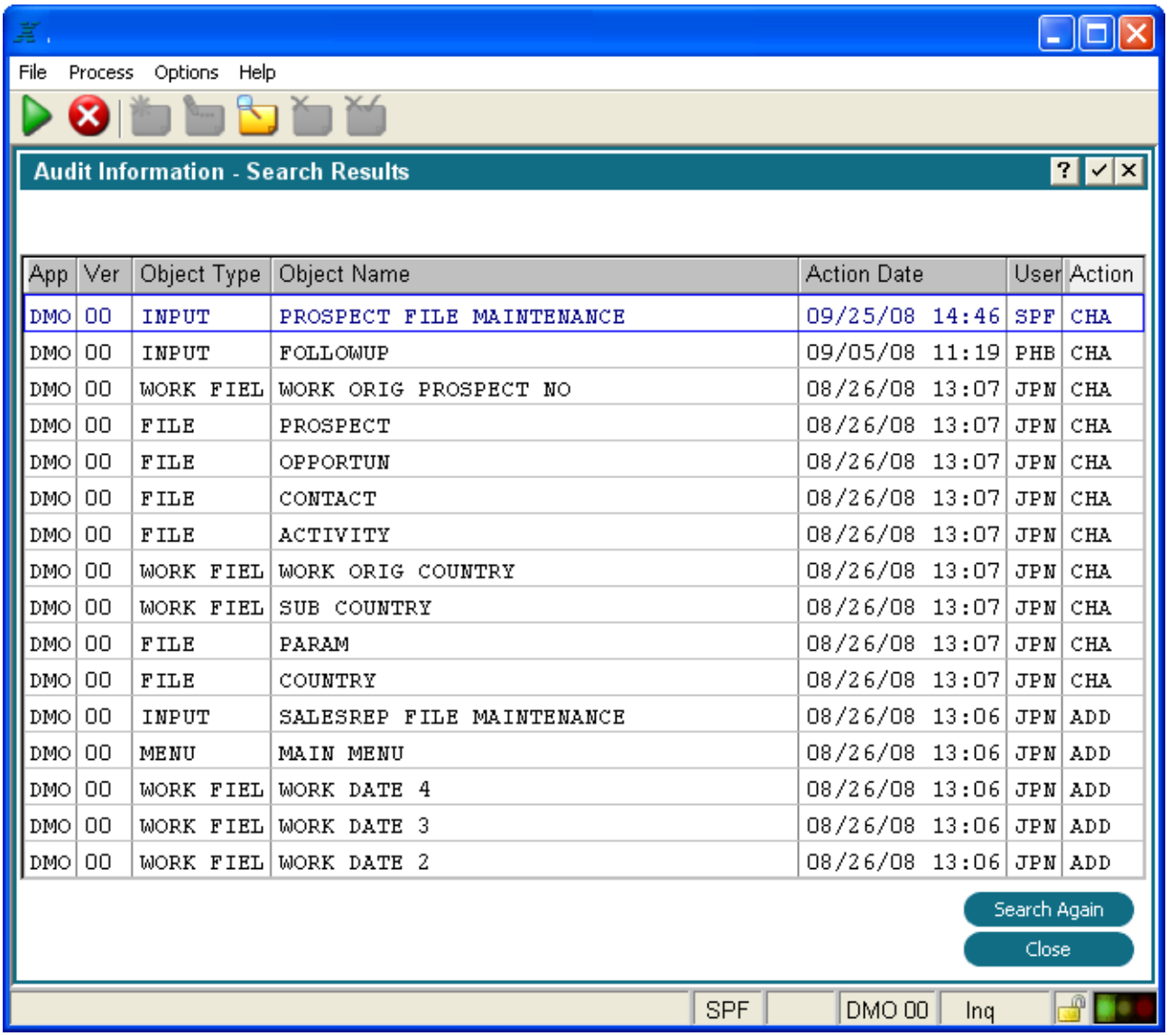
The Audit History Audit Search utility can be found on the Tools menu within Application Design.



Audit History Search

The Audit History Search utility can be used to find all objects within an application or a group of applications which meet the specified criteria. The various fields on the search screen act as search filters. See figure above. Only those objects which meet all of the specified search criteria will be include in the search result.

The Define Apps button can be used to include other applications in the search. The Execute button searches the specified applications applying the specified search criteria and then display the Search Results screen listing all of the design objects that met the specified criteria. See figure below.



App	Ver	Object Type	Object Name	Action Date	User	Action
DMO	00	INPUT	PROSPECT FILE MAINTENANCE	09/25/08 14:46	SPF	CHA
DMO	00	INPUT	FOLLOWUP	09/05/08 11:19	PHB	CHA
DMO	00	WORK FIEL	WORK ORIG PROSPECT NO	08/26/08 13:07	JPN	CHA
DMO	00	FILE	PROSPECT	08/26/08 13:07	JPN	CHA
DMO	00	FILE	OPPORTUN	08/26/08 13:07	JPN	CHA
DMO	00	FILE	CONTACT	08/26/08 13:07	JPN	CHA
DMO	00	FILE	ACTIVITY	08/26/08 13:07	JPN	CHA
DMO	00	WORK FIEL	WORK ORIG COUNTRY	08/26/08 13:07	JPN	CHA
DMO	00	WORK FIEL	SUB COUNTRY	08/26/08 13:07	JPN	CHA
DMO	00	FILE	PARAM	08/26/08 13:07	JPN	CHA
DMO	00	FILE	COUNTRY	08/26/08 13:07	JPN	CHA
DMO	00	INPUT	SALESREP FILE MAINTENANCE	08/26/08 13:06	JPN	ADD
DMO	00	MENU	MAIN MENU	08/26/08 13:06	JPN	ADD
DMO	00	WORK FIEL	WORK DATE 4	08/26/08 13:06	JPN	ADD
DMO	00	WORK FIEL	WORK DATE 3	08/26/08 13:06	JPN	ADD
DMO	00	WORK FIEL	WORK DATE 2	08/26/08 13:06	JPN	ADD

Audit Information - Search Results

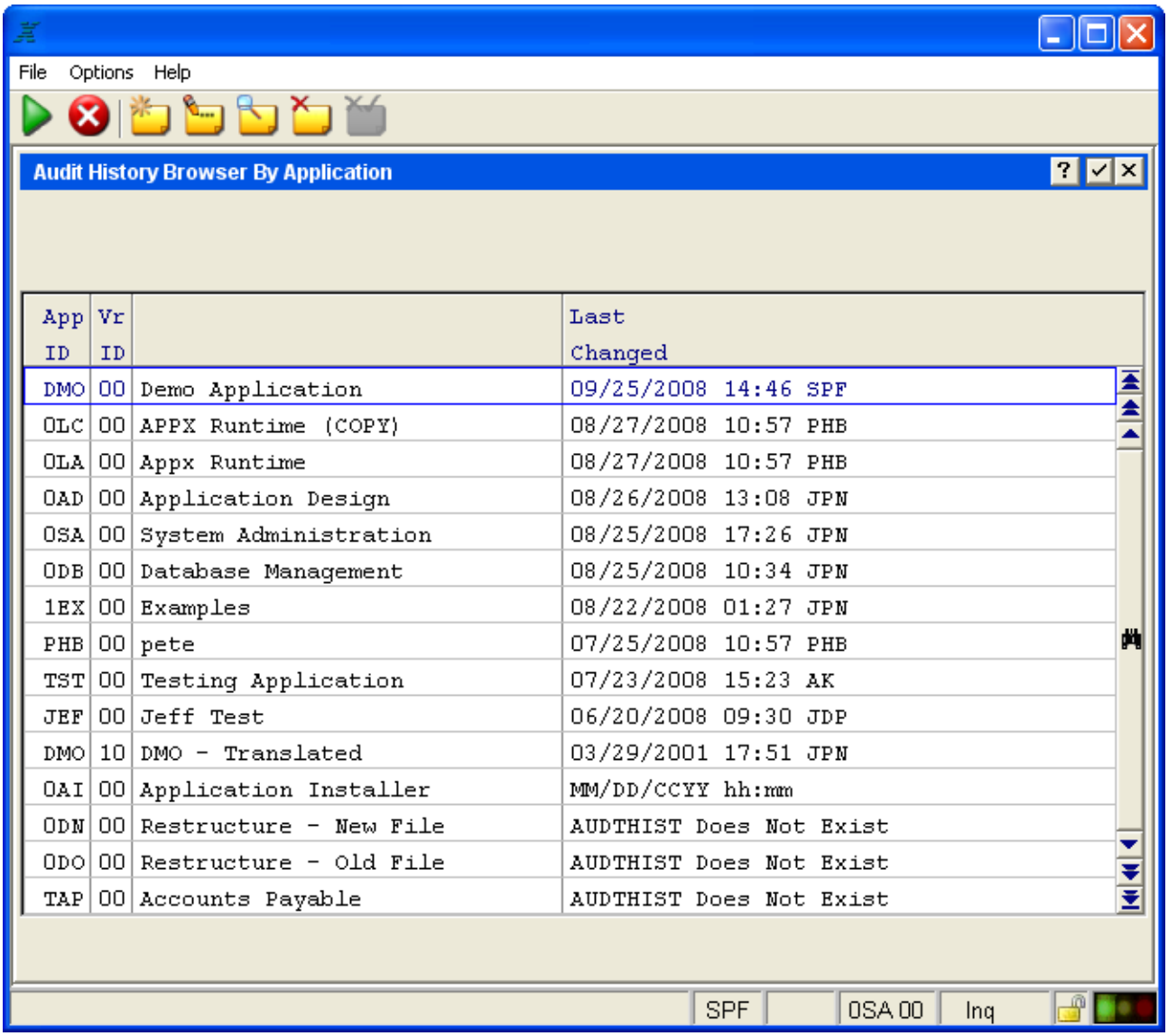
If you select a specific object on the Search Results screen and press RETURN, the Audit Information screen for that object is displayed with a scrolling list of all changes made to that object.

Audit Info Summary

APPX System Administrators can review the audit history for all applications from within System Administration.

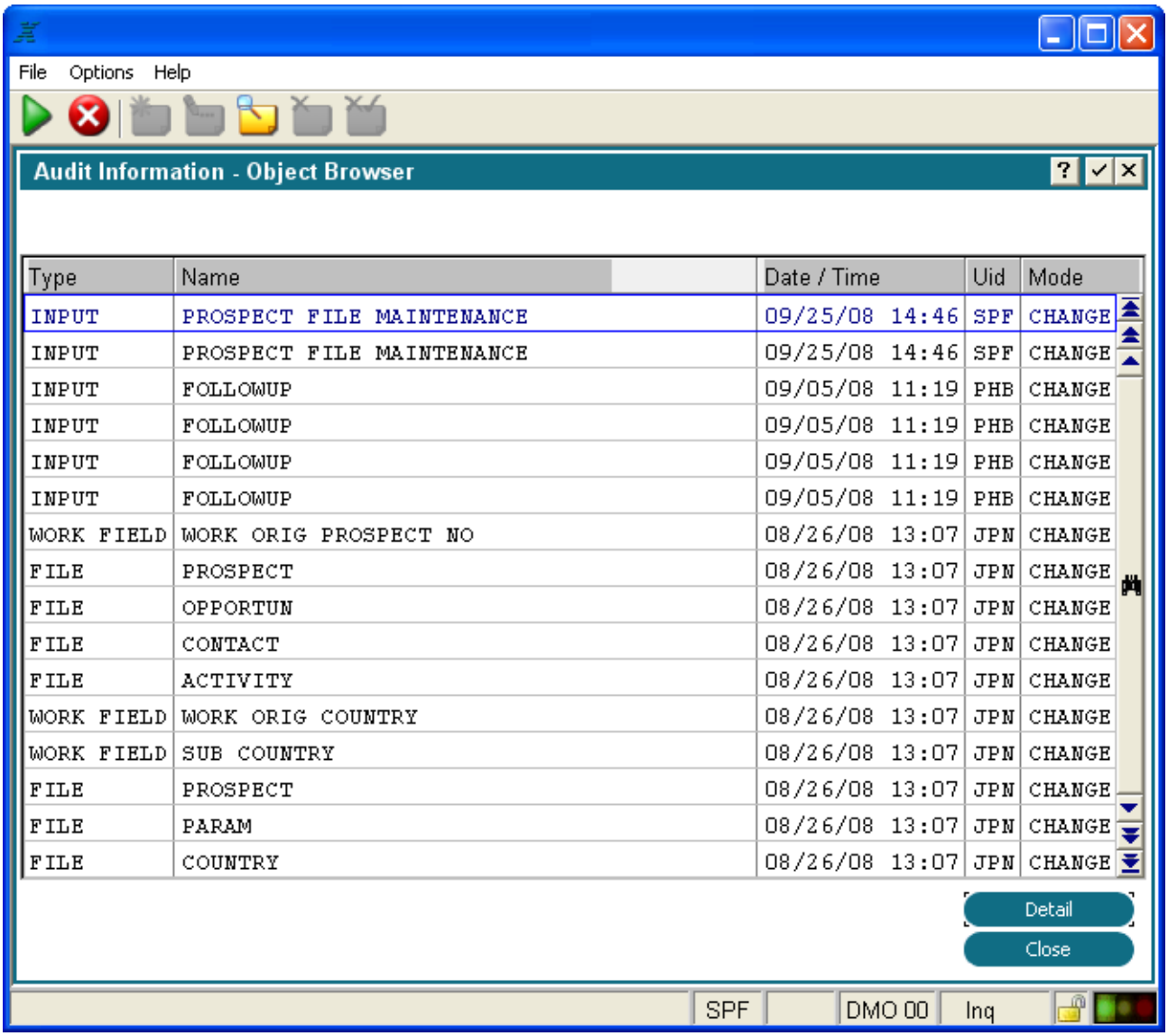
System Administration --> Audit Info Summary

The Audit Info Summary process can be run to display a list of all applications with the date of the last change. See below.



Audit History Browser By Application

From this list you can select an application and then press RETURN to display a list of all audit history records within the application. See below. The audit history records are displayed in reverse order by date changed with the most recent changes at the top of the list.



Audit History Browser Record List

If you select a specific audit history record for an object on the list screen and press RETURN, the full detail screen for the selected Audit History record is displayed.

CHAPTER 3-2

Getting Started

Introduction to Process Concepts

The APPX process facility recognizes nine process types: *menu, input, output, query, subroutine, update, job, status* and *inquiry*. Each represents a specific kind of activity, and each is comprised of a subset of the structural components (PCFs, frames, and event points, for example) that were described in the previous chapter. However, while the structural components are essentially the same from type to type, the way these components are used to perform a required activity varies. For example, menu and inputprocesses use images toformat the screens that display to a user. Output processes, on the other hand, generally use images to format hard copy, such as a list or report. And subroutine processes do not display information to a user, so no images are required.

Because of such differences, there are a number of concepts that apply to one or more, but not all, process types in APPX. To continue the previous example, the way you position images on a frame has obvious significance to a menu, input, or output process, but no relevance at all to a subroutine. To carry the example even further, there are subtle differences between image positioning for input and output images, because the former display on the screen, while the latter generally print on hard copy. The material that follows discusses a number of these process-specific concepts in detail.

The Image Editor

Image editing (screen painting) refers to the APPX facility that allows you to format images for menus, input screens, and output. With image editor options, you design the visual presentation of each image and define specific operational parameters. As you design the image, you are seeing it exactly as it will appear to your users.

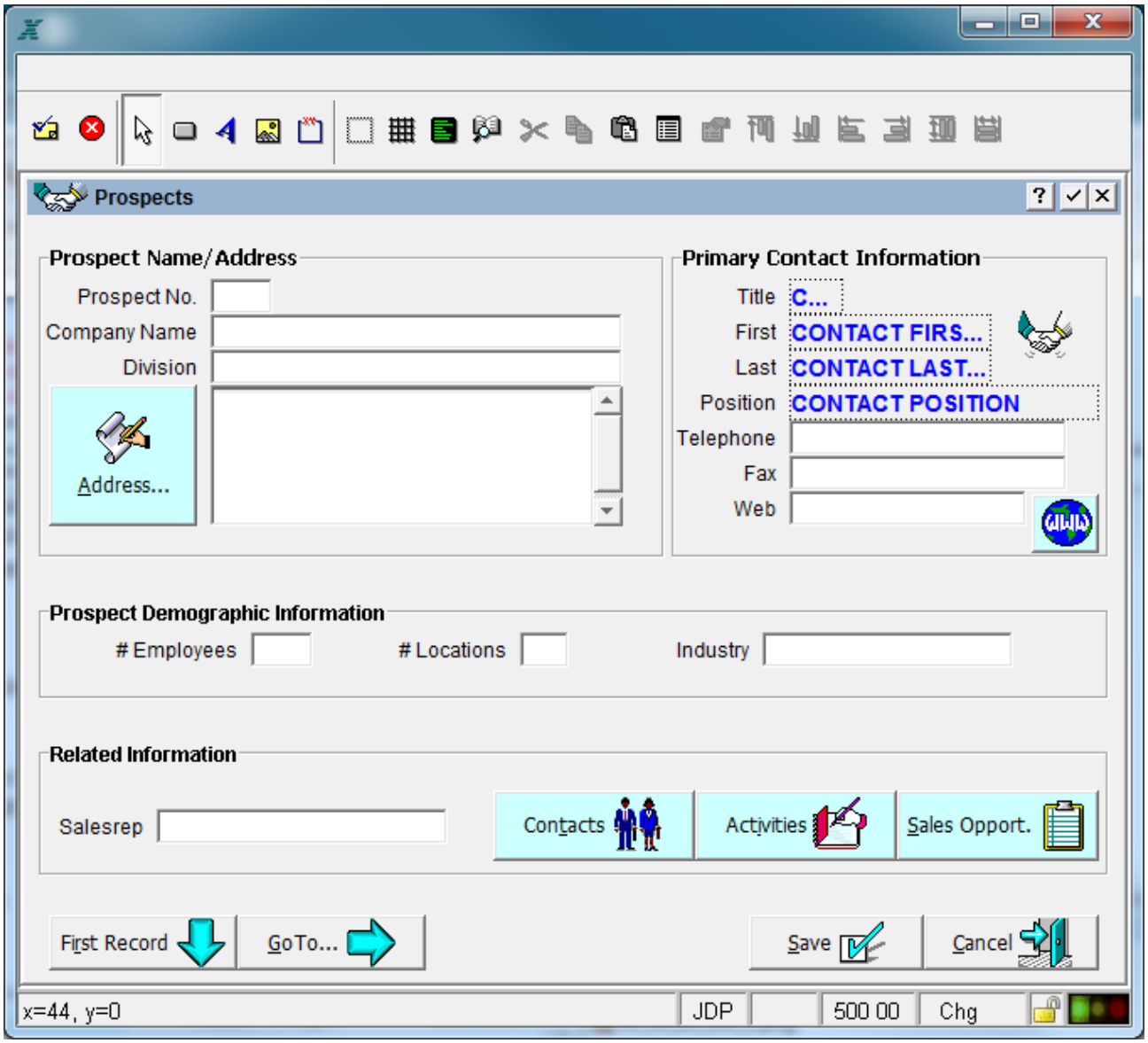


Image Editor

The Image Editor includes options to:

Format items (data dictionary fields) and objects on images.

Define background text and characteristics on images.

Establish data lookups to read data in related files.

Assign graphical attributes to images or image items or objects.

Refer to Using the Image Editor or 3-15: Using GUI Features of the Image Editor for more information on the Image Editor.

Automatic Data Lookup and Display

Data lookups link a field in one file to additional data in a related file by means of a key field in the related file. In other words, they tell APPX how to access another file during process execution. You define a lookup with the image editor as an integral part of defining an item on an image.

For example, you may enter a customer number on an order image. If you want to automatically include additional descriptive information (such as the customer's name) on the image, you can do so with a data lookup to the customer file.

Frame/Image Positioning

When you create frames and images for menu, input, and output processes, you are asked to define a size and display position for each.

Sizes are stated in terms of the number of rows and columns a frame or image occupies. It is important to note that, while images consume physical space on the screen or printed page, frames do not. Frames simply designate regions for image placement.

The position a frame or image occupies (where it displays on the screen or page) is determined by a number of factors, including the type of process, the way the process was invoked, and whether or not it includes a scrolling display.

You can surround frames and/or images in menu or input processes with a box. Boxes do not consume rows or columns within the space that is defined for a frame. They do, however, consume more physical space than overlines and underlines. The physical space on a screen that is consumed by a box is system-specific.

Various factors affect the actual positioning of a frame or image, as discussed in the following sections:

Screen Positioning

The Effect of Child Invocation Screen Display

Page Positioning

The Effect of Scrolling Frames on Screen and Page Positioning

Screen Positioning

For menus and input processes, you must designate where the frames and images of a process are placed on a screen:

Frames are positioned relative to coordinates of a screen. The amount of screen surface that is available for frame display is equal to the size of the surface less three rows (reserved for the APPX status display at the bottom of the screen).

Images are positioned relative to the coordinates of a frame.

You designate position by entering two specifications, one representing a coordinate on a row axis and the other a coordinate on a column axis. Together, these coordinates determine the position at which the frame displays on the screen or the image displays on a frame. (The concepts for positioning a frame on a screen or an image on a frame are identical. Unless otherwise specified, the following information applies equally to both.)

You can enter coordinates as positive numbers, indicating image positioning relative to one of the borders of a frame:

A row coordinate indicates the placement of the upper border of the image relative to the upper border of a frame. For example, an entry of *1* aligns the upper border of an image with that of a frame. An entry of *2* leaves a single blank row between the border of a frame and the border of an image. A negative entry aligns the upper border of an image with that of the bottom border of a frame. For example, a entry of *-3* places the first row of the image 3 lines from the bottom of the frame.

A column coordinate indicates the placement of the left border of an image relative to the left border of a frame. An entry of *1* aligns the left border of an image with that of a frame. An entry of *2* leaves a single blank column between the border of a frame and the border of an image.

Use entries of *0* in either the column or row coordinates (or both) to center the image within the frame's total columns and/or rows.

The Effect of Child Invocation on Screen Display

Your screen display is affected by the way you invoke a child process:

If invoked as a subprocess, a child's images can overlay the images of the parent process.

If invoked as a related or detached process, a child's images cannot overlay the images of the parent process. The screen is automatically cleared immediately before the child displays, and is refreshed immediately after the child completes.

Page Positioning

You define sizes and positions for frames and images in output processes just as you do in input and menu processes. The primary difference between screen positioning for a menu or input process and *page positioning* for an output process, however, relates to the timing of the display. This timing issue is a direct result of the difference in display media for an input process (a screen) versus an output process (a printer).

When displaying an input process, for example, it is a relatively simple matter to add an image that displays before, beside, or perhaps between existing images by refreshing the screen. It is an entirely different matter when those images are committed to paper. You cannot request a printer to back up to print an image beside a previously printed image, or perhaps insert a new image between two printed images.

To overcome this printer limitation, APPX uses a preliminary assembly area for output frames and images called the *Print Beside buffer*. Various components of the output can be pieced together in the buffer before they are committed to paper. A buffer permits you to insert images before or beside existing images, much as you do when displaying to a screen. See the Print Beside section for details.

If you do not use a Print Beside buffer in your output process, each image is immediately committed to the print file during execution. As a result, each image must print *below* the previous image (unless, of course, a new page is started).

The Effect of Scrolling Frames on Screen and Page Positioning

A ***scrolling frame*** is a type of input or output frame that displays more than a single image (one image for each record, up to a maximum number of images), and formats those images in multiple rows and/or columns. The maximum number of images that can display in a single scrolling frame is limited by the relative sizes of the frame and the image. The images that display in the frame can all be the same alternate image definition, or consist of any combination of alternate images.

Images for scrolling frames do not have predefined positions. APPX determines the (multiple) positions for displaying an image within a scrolling frame. These positions are influenced both by the scrolling method, and the relative sizes of the frame and its alternate images.

APPX supports two general methods of scrolling:

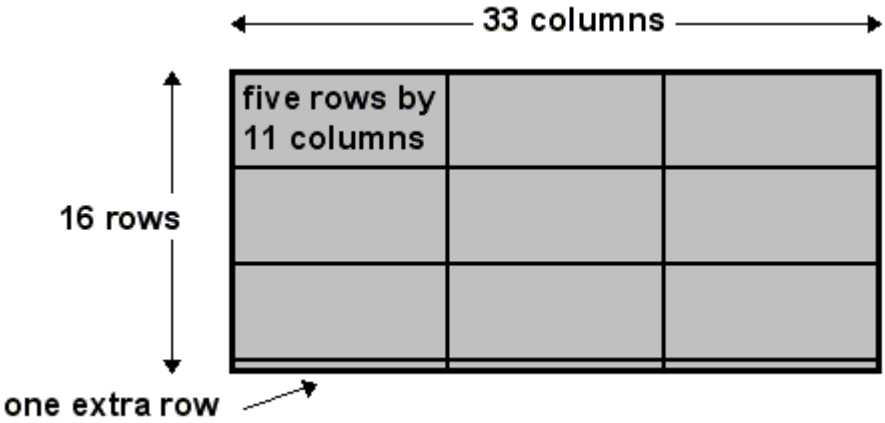
Matrix Scrolling Mode

Columnar Scrolling Mode

Matrix Scrolling Mode

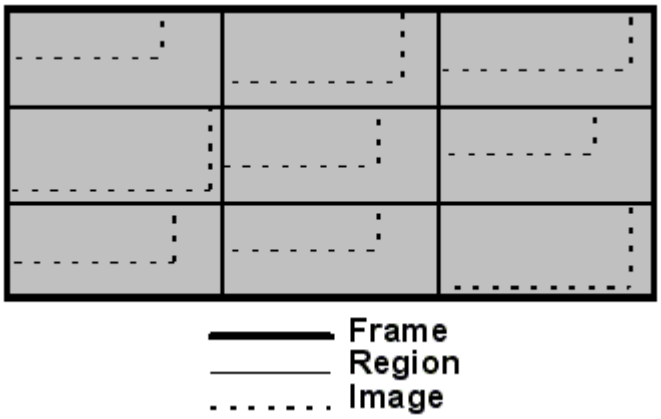
In ***matrix scrolling***, APPX divides a frame into a number of equally sized regions based upon a composite maximum image size. This composite image is large enough to accommodate any of the possible alternate images for the frame, regardless of which one actually displays. APPX calculates this composite size in two ways by: combining the width of the alternate image that has the largest *Columns* specification, and the height of the image that has the largest *Rows* specification; and adding any extra rows or columns you defined to border the image. APPX then calculates the maximum number of regions that will fit down the frame and the maximum number of regions across the frame, based upon this composite image. Any extra space is evenly distributed between the regions.

For example, assume your frame size is 16 rows by 33 columns, as shown below. You defined two alternate images for the frame: one is three rows by 10 columns and the other is five rows by seven columns. You did not specify extra rows or columns. The composite image is five rows by 10 columns. This composite image can be displayed three times down the frame (calculated by dividing 5 into 16) and three times across the frame (10 into 33), leaving one extra row and three extra columns. To evenly distribute the remaining space, APPX allocates five rows and 11 columns to each region in the matrix, and leaves one extra row at the bottom of the frame.



Region Allocation within a Frame

Because the regions are based upon a composite image size, rather than the actual size of each alternate image within a frame, the images in matrix scrolling are always perfectly aligned. Regardless of the alternate images selected, all images in the same row have the same row axis coordinate, and all images in the same column have the same column axis coordinate, as shown below.



The Positioning of Alternate Images in a Frame

For both input and output processes, you determine the sequential placement of images within the regions by requesting one of the following two matrix scroll types. The upper-left corner of each region is the starting coordinate for a selected image.

Down, APPX places the first image in the upper left corner of the frame. Succeeding images are placed immediately below the previous image until the column is complete. The next image is placed at the top of the column immediately to the right of the completed column and the first image. As each column completes, the next image begins a new column until all columns complete.

1	4	7
2	5	8
3	6	9

Down Scrolling

Across. APPX places the first image in the upper left corner of the frame. Succeeding images are placed immediately to the right of the previous image until the row is complete. The next image is placed in the far left-hand position of the row immediately below the completed row and the first image. As each row complete, the next image begins a new row until all rows complete.

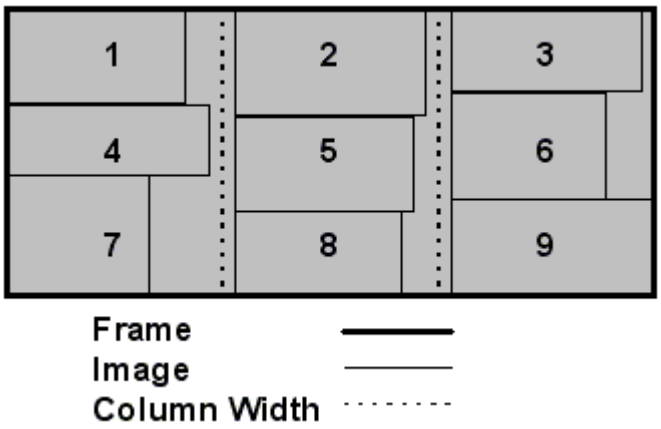
1	2	3
4	5	6
7	8	9

Across Scrolling

Columnar Scrolling Mode

In ***columnar scrolling***, shown in the figure below, the display size of an image is based upon the actual number of rows in the alternate image selected, not upon the region of a matrix scroll. APPX determines column width based upon the number of columns in the widest alternate image and an even distribution of the remainder, if any.

The sequential placement of images is similar to that of matrix-down in that each image is placed below the previous image until the column completes, and the next image begins a new column immediately to the right of the previous column. Unlike matrix scrolling, however, the images in a column are not aligned horizontally unless all the alternate images are the same length.



Columnar Scrolling

Columnar scrolling never displays a partial image in a column, either leading or trailing. All images must be totally visible within the column. If an image does not fit on the bottom of the current column, the entire image displays from the top of the next column (or on the next screen if the current column is the far right-hand column on the screen).

Input Process Concepts

Input processes are interactive; users navigate from screen to screen, select options, and enter and manipulate data. You control the way users interact with APPX by establishing *entry levels*, *keymaps, modes,* and *interactive phases*.

Input Entry Levels

When you paint an item on an input image, you designate the item's *entry level* (0 through 9). This entry level establishes the point in time when the item becomes editable.

If the entry level is *0*, the item is always editable.

If the entry level is nonzero, a user first sees the item in the data entry level represented by the nonzero value. For example, an entry level of *1* indicates that the item is initially active. An entry of *2* indicates that the item becomes active after the user selects return for the first time. An entry level of *3* indicates that the item becomes active after the user selects return for the second time, and so on through the highest entry level used.

The modifiability of an item based on its entry level can be overridden with OK INPUT and NO INPUT statements.

Input Keymaps

The specific keys users press to perform each input-related activity is installation-specific. The key on the keyboard (or other input device) that controls each operation and option is mapped according to the devices at your installation. The resulting keymap tells APPX which keys control which operations. Refer to your system administrator for information about establishing customized keymaps in APPX.

The Data Entry Keymap

The data entry keymap provides capabilities relevant to entering, displaying, and manipulating information on the screen. For input processes, the user is always in the data entry keymap.

In the data entry keymap, only items that have an entry level less than or equal to the current entry level are visible and modifiable on the screen. For example, when APPX first displays the screen, only items with an entry level of *1* are visible. After the user selects return, the items for entry level *2* become visible. This process continues until the entry levels for all items on the image are complete.

You can also establish that an item associated with a specific entry level is non-modifiable either by completing specifications in the image editor, or by explicitly defining a NO INPUT statement.

Input Modes

APPX input processes execute in any of four modes: add, delete, inquire, or change. The mode establishes the type of operation a user performs, relative to records in an APPX file.

Add mode permits users to save new records in a file.

Delete mode permits users to remove records from a file.

Inquire mode permits users to view records in a file.

Change mode permits users to modify records in a file.

A user can select the corresponding icon from the tool bar to switch modes at any time. You can, however, restrict a user's ability to access any mode. You can also interrogate the mode by using statements. Refer to the *User Manual* for additional information on the use of modes.

Input Interactive Phases

Each mode in an APPX input process can be further divided into one of six interactive phases: *data addition, data modification, data inquiry, data deletion, data scroll,* and *key entry*. The relationship between mode and interactive phase is shown in *Table 3-2-1* below.

Table 3-2-1. The Relationship between Modes and Phases for the Data Entry Keymap

Mode	Interactive Phase	Description
Add	Data Addition	Screen displayed for data entry.
	Data Modification	Record on scrolling display selected for editing.
	Data Inquiry	Record on scrolling display selected for Inquiry. Record already written to disk and may beheld by another user.
	Data Scroll	Scrolling display being populated.
Change	Data Modification	Record displayed for editing.
	Key Entry	Key field(s) displayed for selection of record.
	Data Scroll	Scrolling display being populated.
Delete	Data Deletion	Record displayed for deletion.
	Key Entry	Key field(s) displayed for selection of record.
	Data Scroll	Scrolling display being populated.
Inquire	Data Inquiry	Record displayed for Inquiry.
	Key Entry	Key field(s) displayed for selection of record.
	Data Scroll	Scrolling display being populated.

Automatically Saved Records

Input processes are the only type of process that *automatically* save records. APPX automatically saves records in input processes:

After a user completes an input process cycle (a single execution of all the frames in a process) that affects the contents of a record.

Before invoking any automatic child process from an input process.

Before invoking an optional child process from an input process.

Refer to Automatic and Optional Children for more information on child processes and the *Invocation Type* specification.

Output Process Concepts

Output processes permit you to format complex reports based on information contained in, or derived from, an APPX database. To provide this flexibility, the output process includes two additional design components: Frame Class and Print Beside specifications.

Output Frame Classes

Specifications for output frames are classified according to whether they apply to a report in total, pages, or specific sort ranges in a report, or to individual records in the body of a report. Those specifications that relate to each of these categories are grouped together on a single definition screen and referenced by a *frame class*. Because of this classification, there are sevenframe classes that can be entered when defining a report (presented in their order of appearance in the output):

Start of Report frames print once at the beginning of a report. APPX executes a page break immediately after the last *Start of Report* frame prints.

Start of Page frames print once at the beginning of each page of a report. They are primarily used for page headings and column headings. Standard images for both of these are optionally available. Refer to Standard Column Heading Image for additional information.

Start of Range frames print immediately before the first record for which the value in a specific sort field (the range field) changes. They are primarily used for subheadings and lower-level column headings. Standard images for both of these are optionally available. Refer to Standard Column Heading Image for additional information.

Record frames manipulate and print information read from the process control file. They comprise the body of a report. *Record* frames can be defined to scroll.

End of Range frames print immediately after the last record in a series of records that have the same value in a specific sort field (the range field). They are primarily used for subtotals, and a standard subtotal image is optionally available.

End of Page frames print once at the conclusion of each page of a report.

End of Report frames print once at the conclusion of a report. APPX executes a page break immediately before the first *End of Report* frame executes.

See the next section for a discussion of output frame class execution.

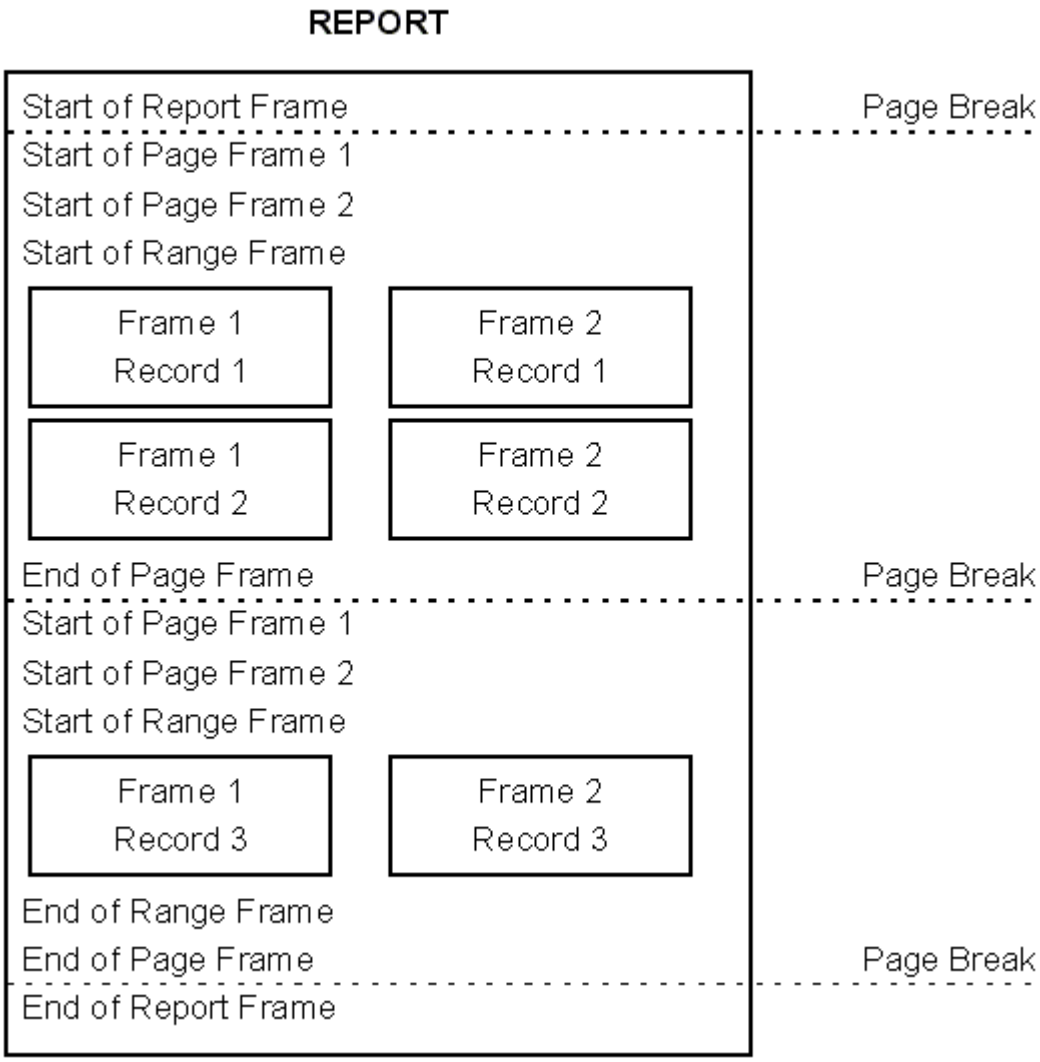
Output Frame Class Execution

For each frame class, you can define multiple frames, each of which executes in *Sequence Number* order.

Report and page class frames never execute unless APPX executes at least one range or *Record* class frame. This guarantees that you do not generate empty reports, comprised exclusively of report headings and footers, and page headings and footers.

With the exception of range class frames, all frames within a class execute when the frame class executes. Individual range class frames execute conditionally; if the range field is not used as a sort field when the report executes, the range class frame does not execute.

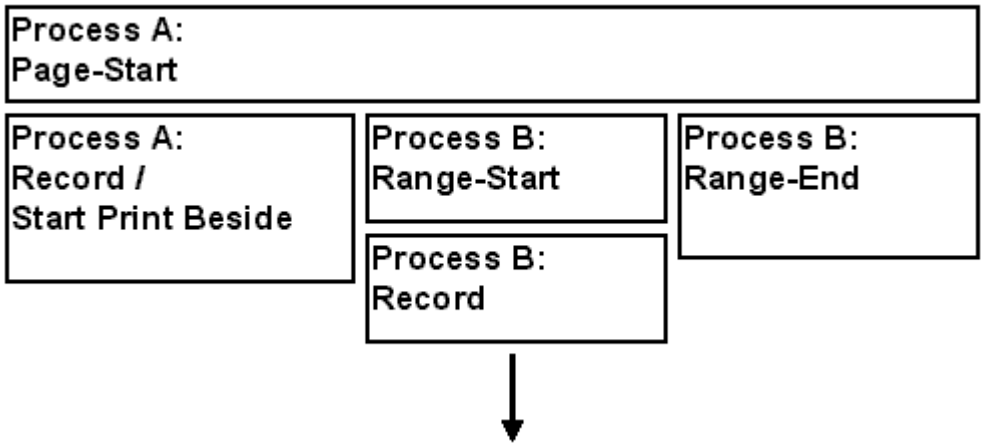
The following figure depicts the placement of frames on a printed page.



Placement of Frames on a Printed Page

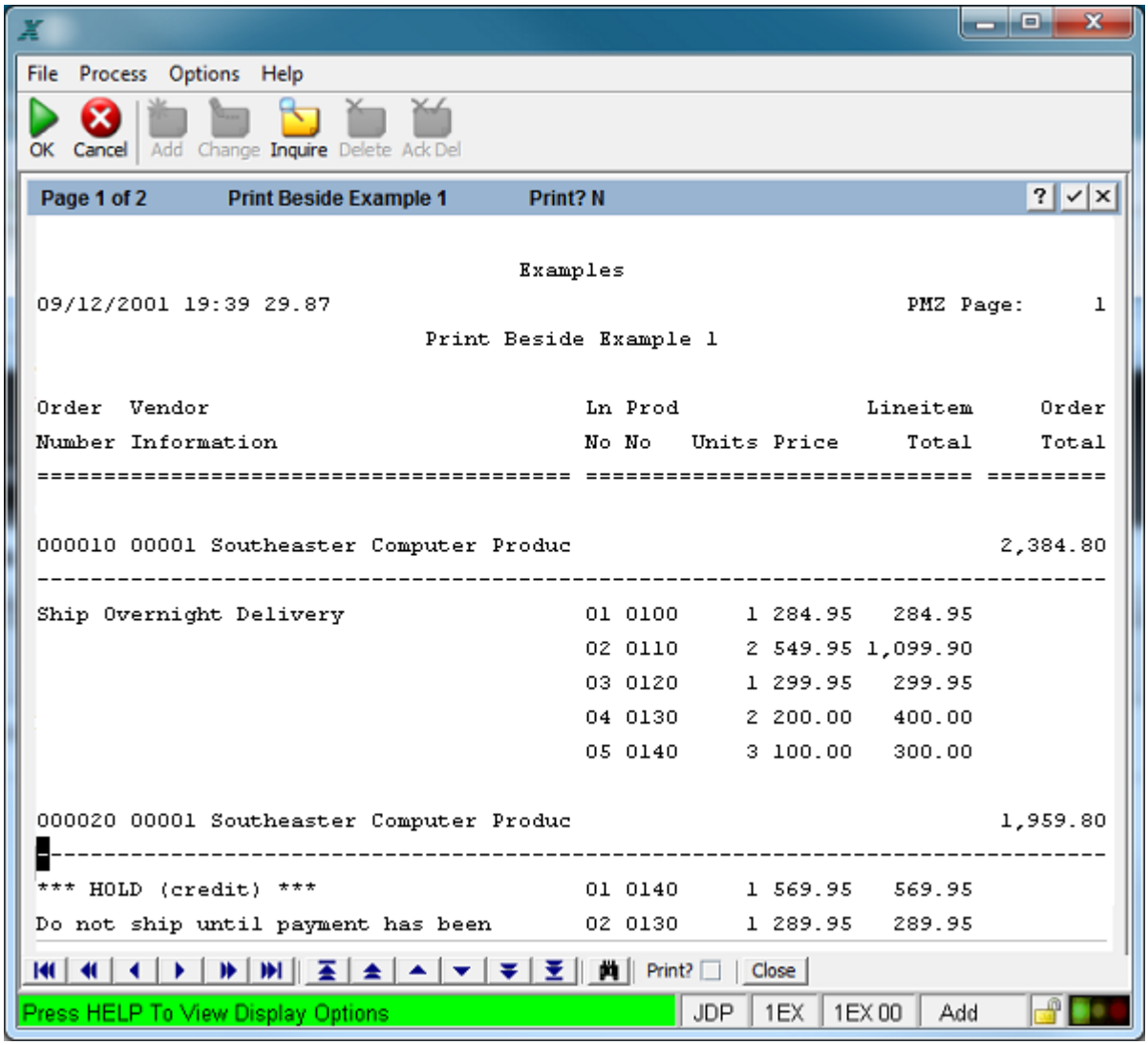
Print Beside

In APPX it is possible to print a report that contains items that print across the page by using the Print Beside feature available via the Output Frame Additional Attributes Option. As you read the following paragraphs, refer to the Print Beside output processes in the 1EX application included with your copy of APPX. In this example, *Start Print Beside?* is set to ☑ in the record frame of the parent process in a 2-level output. A diagram of how such an example behaves on a printed page is shown below.



Placement of Frames on a Printed Page Using Print Beside

Any frame with *Start Print Beside?* set to ☑ will allow subsequent frames to print beside or to the right of this frame as long as the column position of the subsequent frame does not overlap the preceding one. If the column position overlaps, the record is printed below the preceding one. In the example above, the column position of *Process B: Record* overlaps *Process B: Range-Start*, so instead of printing beside, it prints below. Note, however, that the next frame, *Process B: Range End*, prints beside *Process B: Range Start* since its column position did not overlap. In other words, once *Start Print Beside?* is set to ☑, all subsequent frames will print beside or to the right of the initiating frame as long as it is physically possible. When APPX gets back to the frame that started Print Beside, it prints the information and starts a new Print Beside buffer in memory. A sample report using the Print Beside example diagrammed above is shown below.



Sample Report Using Print Beside

In this report, *Process A: Record* includes the Order Number and Vendor Information as well as a text field for shipping information. Since Print Beside is set to ☑ here, the next frame, *Process B: Range-Start*, prints to the right of *Process A: Record*. *Process B: Record* containing the line items you wish to print, is defined with a column position overlapping that of *Process B: Range-Start*, so instead of printing beside *Process B: Range-Start*, APPX prints it below. Note that the purpose of *Process B: Range Start* is to drop you down one line so that the line items print on the line below the subsequent Order Total which is contained in the next frame, *Process B: Range-End.* The Order Total prints beside since its column position does NOT overlap the far right edge on any preceding frame in the record. When APPX gets to the next Order Number/Vendor Information record, where Print Beside was set to ☑, it starts the printing cycle over.

Keep in mind that the Print Beside feature takes up significantly more memory than regular printing.

Update Process Concepts

Update processes update and transfer data between files. The update process permits the execution of statements that are not associated with either an input or an output process.

The structure of the update process is similar to the structure of the output process. Both include process control files, frames, event points, and automatic children. As with output processes, frames for update processes are divided into classes, in this case *Record, Start of Range*, and *End of Range* class frames.

Unlike output processes, however, update processes do not format data for presentation to a user. As a result, they do not use images, and do not include report or page class frames.

Query Process Concepts

Query processes determine the records that are available to a subsequent input, update, or output process, and/or establish the order the records are processed in (the sort hierarchy).

At your option, queries permit an application user to dynamically define:

The records that are available to a process.

The order in which those records are presented.

The query affects only those subsequent processes that you elect to *use* the query for. You do so by completing a *Use Query* specification for the process' child invocation. Refer to *Child Specifications,* for instructions on completing the *Use Query* specification.

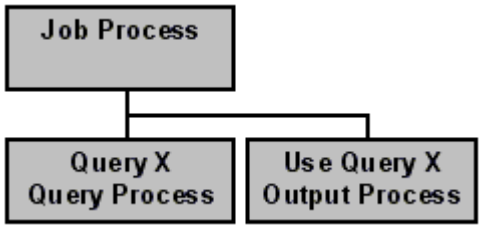
Query Setup versus Execution

A query process is comprised of the following two parts:

Setup,which populates three temporary memory files that contain a query's sort and record selection constraints. It optionally displays Record Selection and Sort Order screens from which the application user can dynamically modify sort and selection criteria.

Execution,which consists of the actual selecting and sorting of records in conformance with the criteria established during query setup.

Query setup executes when a query process is invoked as an automatic child from another APPX process. Query execution is performed in conjunction with the process that uses the query. Following is an example of a process tree, with query and output processes executing as children of a controlling job process. Query setup executes first, permitting interactive editing of the query specifications (record selection criteria and sort order). Query execution is performed in conjunction with the subsequent output process that uses the query.



An Example Process Tree

If a query process is not explicitly invoked as a child, query setup executes implicitly with query execution and in conjunction with the child process that uses the query. In such a case, query setup's Record Selection and Sort Order screens do not display to a user.

It is important to note that, while queries execute at the same time as the first process that uses the query, *Query Execution* event points do not share record areas or record pointers with the other process. The two processes, the query, and the process using the queried records, can be considered to execute in parallel, communicating with one another only through the records that are retrieved. (The process requests a record from the query; the query returns a record.) Consequently, APPX cannot guarantee that the query, particularly the End of Query Execution event point, will complete before *Start of Process* for the process that is using the queried records. Therefore, you should not use a query to compute summary information for use by a subsequent process.

Query Files

Query files consist of a *process control file (PCF),* three *temporary files,* a *pointer file,* and an optional *alternate control file.*

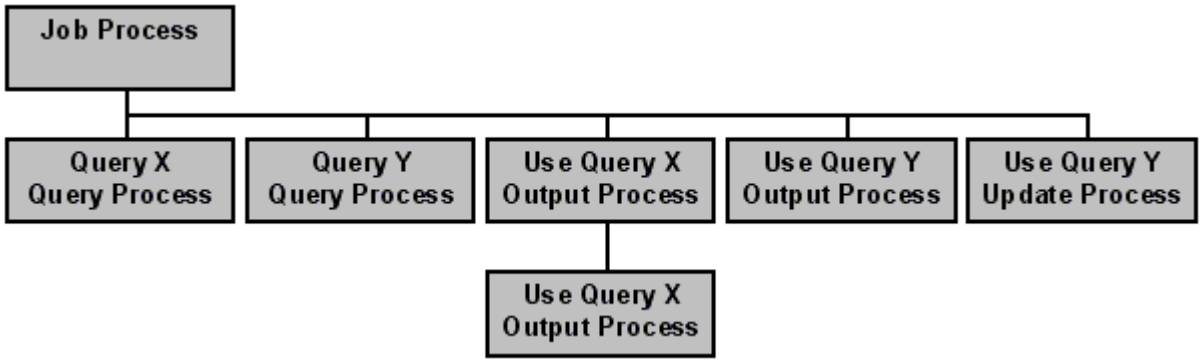
Process control files are mandatory for queries; they govern the execution of a query by identifying the file that contains the records to be constrained and/or sorted.

Queries populate three temporary files at the end of setup. *QSLCT* maintains selection constraints, *QPARM* maintains selection expressions, and *QSORT* stores sort fields. These temporary files are populated based on the sort and selection criteria established for the query in application design, and adjusted by the application user during query setup. The contents of these files determine the records from the PCF that are available to any process using the query.

During execution, the query process creates a pointer file, which includes the keys to all records that satisfy the selection criteria, in the order that is designated by the sort.

Once the temporary files and the pointer file are populated, the query is referred to as *active*.In general, a query remains active throughout the execution of a subprocess family or a related process family. When a process that was invoked as detached ends, any queries within its scope automatically end.

This permits you to have more than one query active at any time, and to use the same query with more than one process in a family, as shown below.



A Process Tree with Multiple Potentially Active Queries

Job Process Concepts

Job processes are used to control the sequencing of related processes. The job process executes a series of automatic children. It serves as a control structure to group the related child processes.

Inquiry Process Concepts

Inquiry processes have most of the characteristics of output processes, including all of the same kinds of frame classes. They differ from output processes in only three ways: 1) the assumption is made that the image is going to the screen so the default width is 80 columns and the *Print On Screen* value is set to *Y*; 2) the assumption is made that the user wants a specific record, or set of records, so the process definition function creates an input frame that executes before the output and requests the record's key; and 3) there is no Print Beside feature.

Status Process Concepts

Status processes provide various error handling options. The status process maintains a log file of error and warning messages that generate during the execution of the process. This log is displayed to the screen. If error conditions are detected, you can stop the execution of the process.

Subroutine Process Concepts

Subroutine processes define *reusable procedural programs* that execute from other APPX processes. The subroutine process is essentially a means of grouping a number of statements that can execute as a unit.

You can execute a subroutine:

As a child of another APPX process.

From an event point in another process with a COPY, SUBR or GOSUB statement.

Performance Tuning

Several options in APPX permit you to affect the performance of your application. Because there are tradeoffs associated with performance tuning, such as consumption of additional disk space, all performance-enhancing options are not automatically employed. The best combination of options is determined by the specific circumstances of your installation.

Saving Executable Modules

An *executable module (EM)* is the end result of compiling a process. It is the APPX-executable format that is generated by the process compiler, and accessed by the process loader and process interpreter to execute the process. A process is automatically verified and compiled by APPX when the process is loaded.

To avoid verifying and compiling a process each time it is loaded, and thereby increase performance, you can elect to save an EM on disk. Once an EM is compiled and saved, APPX refers to the saved EM during execution. The process loader, however, verifies that the saved EM is current. If changes to application specifications make the EM obsolete, APPX automatically generates a new EM.

Each EM is automatically assigned an eight-character alphanumeric file name. This unique string is never changed. If APPX finds it necessary to recreate an existing EM, the new EM retains the same file name.

You can designate whether or not you want to save EMs at the installation, application, and process levels. You establish installation and application values in system administration. You can optionally override these designations for each individual process in application design. If you leave a process specification blank, the application value is assumed. If both are blank, the installation value is assumed.

There is a cost associated with saving an EM; it consumes disk space. This trade-off must be evaluated based upon the specifics of each installation. As a general rule, however, EMs should be saved for larger processes, because they require significant compile time. For smaller processes that are relatively quick to compile, the consumption of additional disk space may not be warranted.

Refer to *Process Definition*, for *Executable Module -- Save on Disk?* specifications.

EM Caching

Without explicit designer intervention, a *related* or *detached* process' executable module (EM) is automatically loaded into memory when the process begins, and automatically removed from memory when the process completes. A *subprocess?* EM remains in memory only as long as the parent process' EM remains in memory. You can override this automatic removal of the EM from memory with APPX's *EM Caching* capabilities.

EM caching refers to the technique whereby the EM for a non-active process is retained in memory. Thus, the use of EM caching enhances perceived performance by reducing the time that is required to begin a process. When entering sales orders, for example, a user accesses both an order header input process and an order line items input process. If the EM for the order header process is not cached, it has to be reloaded each time the line items for one order are completed and the user begins a new order. If the order header process is cached, its EM is already in memory when the user completes line item entry. Note that subprocesses are always cached for at least the duration of the subprocess family. Thus, in this example, the line item process is always cached during sales order entry.

EM caching is controlled through a *Cache Priority* specification for each process, and through *Cache Level* and *Maximum Number of Cached EMs* specifications that are defined in system administration for each user:

The cache priority (a number from 0 through 99) determines the likelihood that the EM for a specific process is retained in memory, relative to the EMs for other processes. A process with a cache priority of *0* is always discarded from memory when the process completes. A process with a cache priority of *99* has the highest priority; it is the most likely to be retained in memory after the process completes. (A subprocess assumes the cache priority of its parent process.)

The cache level is the user's 'automatic discard level'. In other words, any process that has a priority equal to or less than this number is never cached. The cache level ensures that low-priority EMs (determined relative to a specific user) do not consume space in memory.

The cache limit determines the maximum number of EMs for non-active processes that can be retained in memory at the same time. When this limit is reached, APPX does not prohibit a new EM from entering the cache, as long as its priority is greater than that of at least one EM already in the cache. The EM with the lowest priority (whether this EM is already in the cache or is attempting to enter the cache) is discarded.

As a result of this combination of process-level and user-level specifications, caching definitions are extremely flexible. They are both process-specific and user-specific. The same processes may be retained in memory for one user and not another. The same process run by the same user may be retained in memory during one session, and discarded from memory during another session, depending on the relative priorities of other processes that are executed during the session.

Refer to the *System Management Manual* for additional information on caching specifications.

Documentation

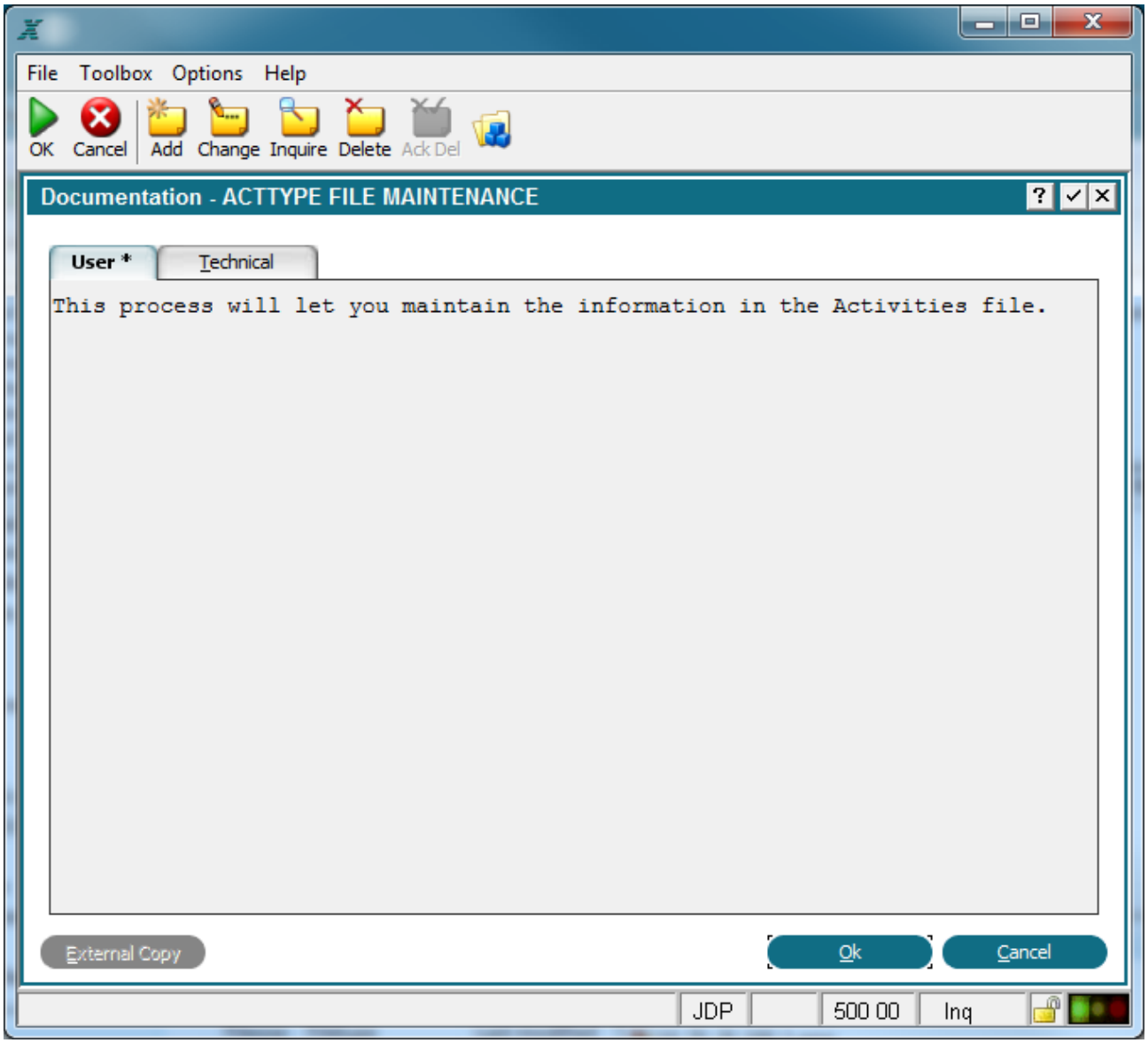
APPX provides screens to document each process as an integral part of its definition. When you create a process, you define:

User documentation. The text you enter on these screens is the basis for APPX's online help facility. An example is shown below. (User documentation can also be directly maintained using the Documentation Management option from the APPX Main Menu, as described in the *System Management Manual*.)

Technical documentation. The text you enter on these screens provides additional technical documentation.

Each User and Technical Documentation screen includes specifications that identify the process being documented, and provides 18 lines of up to 78 characters to explain the process. The *External Copy* feature lets you access other documentation records and copy them into User and Technical Documentation screens.

When you enter text in any of the documentation screens, APPX provides a number of editing functions, including word-wrap, text insertion, text redisplay, and end paragraph control. Refer to the *User Manual* for a discussion of text editing capabilities.



User Documentation Screen

Accessing Process Documentation Screens

Documentation is an integral part of the processes facility. You access:

User or technical documentation for any process in the process facility by selecting the appropriate tab on the process Documentation overlay.

The external copy of a documentation record by selecting an option on the process User or Technical Documentation screens.

Security

Security refers to the facility through which programs and data are protected from unauthorized access and/or modification. Within the APPX environment, security is optional, and can be implemented or modified any time during the life of an application.

There are two phases of APPX security: design and implementation. Each of these are the responsibility of different functions within your organization.

A designer establishes what to protect.

A security administrator determines who needs access to secured components of applications, and in what combinations.

Each process permits the specification of an *Execute Security Code*. Only those users who have rights to the security code are permitted to execute the process. Refer to the Database Security sectionof this manual for an overview of APPX security and a discussion of data security. Refer to the *System Management Manual* for a discussion of security implementation.

CHAPTER 3-3

Process Definition

Introduction to Process Definition

Processes are reusable software building blocks for constructing APPX applications. You can access the nine types of processes from the Application Design Specifications Menu shown below. Processes are grouped on this menu according to whether or not they support image design. **Form Based Objects** include processes that invoke the Image Editor to define or edit images. **Processing Objects** include processes that do not involve the design of images.

Application Design Specifications Menu

Form Based Objects include the following four types of processes:

Menus provide an on-screen display from which to execute selected processes. For example, a screen that lists the reports available in an application and from which you select a specific report is a menu process. Refer to Menu Processes for a discussion of menu specifications.

Inputs permit you to enter or maintain data in one or more files from designer-formatted screens and overlays. A sales order entry function and a customer file maintenance function are both input processes. Refer to Input Processes for additional information.

Inquiries are exactly like output processes, except that they automatically print to the screen, and allow a user to select a specific record for inquiry. Refer to Inquiry Processes for more information.

Outputs convey information from a database, either on the screen or in hard copy, according to a designer-defined format. Trial balances, product purchase history reports, and customer lists are all examples of output processes. See Output Processes for more information.

Processing Objects include the following five types of processes:

Queries determine the records that are available to a subsequent input, update, or output process, and/or establish the sort hierarchy. See Query Processes for more information.

Updates alter a database by adding, deleting, and changing records in the database?s files. Refer to Update Processes for additional information.

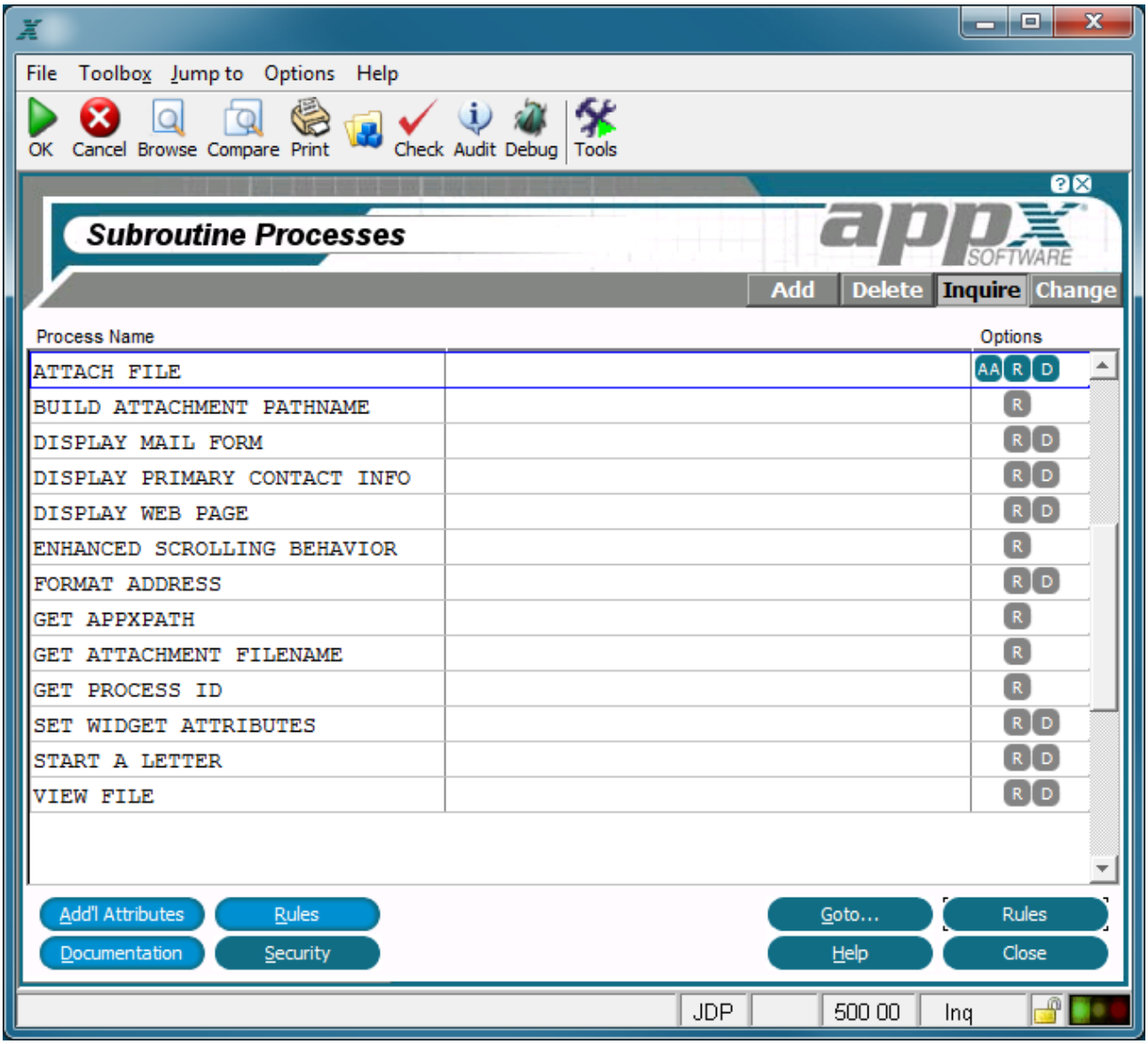
Subroutines define reusable procedural programs that can be executed from other APPX processes. A program that converts one unit of measure to another, for example, can be written as a subroutine. Refer to Subroutine Processes for more information.

Job streams control the sequencing of related processes. Refer to Job Processes for more information.

Status checks provide various error reporting options. Refer to Status Processes for additional information.

Common Process Specifications

Common process specifications define attributes that are applicable to all processes regardless of type (input, output, update, etc.). A Subroutine Processes screen, shown below, illustrates these common elements.



A Subroutine Processes Screen

Every Processes screen regardless of type contains the following items:

Process Name identifies a specific process of the type named in the screen heading. Process names may contain up to 30 uppercase alphanumeric characters and must be unique within type and application.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), D (Documentation), and src="http://www.appx.com/common/documents/manuals/appx/designer/Icon_OptionS.png" /> (Security).

Buttons are provided at the bottom of each Processes screen for accessing options. Process options vary depending on the type of process you are entering, but every process offers the following options:

Additional Attributes - See the Process Additional Attributes Option for details.

Rules - See the Process Rules Option for details.

Documentation - See the Process Documentation Option for details.

Security - See the Process Security Option for details.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

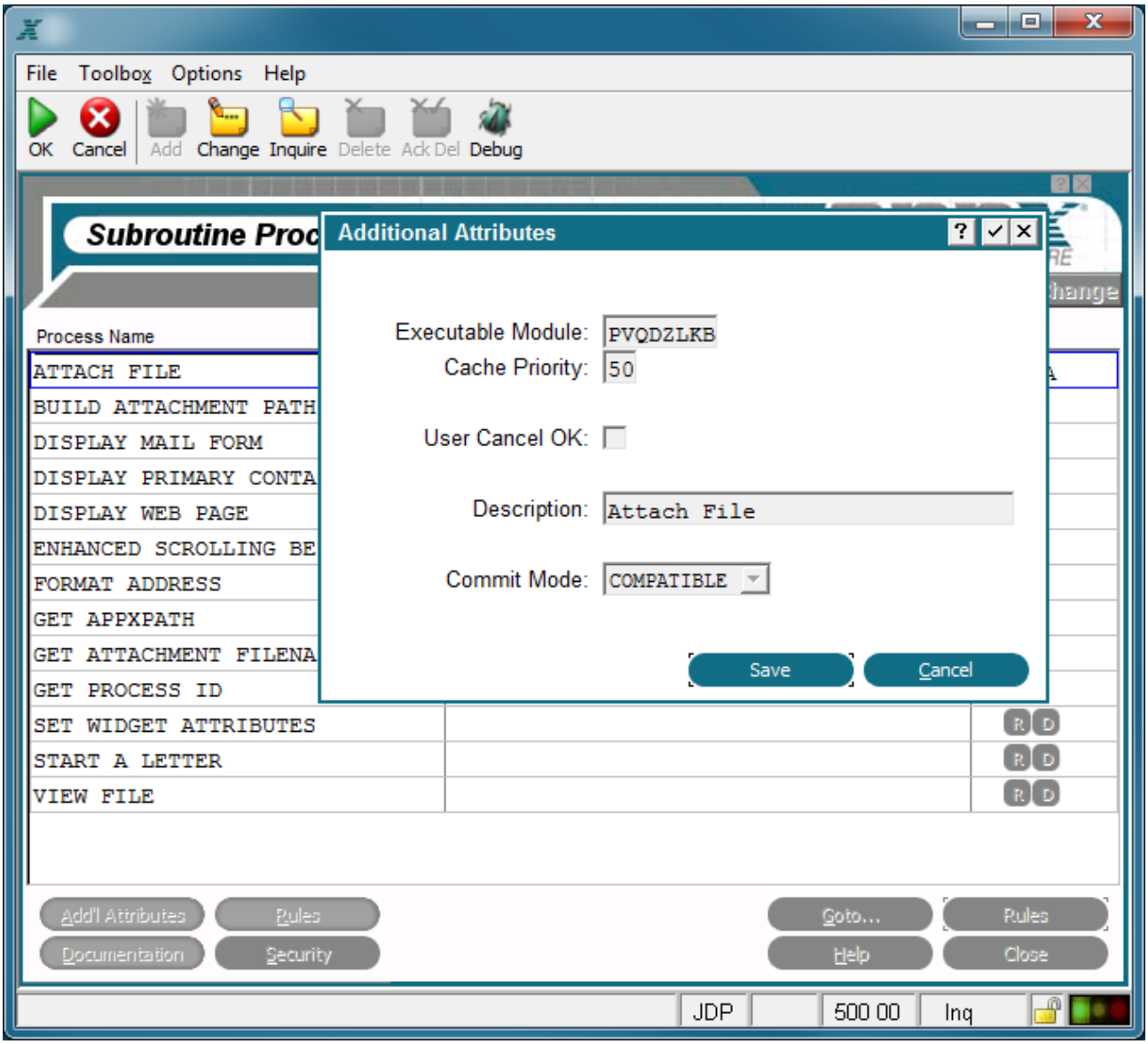
In addition, the menu bar on every Processes screen provides the following pulldown menus:

Toolbox - See the Process Toolbox Pulldown Menu for details.

Jump to - See the Process Jump to Pulldown Menu for details.

Process Additional Attributes Option

When you select the Additional Attributes option from a Processes screen, a process Additional Attributes overlay is displayed similar to the sample shown below for a subroutine process. It illustrates the fields applicable for all processes, although some processes have still more attributes.



Sample Process Additional Attributes Overlay

The sample process Additional Attributes overlay contains the following fields common to all processes:

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name. See Saving Executable Modules for more information.

Cache Priority, represented by two numeric characters, establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is 50.

User Cancel OK? contains either 'yes' ☑ or 'no' ☐ and determines whether or not a user can press the cancel option key to stop the execution of this process. The default is 'yes'. You can conditionally control the user's ability to select the canceloption with statements and the predefined field CANCEL OK. You can toggle between 'yes' and 'no' by clicking on the checkbox.

Description is incorporated in the message that displays on the screen when the process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE, Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT, APPX will commit each modification as it is made. *This value will be implemented in a future release.

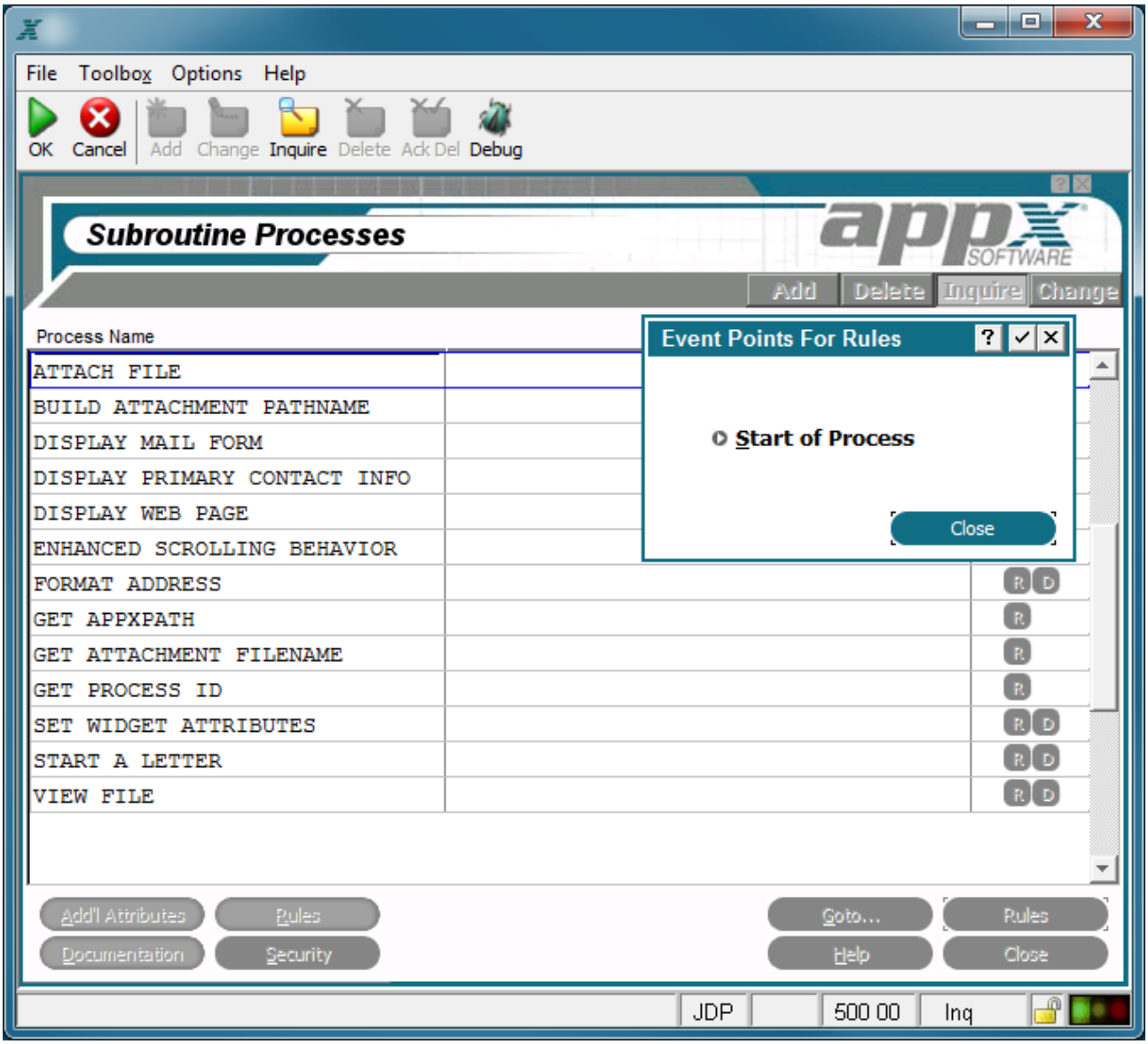
PCF CYCLE, APPX will commit modifications as each PCF record is processed.

END, APPX will only commit modifications at the end of the process family.

MANUAL, APPX will not automatically commit changes. You must use the COMMIT statement to do so.

Process Rules Option

When you select the Rules option from a Processes screen, an Event Points For Rules overlay is displayed. The following figure shows the overlay applicable for a subroutine process. It contains the only event point that is common to such overlays for all processes.



Sample Event Points for Rules Overlay

All types of processes have the Start of Process event point. Other event points are available depending on the type of the currently selected process. See the chapters later in this manual about specific types of processes for information about event points available from each type.

Start of Process

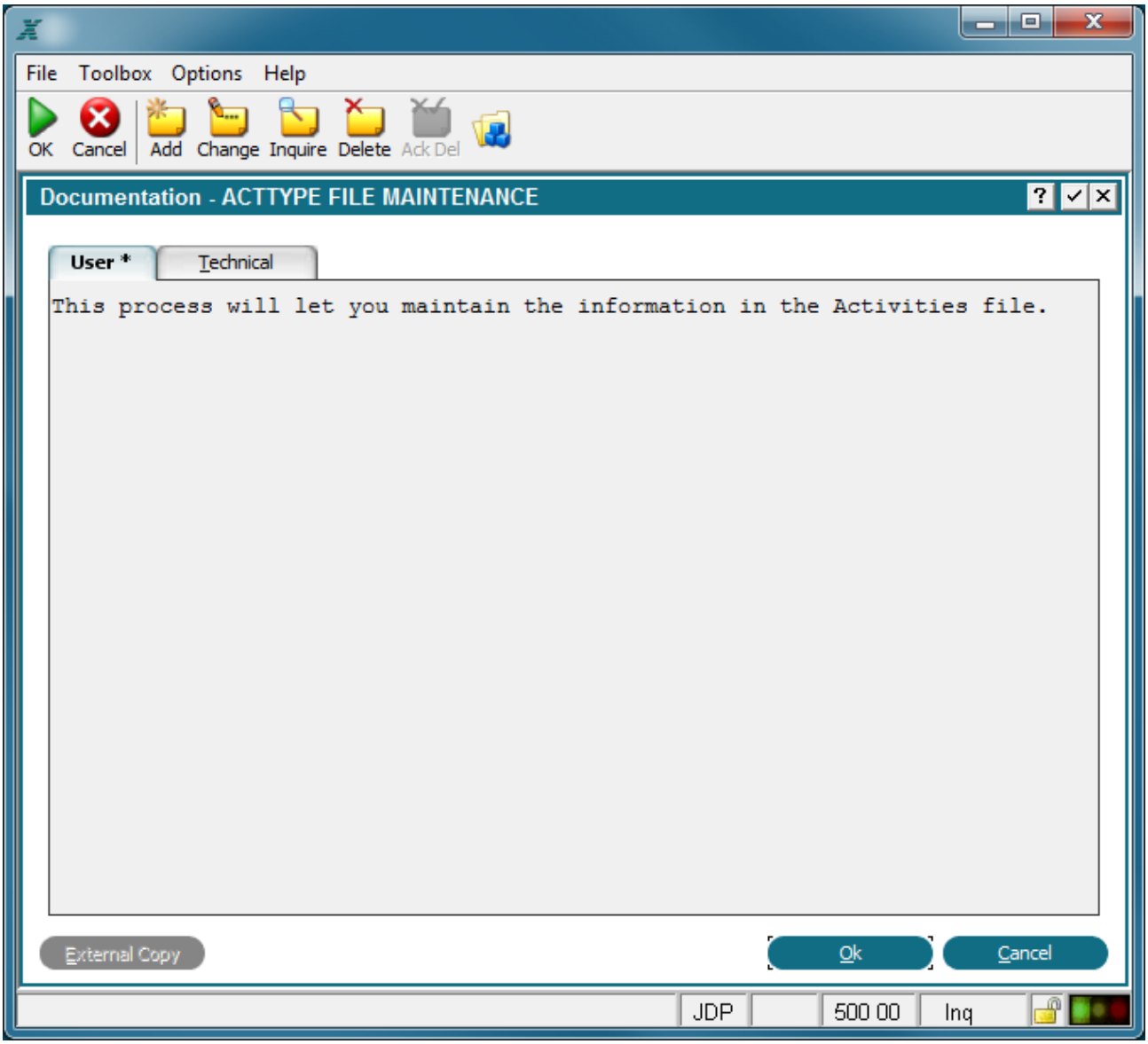
Start of process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned back to the Event Points for Rules overlay.

Refer to Using Event Points for more information about event points.

Process Documentation Option

APPX provides for two types of documentation: user documentation and technical documentation. User documentation is the basis for the online help facility. Technical documentation is the basis for printing technical documentation from the Application Design Documentation Menu.

When you select the documentation option from a Processes screen, a Documentation overlay is displayed similar to the sample shown below, with the User tab selected by default. The Technical tab has an identical format. This presentation is the same for all processes.



Process Documentation Overlay

Each Documentation screen contains the following field:

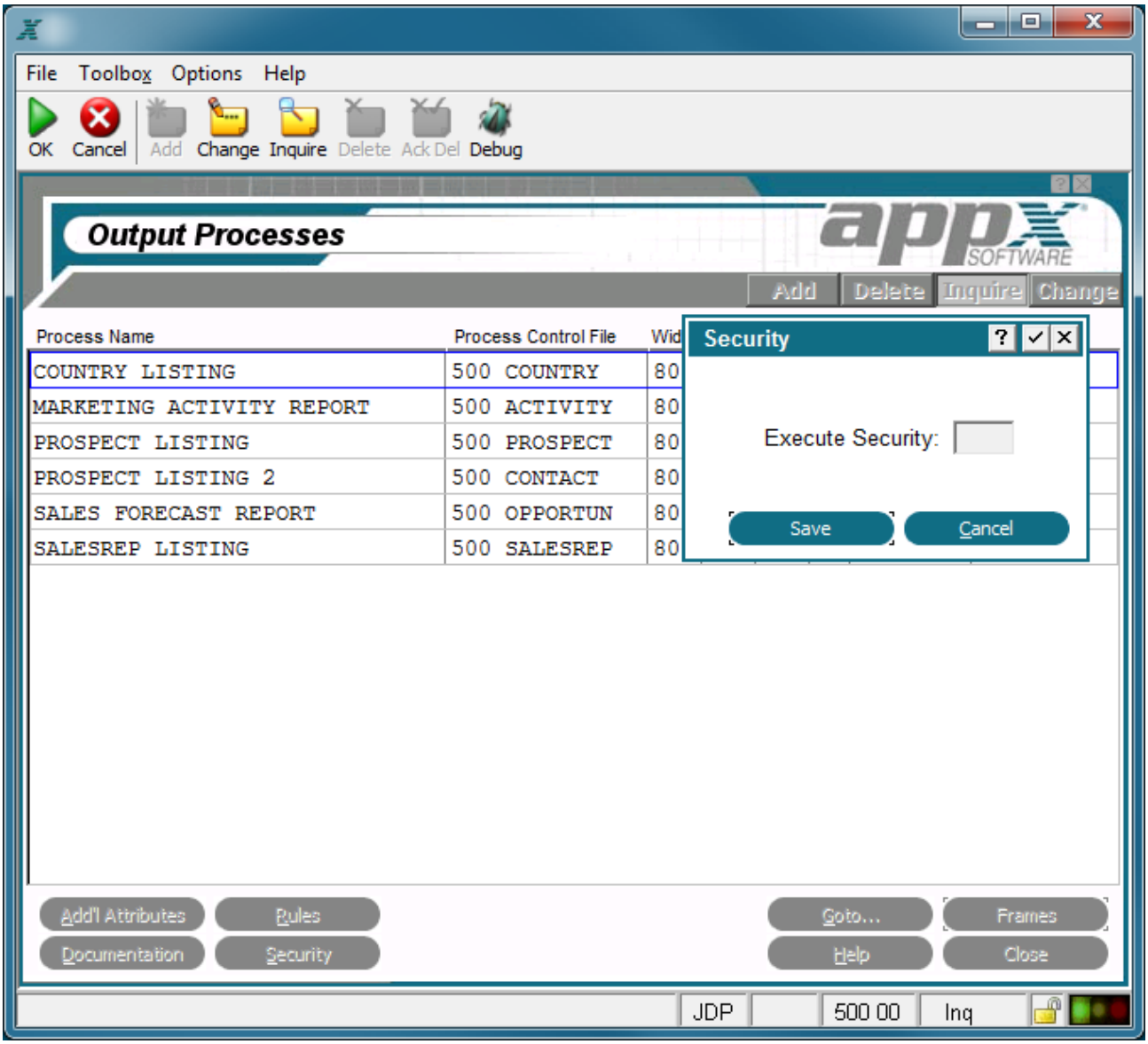
Text provides up to 17, 77-character lines to describe a process, or a total of 1,264 alphanumeric characters. APPX's text editing functions, including word-wrap, text insertions, text display, and end paragraph control can be used when entering this field. Refer to the *User Manual* for additional information on text editing capabilities.

A button is provided at the bottom of each Documentation screen for accessing the following option:

External Copy - Provides for accessing and copying another documentation record into the *Text field*.

Process Security Option

When you select the security option from a Processes screen, a Security overlay is displayed. The following figure shows the overlay applicable for all processes except inputs. Input processes provide for mode security codes as well as execute security.



Sample Process Security Overlay

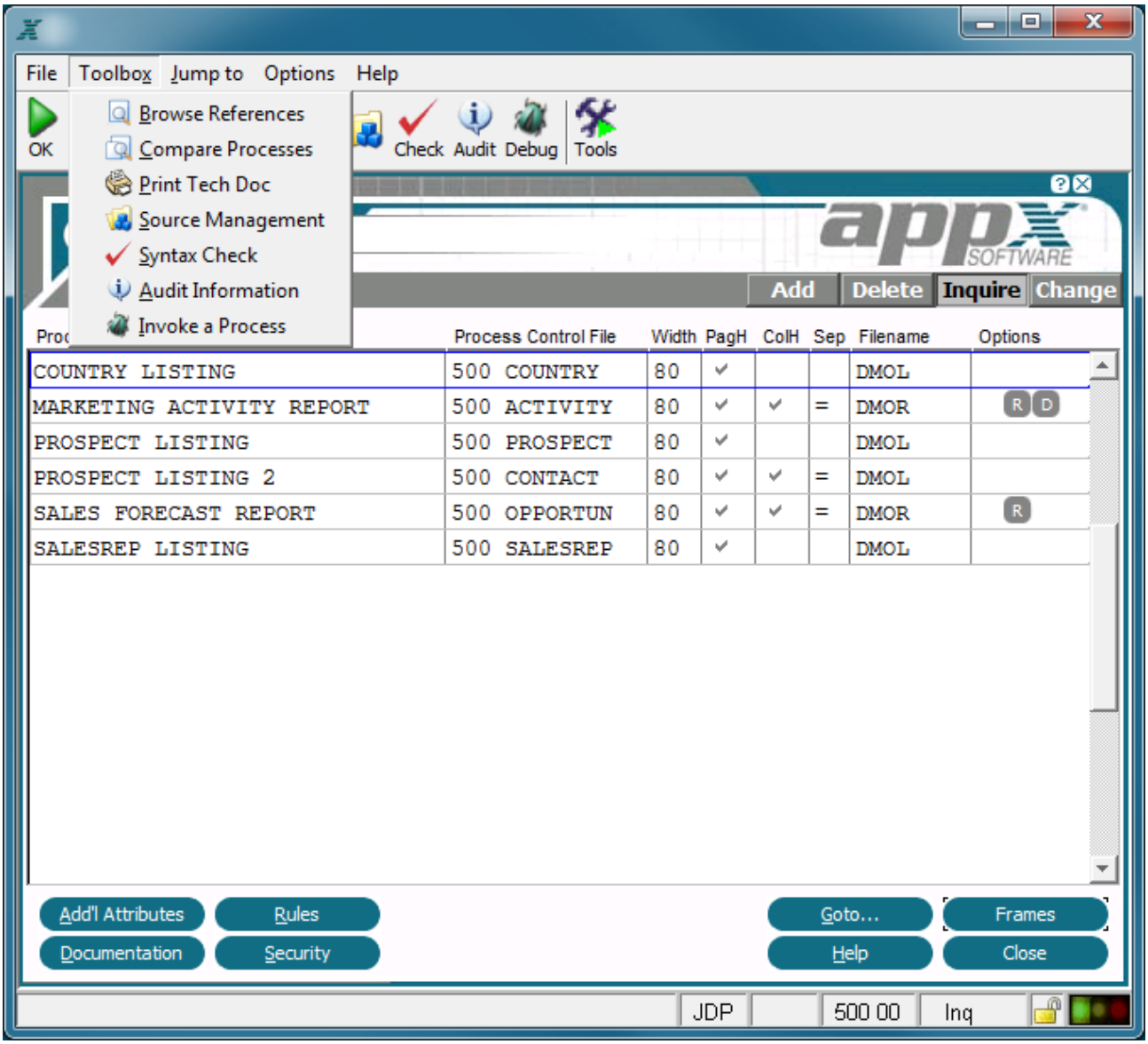
The sample process Security overlay contains the following field common to all processes:

*Execute Security*identifies the APPX security code to which a user must have rights in order to run the process (menu, job, input, etc.). The security code must be four numeric digits. If blank, there are no restrictions.

Refer to Security for an overview of APPX security.

Process Toolbox Pulldown Menu

When you select **Toolbox** from the menu bar on a Processes screen, the process Toolbox Pulldown Menu appears as shown below. The same toolbox applies to all processes. Note that each tool can also be accessed by selecting the corresponding icon on the Processes screen toolbar.



Process Toolbox Pulldown Menu

The process Toolbox Pulldown Menu offers the following options for all processes:

Browse References

The browse references option runs a modified version of 'Cross Reference - All' and produces a list of design components utilized by the currently selected process. The results can be displayed interactively where links allow you to see the context of the references, edit the referenced component, and drill down to the child process. This option can be used to identify, and optionally edit, the file level event points utilized by this process.

Compare Processes

The compare processes option compares the currently selected process to another process that you identify and produces a report listing any differences. You can also opt to browse the results interactively.

Print Technical Documentation

The print technical documentation option allows you to print the technical documentation for the currently selected process to the screen or to hard copy.

Source Management

Open Source Management to allow designer to post modifications. This option is active if this application is flagged in the Source Management Control System in Systems Administration.

Syntax Check

The syntax check option allows you to create the Executable Module for the currently selected process without running the process. If the Executable Module already exists and is still valid, this option is ignored if invoked. Note that this option (Option 97), like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox.

Audit Information

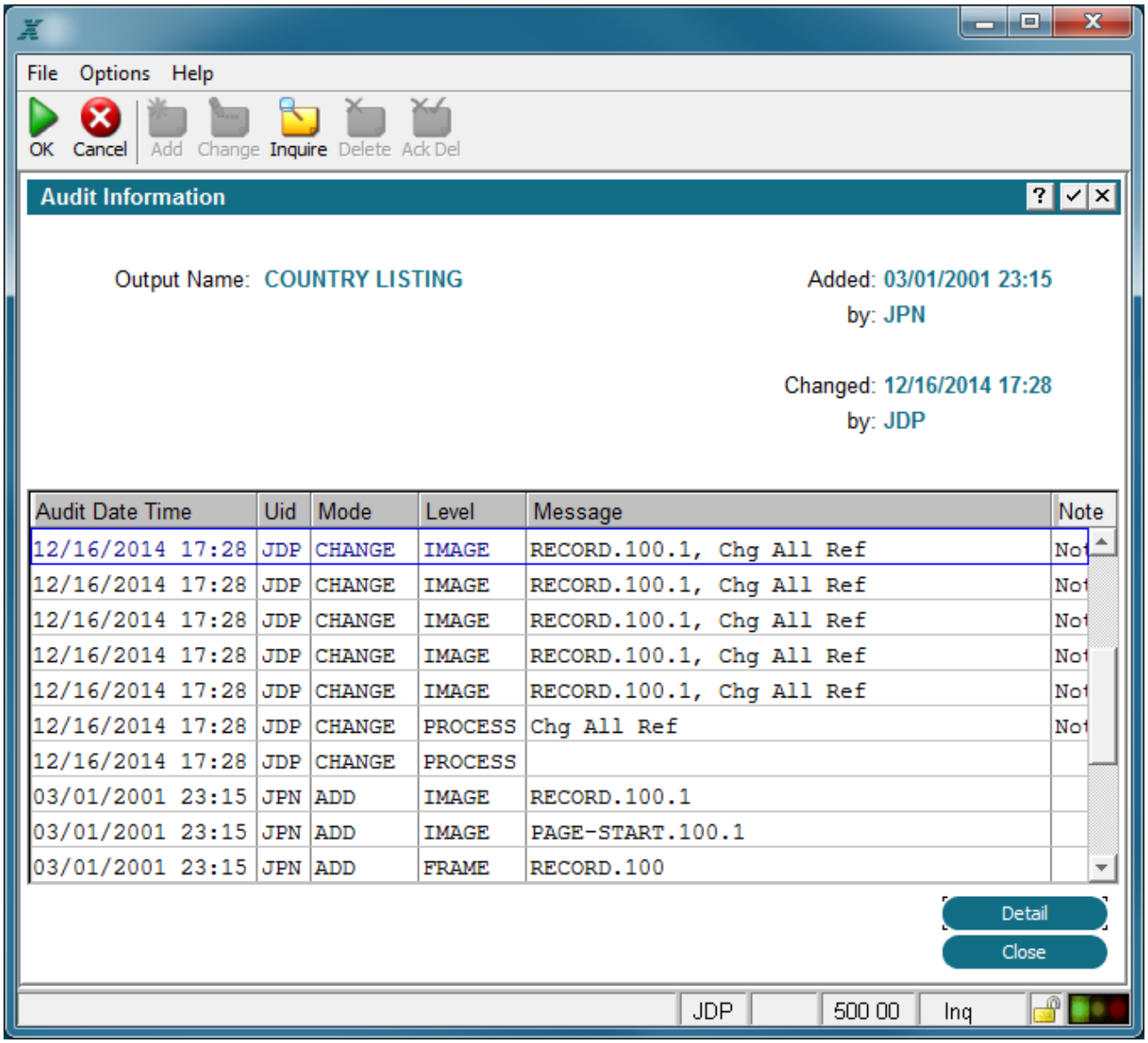
The audit information option allows you to see who created the currently selected process and who changed it most recently. It also provides you with the date that the process was created and the date that it was last changed. Note that this option (Option 98), like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox. See Audit Information Overlay for an example of the overlay.

Invoke a Process

The invoke a process option is available to facilitate testing. When you select this option, APPX defaults to the currently selected process but you may override the defaults to invoke any process. Note that this option, like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox. See Invoke a Process Overlay for details on using this option.

Audit Information Overlay

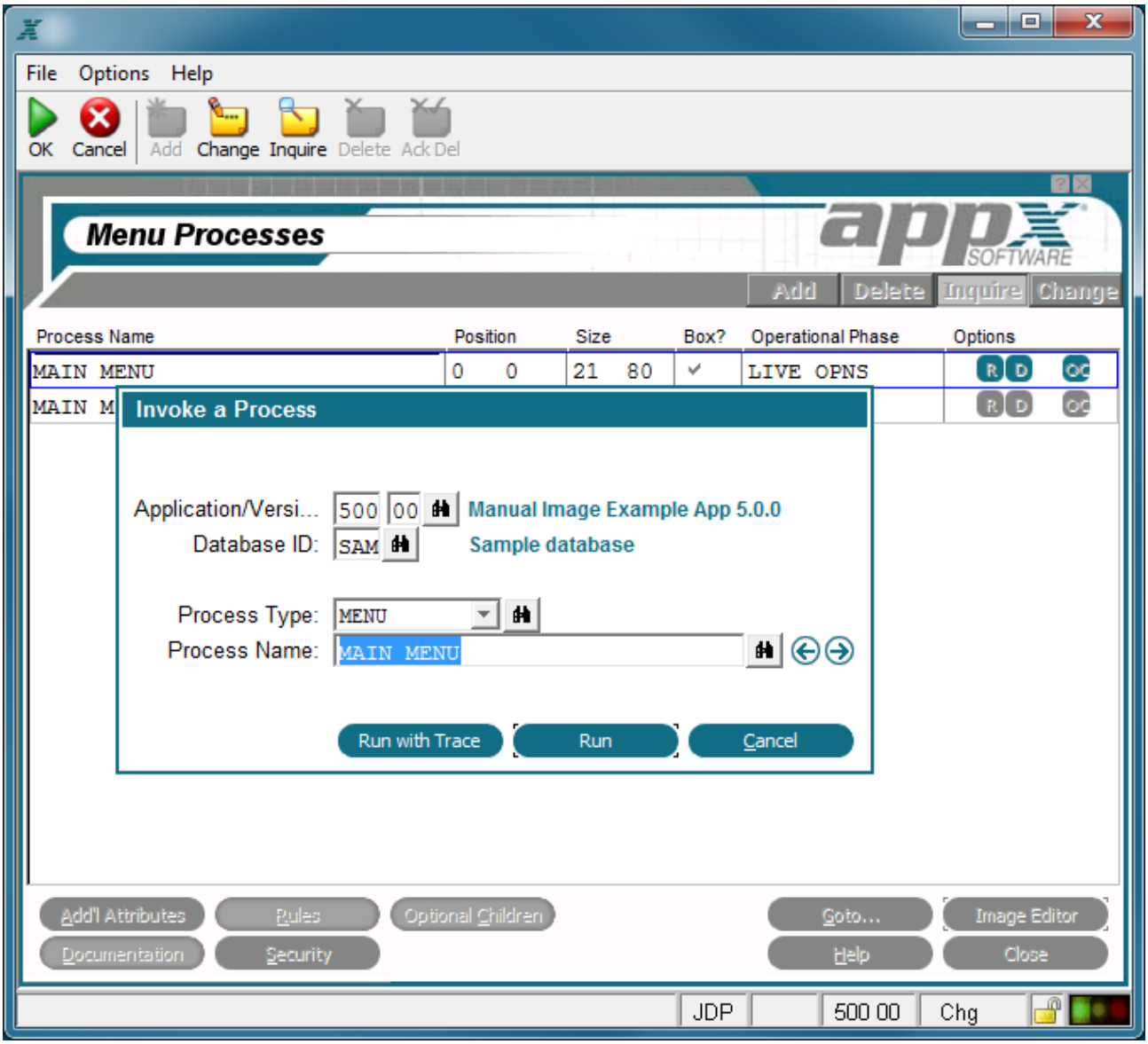
The Audit Information Overlay is the same when you select the audit information option for an object anywhere in Application Design. The following figure shows the overlay called from an output process. Audit information shows who created the currently selected object and who changed it most recently. It also lists the change history.



Audit Information Overlay

Invoke a Process Overlay

The Invoke a Process overlay is the same when you select the invoke a process option anywhere in Application Design, although the level of defaults may vary. The figure below shows the overlay called from a menu process which defaults the currently selected process.



Invoke a Process Overlay

You can change the default values on the Invoke a Process overlay to invoke any process name or type that you choose. This overlay also contains the following option:

Run with Trace

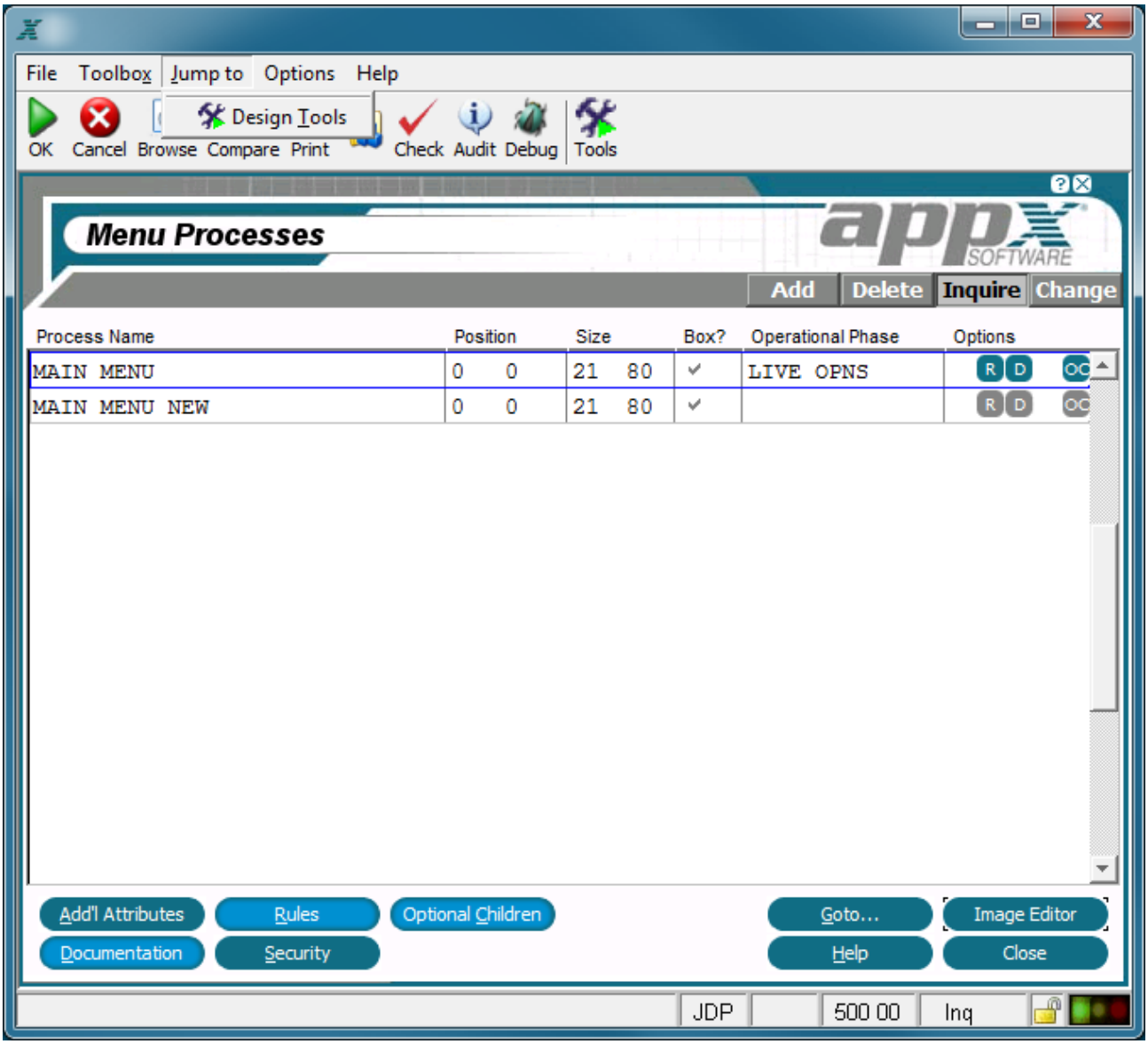
The run with trace option supplies you with a trace log that itemizes everything APPX has done during the execution of the selected process when the selected process is finished. Each line of the trace log shows a sequence number and a description of the logged event. The display of the trace log permits you to browse the trace in a hierarchical fashion. Events that have additional detail are identified by a *greater than* sign (>) next to the sequence number. To view the additional detail, place the cursor on the record and select enter. To return to a higher level, select end.

Selecting the cancel icon from the toolbar exits the trace display from any level.

Use the inquire option to switch to key entry at any time; this allows you to reposition yourself to a particular sequence number. While viewing a trace log, you can also use the hidden *Option 1* to view the entire trace in chronological (sequence number) order.

Process Jump to Pulldown Menu

When you select **Jump to** from the menu bar on a Processes screen, the process Jump to Pulldown Menu appears as shown below. The same toolbox applies to all processes. Note that each tool can also be accessed by selecting the corresponding icon on the Processes screen toolbar.



Process Jump to Pulldown Menu

The process Jump to Pulldown Menu offers the following option for all processes:

Design Tools

The design tools option calls the Application Design Tools Menu shown below. This is the same menu that is displayed when you select the Tools tab from the Application Design screen. When you exit from this screen, you will return to where you were when you selected the design tools option.

Application Design Tools Menu

CHAPTER 3-4

Menu Processes

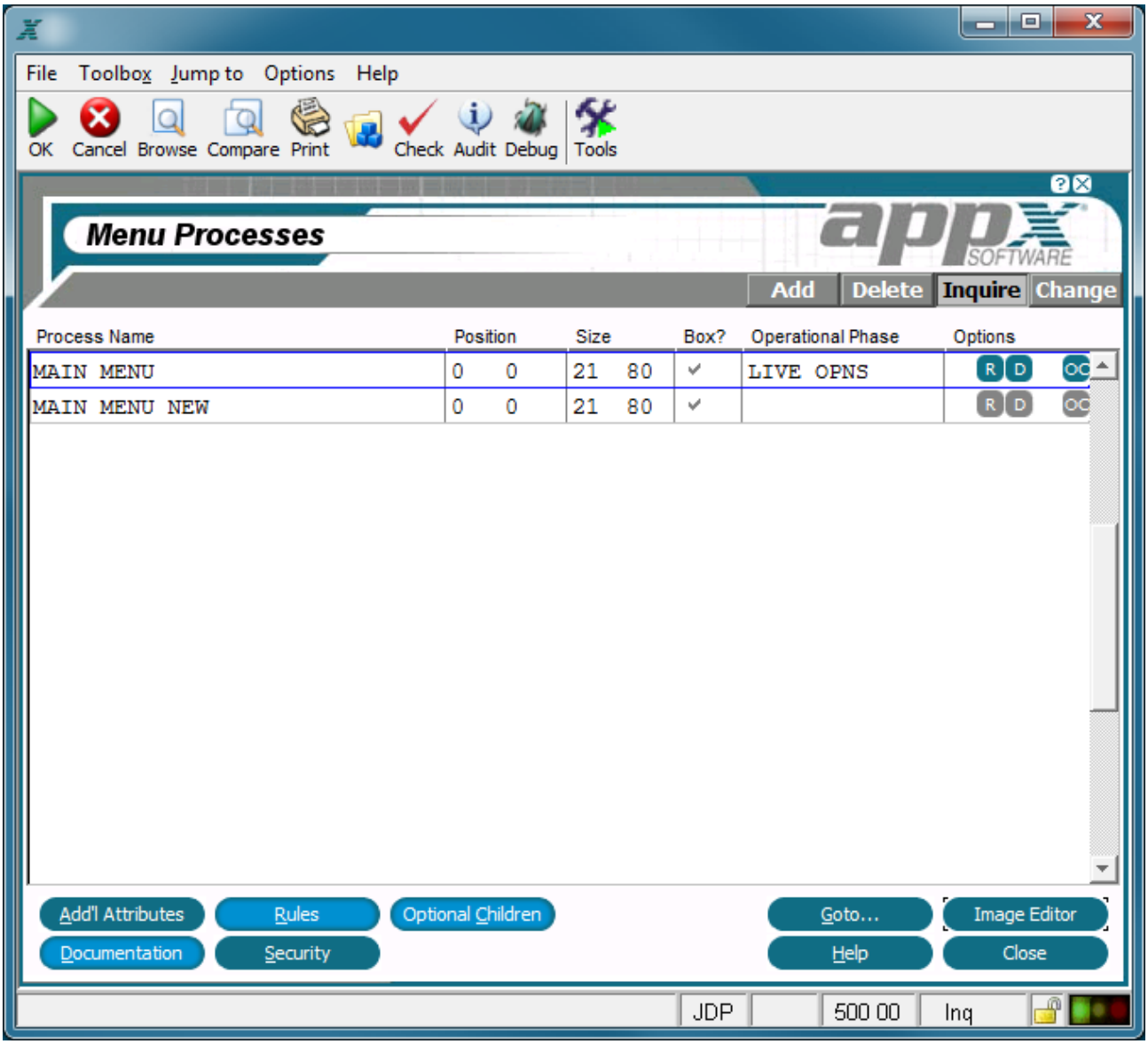
Introduction to Menu Processes

Menu processes provide an on-screen display from which to execute selected processes. For example, a screen that lists the reports available in an application and from which you select a specific report is a menu process.

In a typical application, you begin process definition by designing and specifying the main menu that is presented when a user first enters the application. You then proceed to identify what happens when each of the options on the menu is selected. APPX allows you to define up to 249 options (choices) on each menu. An option may invoke another menu, and the number of 'nested' menu levels that you can specify is unlimited.

Menu Process Specifications

Menu processes specifications establish the general attributes of a menu process. The Menu Processes screen, shown below, is displayed when you select menus from the Application Design Specifications Menu.



Menu Processes Screen

The Menu Processes screen contains the following fields:

Process Name identifies a specific process and consists of up to 30 uppercase alphanumeric characters that must be unique within type and application.

Position fields contain up to three numeric characters each and determine the placement of the rows and columns of a frame relative to the rows and columns on the screen display. Row entries designate positioning relative to the top of the screen. Column entries designate positioning relative to the left of the screen. The default is *1, 1*. See Frame/Image Positioning for more information.

Size fields, which consist of three numeric characters each, designate the number of rows and columns that comprise the displayed frame. This size may be greater than the size of the screen if panning capabilities are desired. The default is *21, 80*.

Box?, represented by 'yes' ☑ or 'no' ☐, indicates whether or not APPX draws a box around an image before it displays to a user. The border does not consume rows or columns within the space that is defined for the frame/image, but does consume space on the screen. The default is 'no' and the value can be toggled by clicking the checkbox.

Operational Phase allows you to enter the appropriate operational phase, if the currently selected menu is the main menu for one of the three operational phases. Valid entries are:

INITIAL SETUP

LIVE OPNS

RECOVERY PROC

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), D (Documentation), S (Security), and OC (Optional Children).

Buttons are provided at the bottom of each Menu Processes screen for accessing the following options:

Additional Attributes - Same as the Process Additional Attributes Option.

Rules - See the Menu Process Rules Option for details.

Optional Children - See the Menu Process Optional Children Option for details.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Image Editor - See Menu Image in the Image Editor for details. This is the default option.

Documentation - Same as the Process Documentation Option.

Security - Same as the Process Security Option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

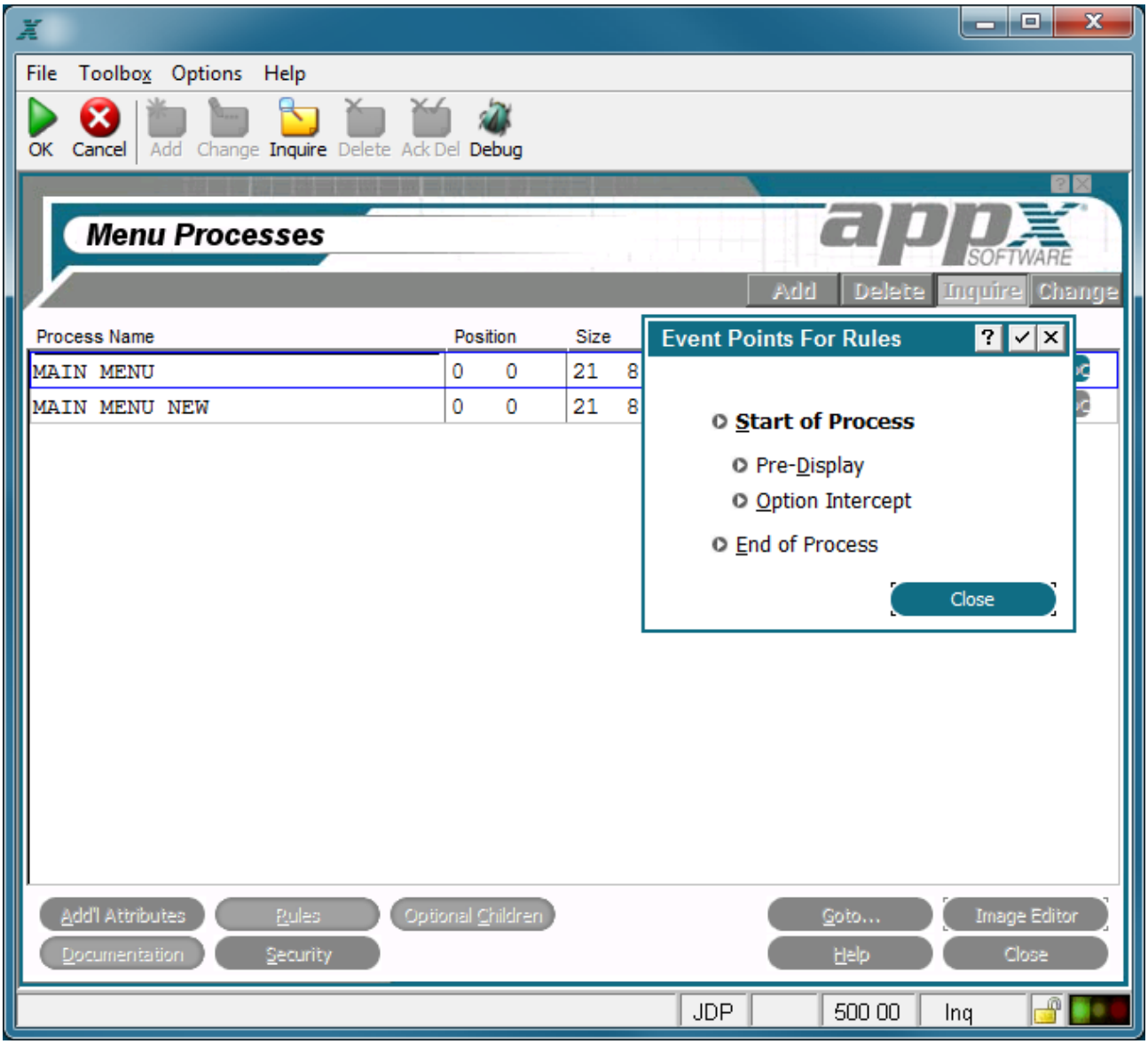
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Menu Process Rules Option

When you select the Rules option from the Menu Processes screen, the menu processes Event Points for Rules overlay is displayed as shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted.



Menu Processes Event Points for Rules Overlay

The Menu Processes Event Points overlay contains the following options:

Start of Process

start of process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the process Event Points overlay.

Pre-Display

pre-display accesses the ILF editor for the Pre-Display event point. Upon completion, you are returned to the process Event Points overlay.

Option Intercept

option intercept accesses the ILF editor for the Option Intercept event point. Upon completion, you are returned to the process Event Points overlay.

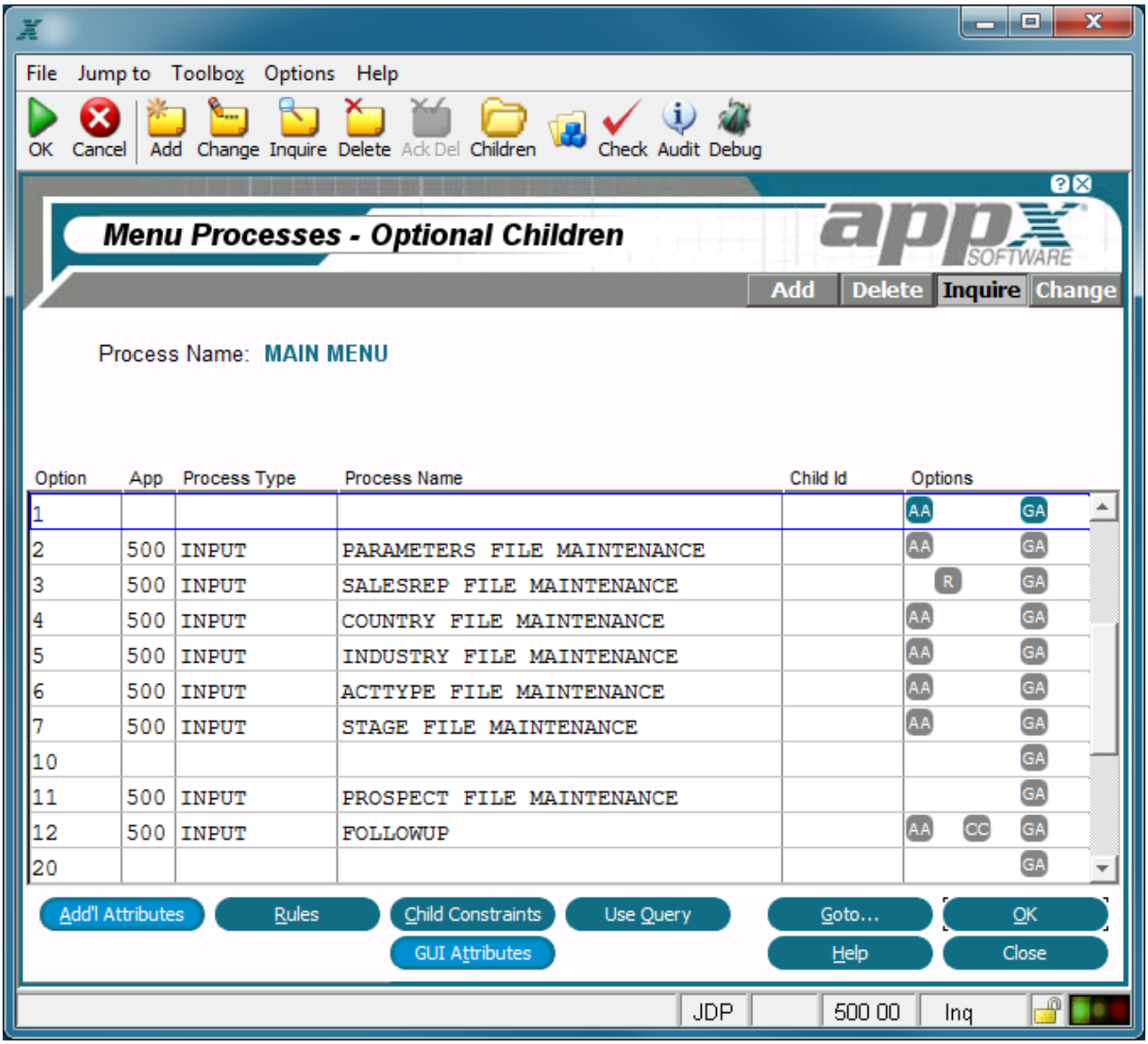
End of Process

end of process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the process Event Points overlay.

Refer to Using Event Points for more information about event points.

Menu Process Optional Children Option

When you select the optional children option from the Menu Processes screen, the menu processes Optional Children screen is displayed as shown below. This screen defines attributes to govern the discretionary invocation of another APPX process from the menu process image. These specifications include the name of the child process, the invocation type, and whether or not various activities at the child level affect the parent process.



Menu Processes Optional Children Screen

Defining optional children is described in depth in Automatic and Optional Children. Upon completion, you are returned to the Menu Processes screen.

Menu Image in the Image Editor

After you complete specifications for a menu process on the Menu Processes screen, you automatically enter the Image Editor when you press return or select the image editor option. The Image Editor, APPX's screen painting facility, is the facility used to format menus, inputs, outputs, and inquiry screens. As you design the menu screen, you are seeing the image exactly as it will appear to your users. The figure below shows a menu image being edited in the Image Editor.

Menu Image in the Image Editor

The standard features of the Image Editor can be employed in character mode using only a keyboard. However, you need a mouse to take advantage of the GUI features within the Image Editor. GUI tools provide designers with the ability to create screen images complete with pictures, buttons, icons, wallpapers, and other graphical features. Another GUI tool is a data palette offering drag and drop selection and placement of data fields.

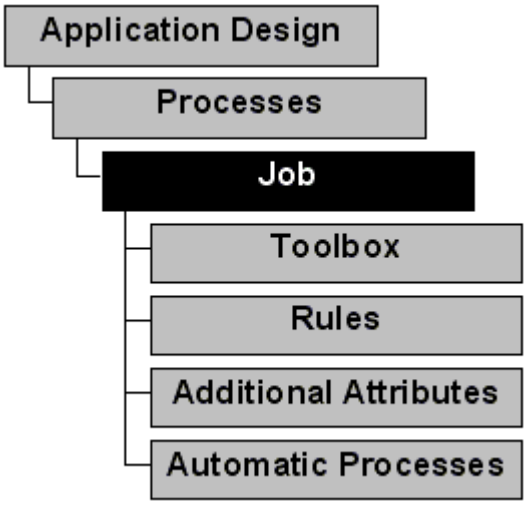
Basic functionality of the Image Editor is fully explored in Using the Image Editor and a complete discussion of its GUI features is presented in Using GUI Features of the Image Editor.

CHAPTER 3-5

Job Processes

Introduction to Job Processes

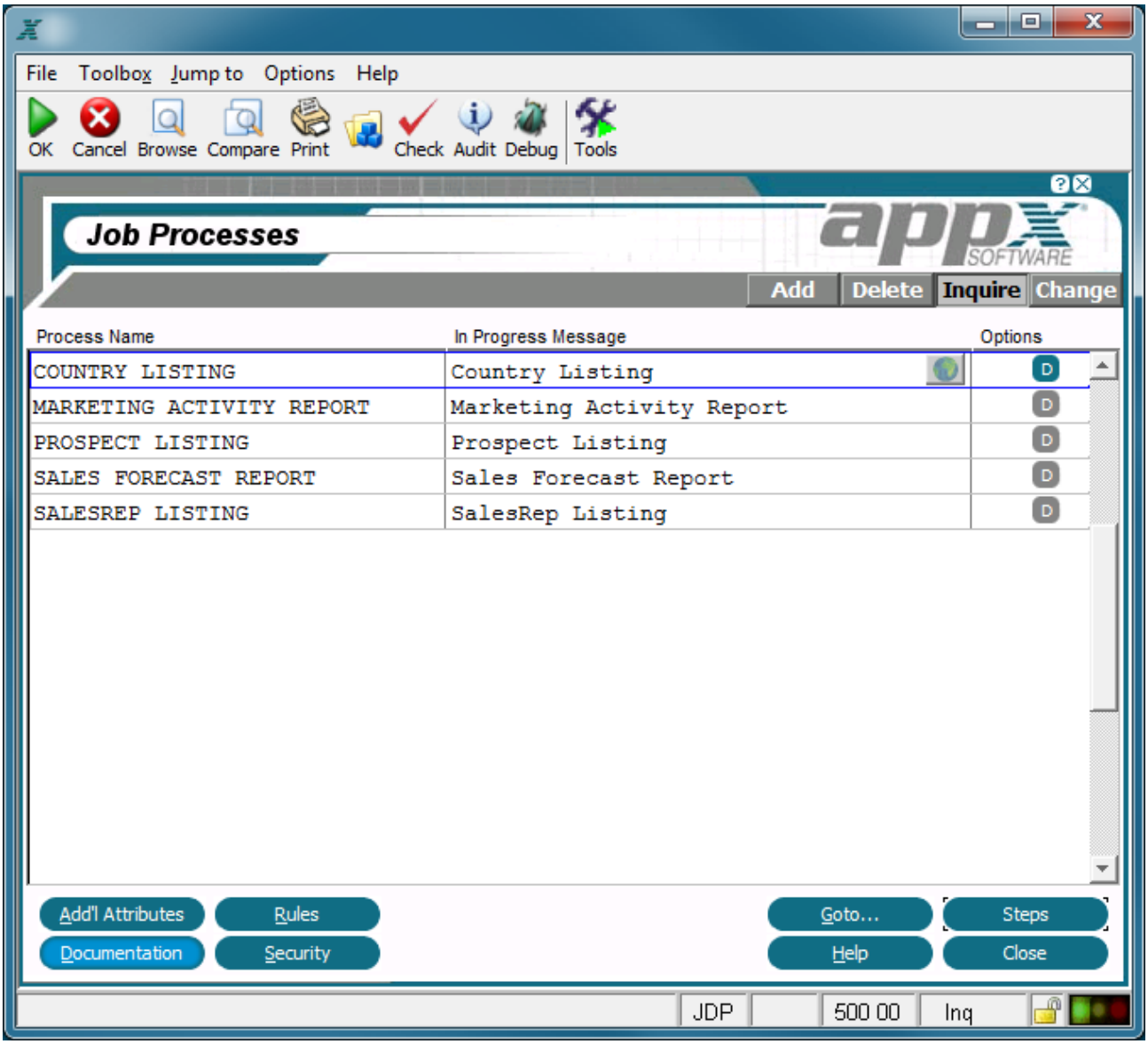
Job processes are used to control the sequencing of other related processes.



Job Process Definition

Job Process Specifications

Job process specifications establish the general attributes of an job process, including the 'In Progress' message. The Job Processes screen, displayed when you select job from the Process Management overlay, is shown below.



Job Processes Screen

The Job Processes screen contains the following fields:

Process Name identifies a specific process and must be unique within type and application.

In Progress Message field provides text for the message that displays on the screen while the job process executes in the foreground.

Opts are indicators that are present whenever documentation (T), rules (R), or additional attributes (AA) have been defined for this process.

Buttons are provided at the bottom of each Menu Processes screen for accessing the following options:

Additional Attributes - Same as the Process Additional Attributes Option.

Rules - See the Job Process Rules Option for details.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Steps - Shows the list of processing steps defined in this Job.

Documentation - Same as the Process Documentation Option.

Security - Same as the Process Security Option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Job Process Toolbox Option

The Toolbox overlay, which appears on the screen when you invoke the Toolbox option from the Job Processes screen contains a number of features that will help you design a job process. See Process Toolbox for more details.

Job Process Rules Option

Selecting the Rules option accesses the job processes Event Points For Rules overlay which allows you to select from two options that access the ILF Editor for APPX event points. The overlay is shown below. If statements were defined in the event point, the text on the screen is highlighted. Refer to Using Event Points for more information. The Job Processes Event Points overlay contains the following options:

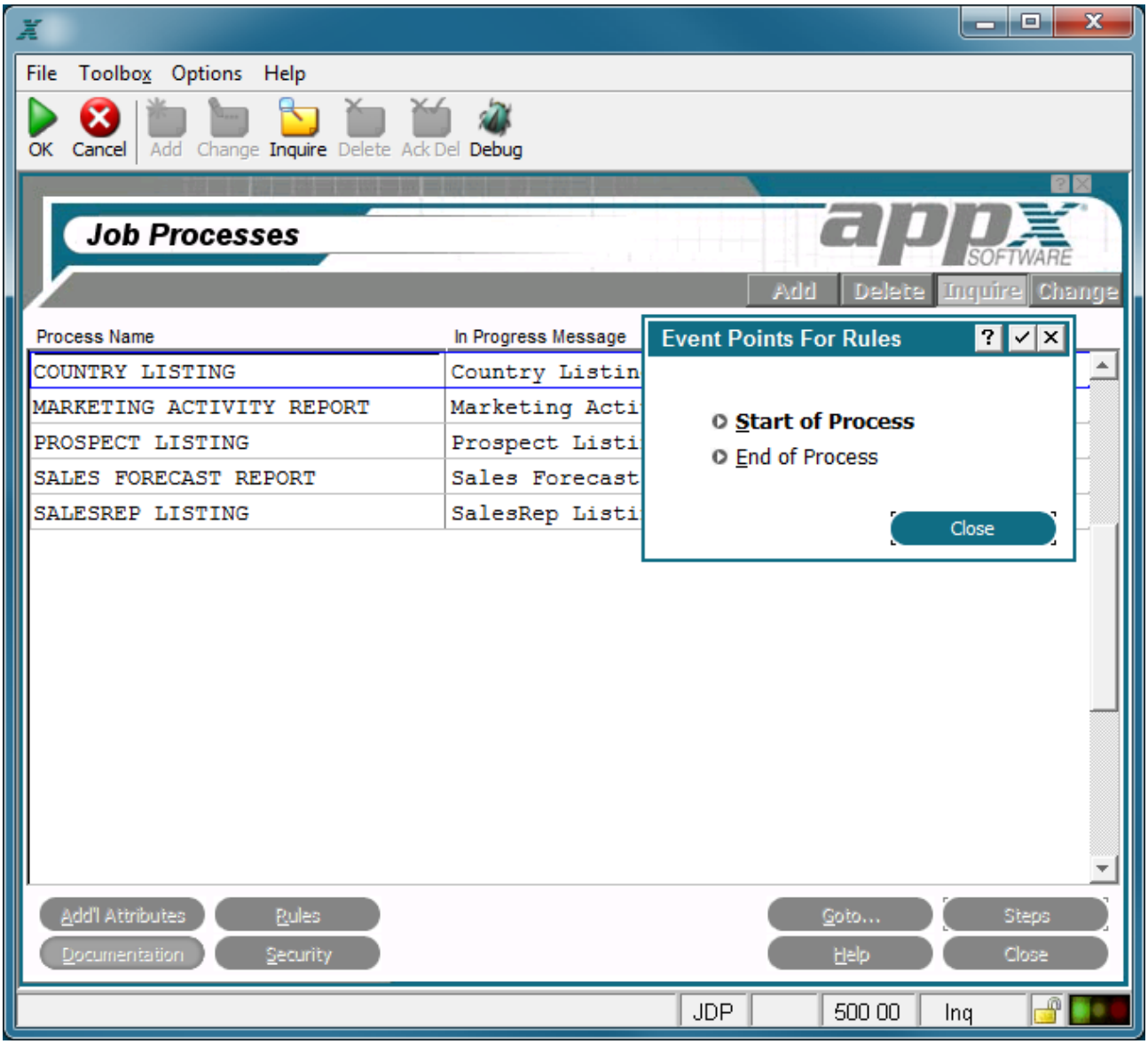
Start of Process

start of process accesses the ILF editor for the *Start of Process* event point. Upon completion, you are returned to the process Event Points overlay.

End of Process

end of processaccesses the ILF editor for the *End of Process* event point. Upon completion, you are returned to the process Event Points overlay.

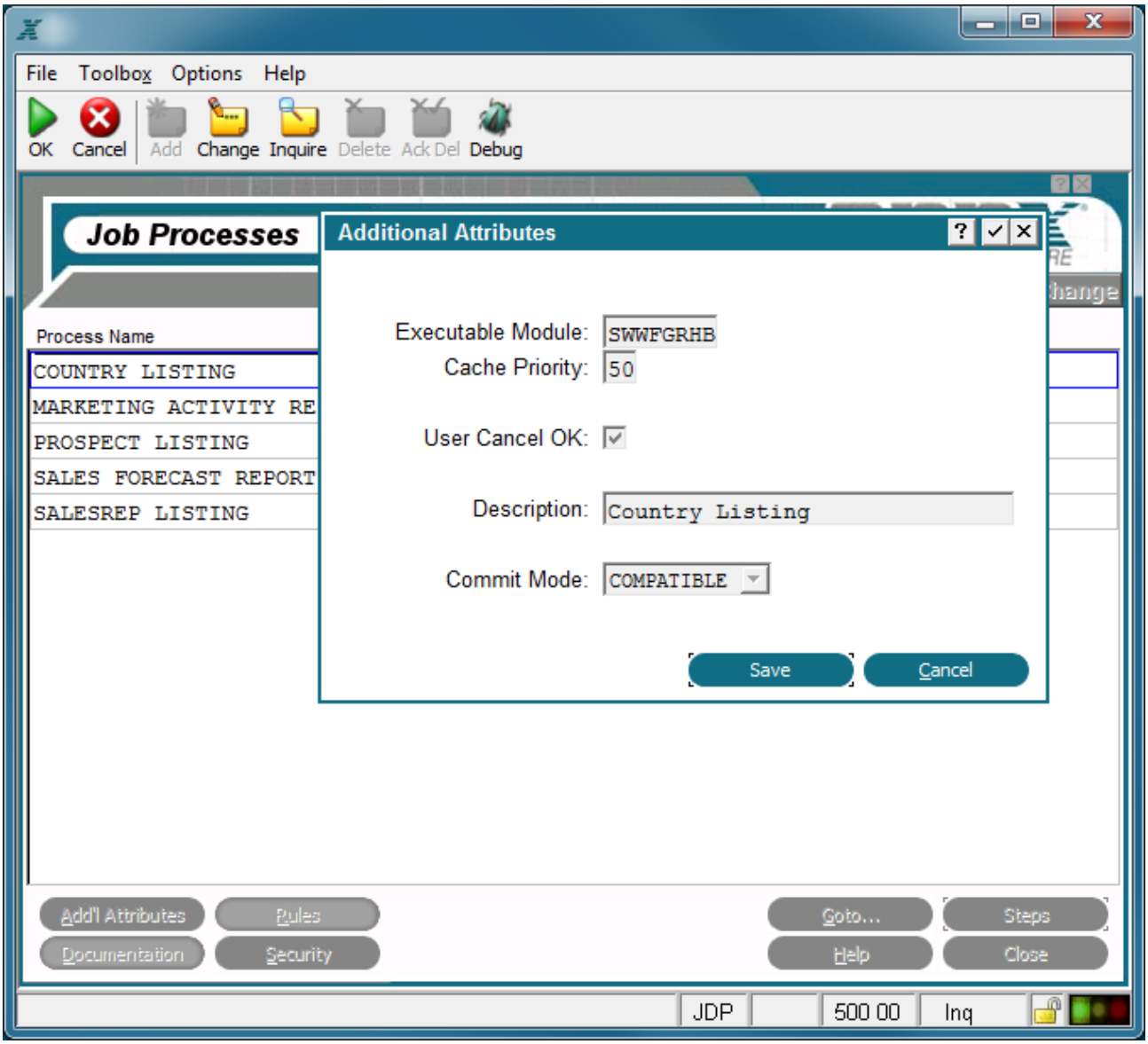
Refer to Using Event Points for more information.



Job Processes Event Points For Rules Overlay

Job Process Additional Attributes Option

Additional Attributes accesses the job processes Additional Attributes overlay where you will find additional parameters. The job processes Additional Attributes overlay, shown below, contains the following fields.



Job Processes Additional Attributes Overlay

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected job process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name. See *Process Definition*, for more information.

Cache Priority establishes the likelihood that the currently selected job process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is *50*. See *Process Definition*, for more information.

User Cancel OK? contains either 'yes' ☑ or 'no' ☐ and determines whether or not a user can press the Cancel option key to stop the execution of the currently selected job process. The default is 'yes' but can be toggled to 'no' by clicking the checkbox. You can conditionally control the user's ability to select the cancel option with statements and the predefined field CANCEL OK.

Description is incorporated in the message that displays on the screen when the currently selected job process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank. See *Process Definition*, for more information.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT*. APPX will commit each modification as it is made. *This value will be implemented in a future release.

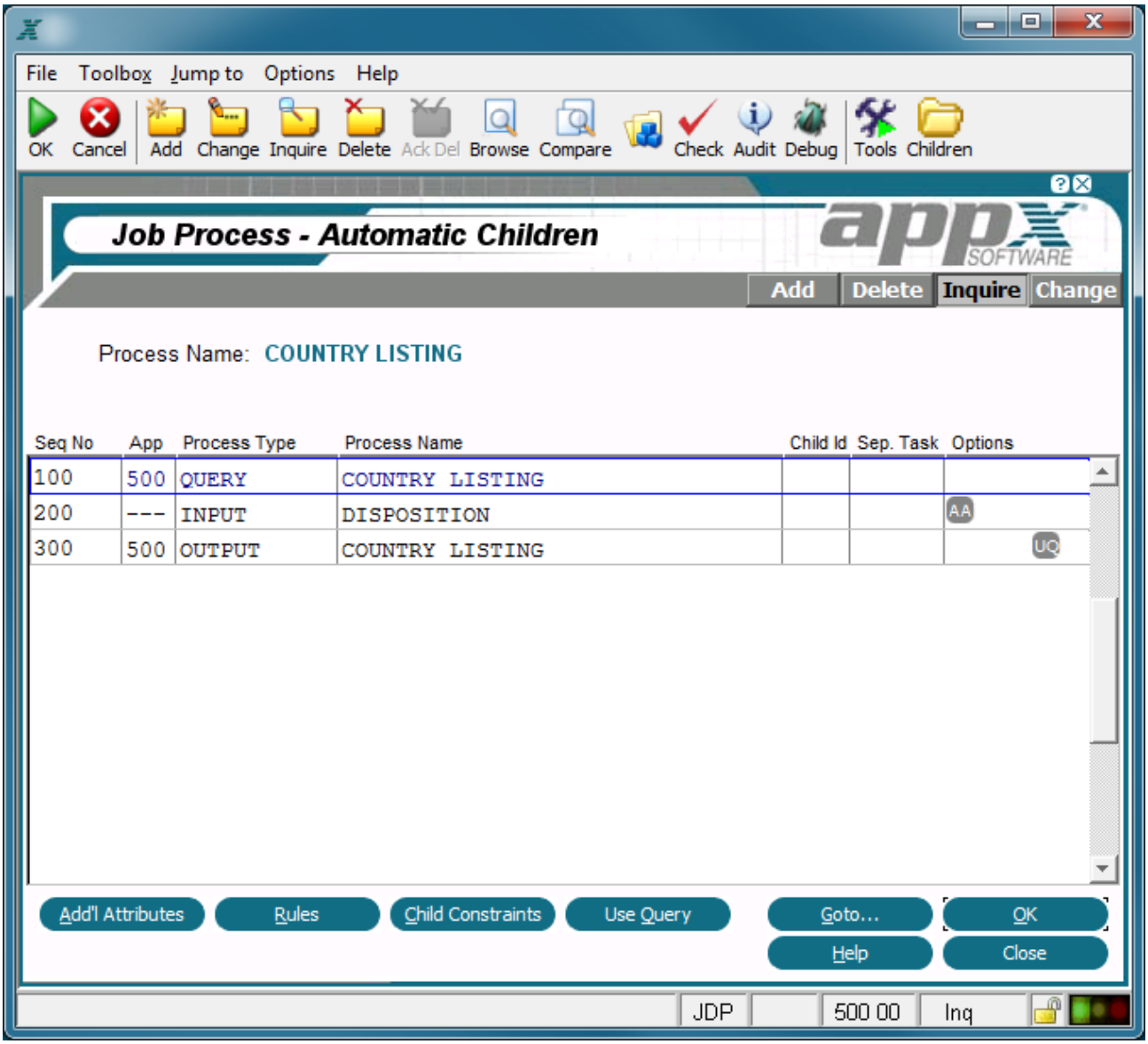
PCF CYCLE. APPX will commit modifications as each PCF record is processed.

END. APPX will only commit modifications at the end of the process family.

MANUAL. APPX will not automatically commit changes. You must use the COMMIT statement to do so.

Job Process Automatic Child Processes

A job consists of a series of *Automatic Child Processes* that are executed sequentially. These processes are defined using the overlay shown below. For more information regarding Automatic Child Processes and the options available on this overlay, see the chapter Automatic and Optional Child Processes.



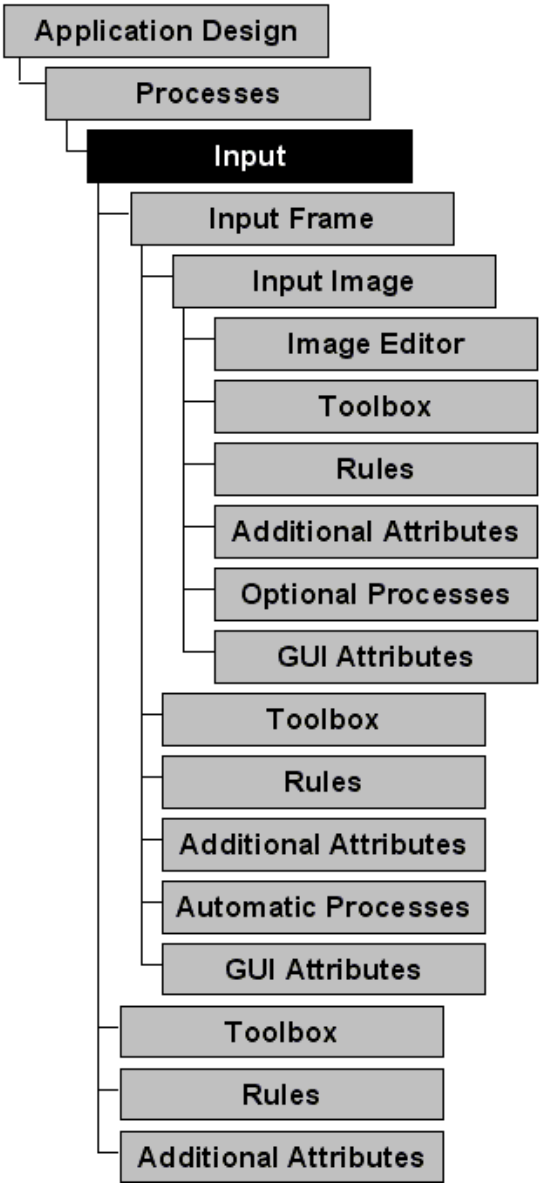
Automatic Child Processes Overlay For Jobs

CHAPTER 3-6

Input Processes

Introduction to Input Processes

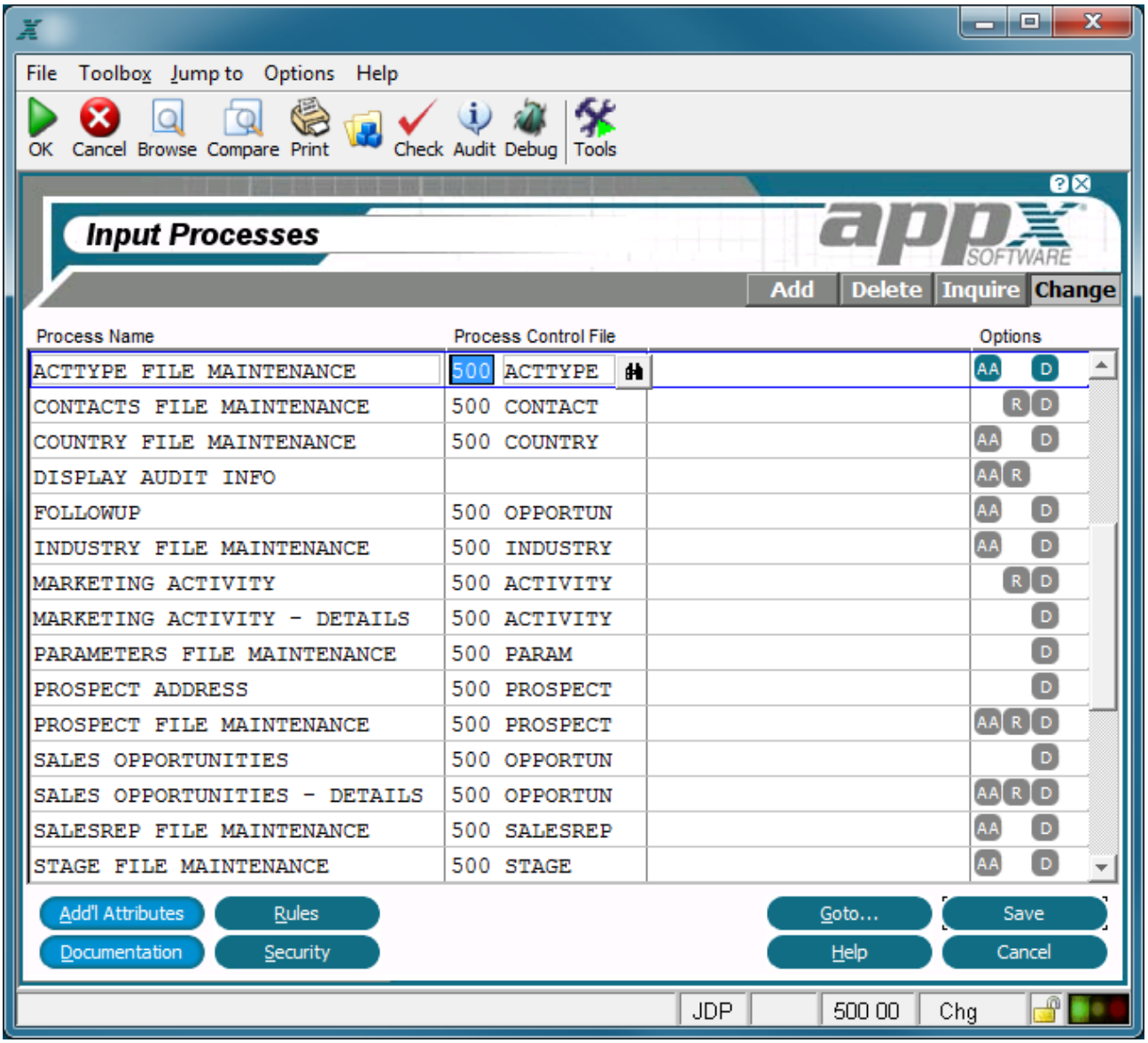
Input processes permit you to enter or maintain data in one or more files from designer-formatted screens and overlays. A sales order entry function and a customer file maintenance function are both examples of input processes.



Input Process Definition

Input Process Specifications

Input process specifications establish the general attributes of an input process, including a process control file and operational characteristics. The Input Processes screen, shown below, displays when you select inputs from the Application Design Specifications Menu.



Input Processes Screen

The Input Processes screen contains the following fields:

Process Name identifies a specific process and consists of up to 30 uppercase alphanumeric characters that must be unique within type and application.

Process Control File is optional for input processes. If present, it identifies a file by application ID and file name that is to be automatically managed by APPX during the execution of this process. APPX automatically reads, writes, rewrites, and deletes records in the process control file (PCF) during input process execution (and provides for updating the child PCF for any automatic children). If the PCF is left blank, the input process will execute once and then automatically end (as opposed to executing once for every record).

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), D (Documentation), and S (Security).

Buttons are provided at the bottom of each Input Processes screen for accessing the following options:

Additional attributes - See the Input Process Additional Attributes Option for details.

Rules - See the Input Process Rules Option for details.

Documentation - Same as the Process Documentation Option.

Security - Same as the Process Security Option.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

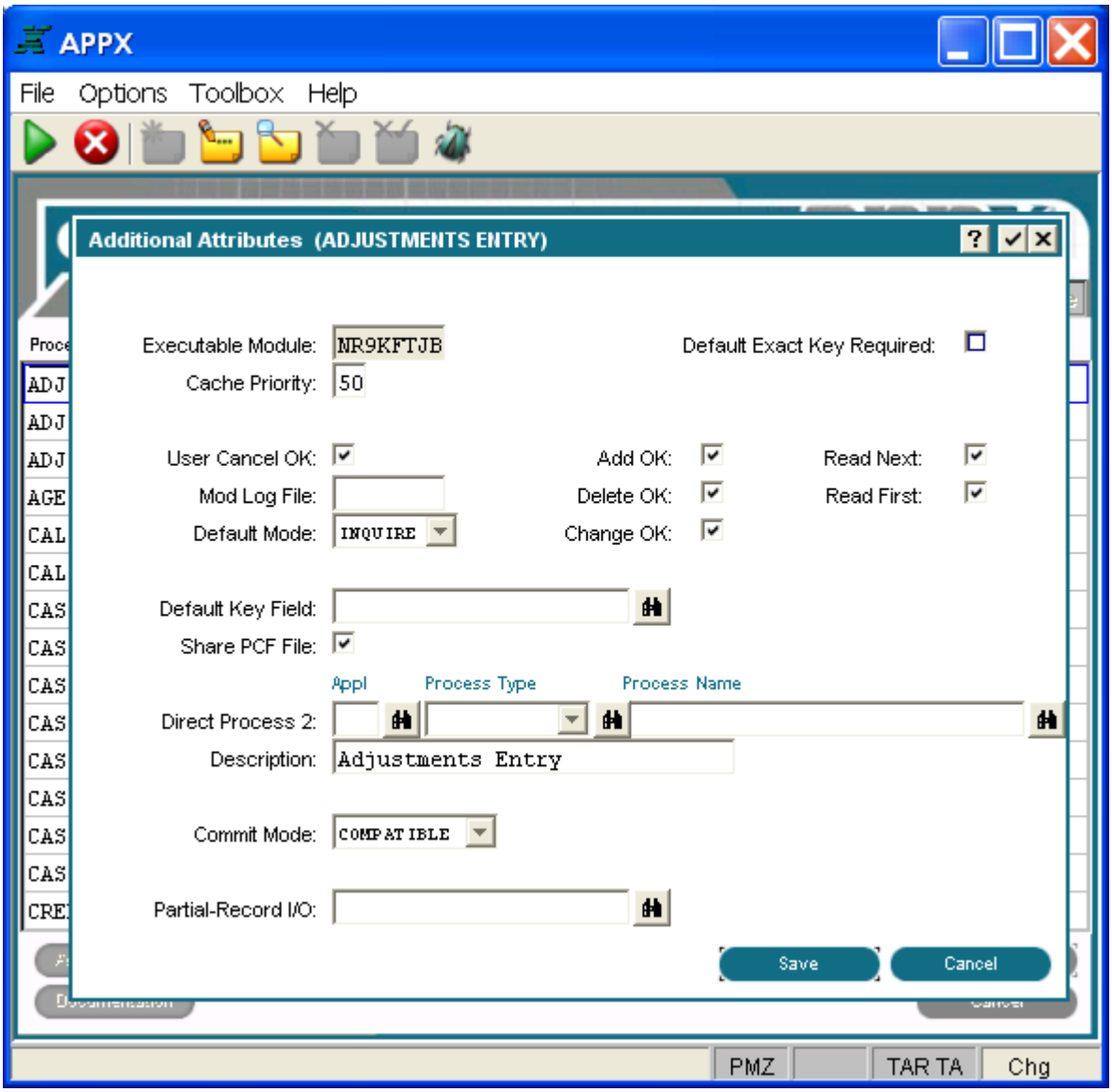
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Input Process Additional Attributes Option

When you select the Additional Attributes option from the Input Processes screen, the Input Processes Additional Attributes overlay is displayed as shown below. This overlay permits the definition of more properties affecting the operation of the input process.



Processes Additional Attributes Overlay

The Additional Attributes overlay for Input processes contains the following fields:

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name. See Saving Executable Modules for more information.

Default Exact Key Required?contains either 'yes' ☑ or 'no' ☐ and establishes the default value for the *Exact Key Required?* option. This option controls whether or not a user is required to enter a complete and exact key value to retrieve a record. The designer may override this default value with statements. If the field is set to 'no', users are allowed to enter partial key values. APPX retrieves the record with the next highest key value if the entered value is not on file. The default is 'no'.

Cache Priority, represented by two numeric characters, establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is 50.

User Cancel OK? contains either 'yes' ☑ or 'no' ☐ and determines whether or not a user can press the cancel option key to stop the execution of this process. The default is 'yes'. You can conditionally control the user's ability to select the canceloption with statements and the predefined field CANCEL OK. You can toggle between 'yes' and 'no' by clicking on the checkbox.

Add OK? and **Delete OK?** and **Change OK?** control whether or not a user can access this process in add, delete and change modes. Each of these fields requires 'yes' ☑ or 'no' ☐ and the values can be toggled by clicking the respective checkbox. The default is 'yes'.

Read Next?controls whether the user can retrieve the next record in the file by simply selecting Enter. If 'no' ☐, the user must identify the next record to be retrieved. The default is 'yes'.

Read First? controls whether the first record of the PCF file is presented to the user upon entry into this process. 'Yes'☑ indicates it will and 'no' ☐ indicates it will not.

Mod Log Filegenerates a modification log when this input process is run when you enter up to eight alphanumeric characters for the print file name. If ☐, no modification log is printed. A modification log lists all additions, deletions, and changes to the process control file. During initial setup, a modification log is never printed. During recovery processing, a modification log is always printed, regardless of whether a *Mod Log Print File* name is specified or not. If no name is specified, *MODLOG* is used. The default is ☐.

Default Mode determines the initial mode in which the process invokes. The *Default Mode* options are add, delete, inquire, change. The default is *Change.* If you want to override this specification, there are two methods. See Start of Process in Using Event Points to explain how to override the default mode using statements. The other method would be to select 'yes' in the *Override Default Mode* field on the Additional Attributes overlay when defining this process as an optional child from menu, input, or job processes.

Default Key Field designates the specific keypath that is initially presented to a user invoking this process. This specification is overridden by the default keypath that is defined for the child process invocation of the process, if applicable. The keypath may also be dynamically specified via ILF code. APPX determines the appropriate keypath at runtime. If no explicit specification of keypath is found, the primary key is used.

Share PCF File*?* contains either 'yes' ☑ or 'no' ☐ and determines whether or not the file can be shared. If 'no', the file is opened for exclusive use. Note that care should be exercised in opening a file for exclusive use to avoid unintended consequences. For instance, if another process attempts to read

this file while it is in exclusive access, the read will not wait for the lock to be released. Instead, the read will fail and act in accordance with the fail type specified in the read statement. The default is 'yes' but can be toggled to 'no' by clicking the checkbox.

Direct Process 2 designates the Application ID, Process Type, and Process Name of the process to be executed when the application-specific Direct Process option is selected from this input process. The Application ID contains three alphanumeric characters; the Process Type contains ten alphanumeric characters, and the Process Name contains up to 30 alphanumeric characters. Refer to the *User Manual* for additional information on the use of Direct Process options.

Description is incorporated in the message that displays on the screen when the process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE .. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT . APPX will commit each modification as it is made. *This value will be implemented in a future release.

PCF CYCLE ..... APPX will commit modifications as each PCF record is processed.

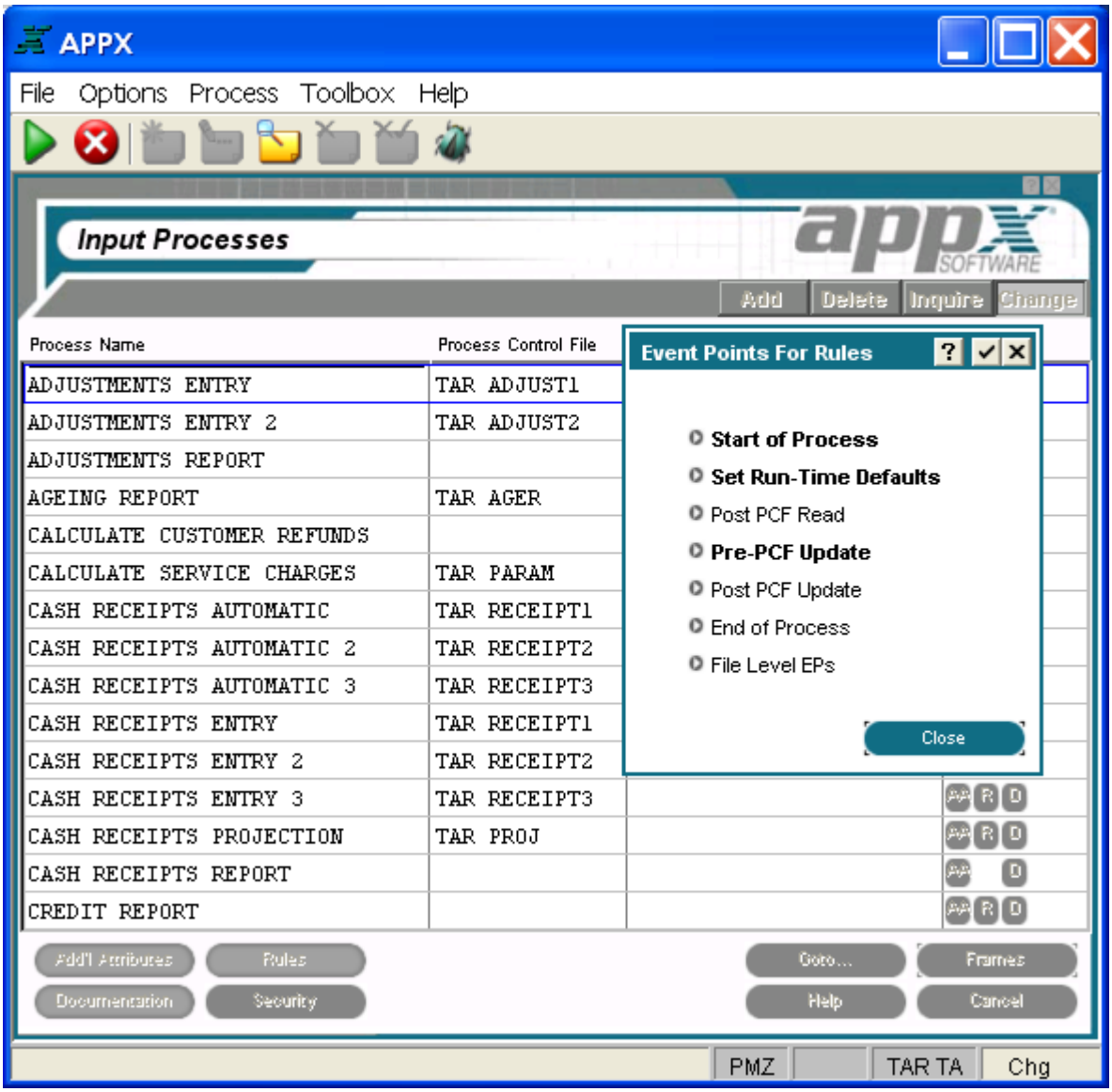
END ..... APPX will only commit modifications at the end of the process family.

MANUAL ..... APPX will not automatically commit changes. You must use the COMMIT statement to do so.

Partial-Record I/O is used to specify a field from the PCF file so that instead of operating on the entire PCF record, APPX operates on the designated field only. If the field is a group header, then I/O will be performed on all members of the group. Utilizing partial-record I/O can greatly improve performance when the PCF is a table in an RDBMS. This is especially true when the table contains many columns, but relatively few are being utilized by the process. The scan option is available for field selection.

Input Process Rules Option

When you select the Rules option from the Input Processes screen, the Input Processes Event Points for Rules overlay is displayed as shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted.



Input Processes Event Points for Rules Overlay

The Input Processes Event Points for Rules overlay contains the following options:

Start of Process

start of process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the Event Points overlay.

Set Run-Time Defaults

set run-time defaults accesses the ILF editor for the Set Run-Time Defaults event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Read

post pcf read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the Event Points overlay.

Pre-PCF Update

pre-pcf update accesses the ILF editor for the Pre-PCF Update event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Update

post pcf update accesses the ILF editor for the Post PCF Update event point. Upon completion, you are returned to the Event Points overlay.

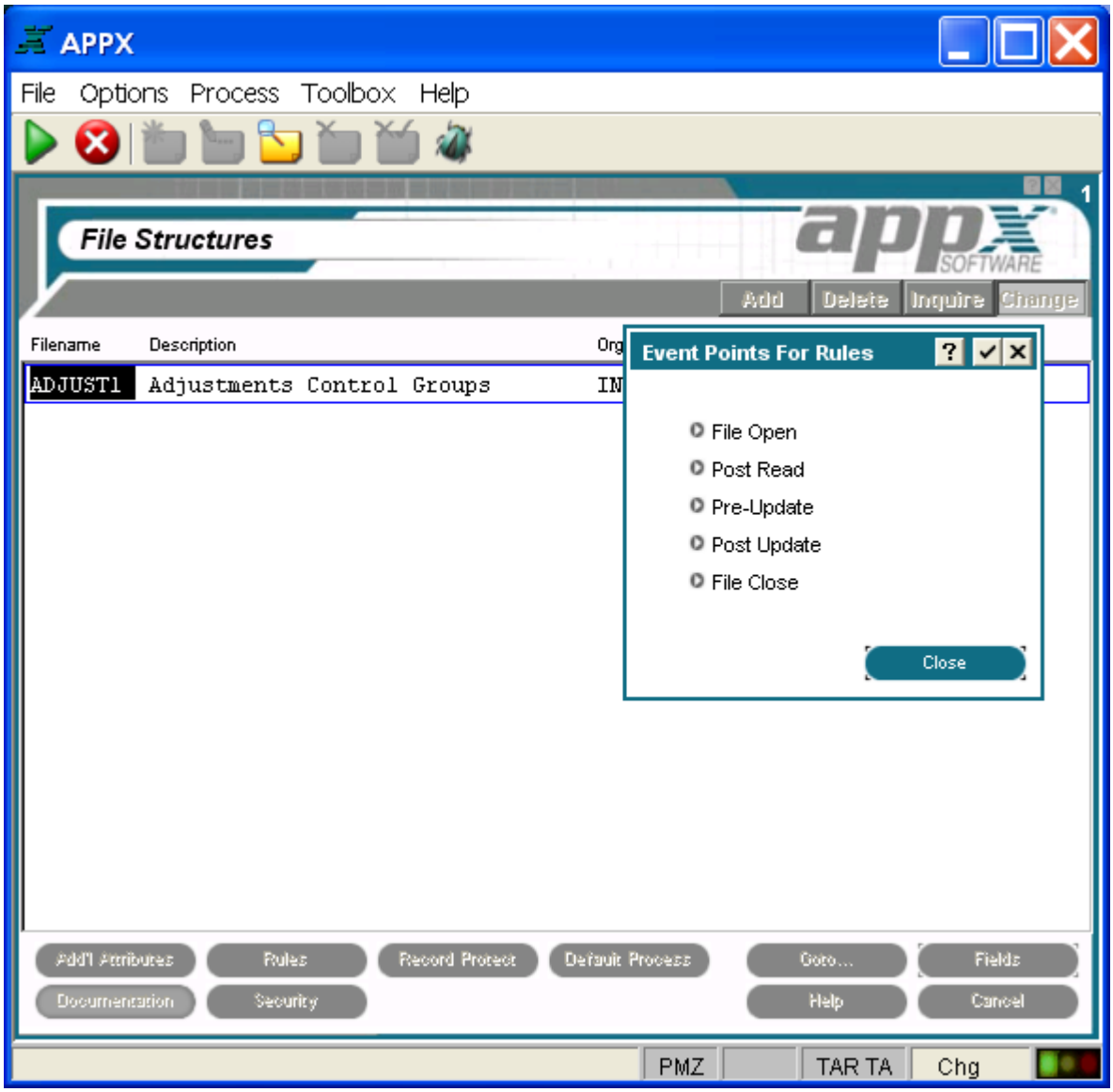
End of Process

end of process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the Event Points overlay.

File Level EPs

file level eps provides access to the File Level Event Points for the PCF file, as shown below. These event points are not directly associated with the process but with the PCF file. See the Files Rules Option in this manual for more information on using these event points.

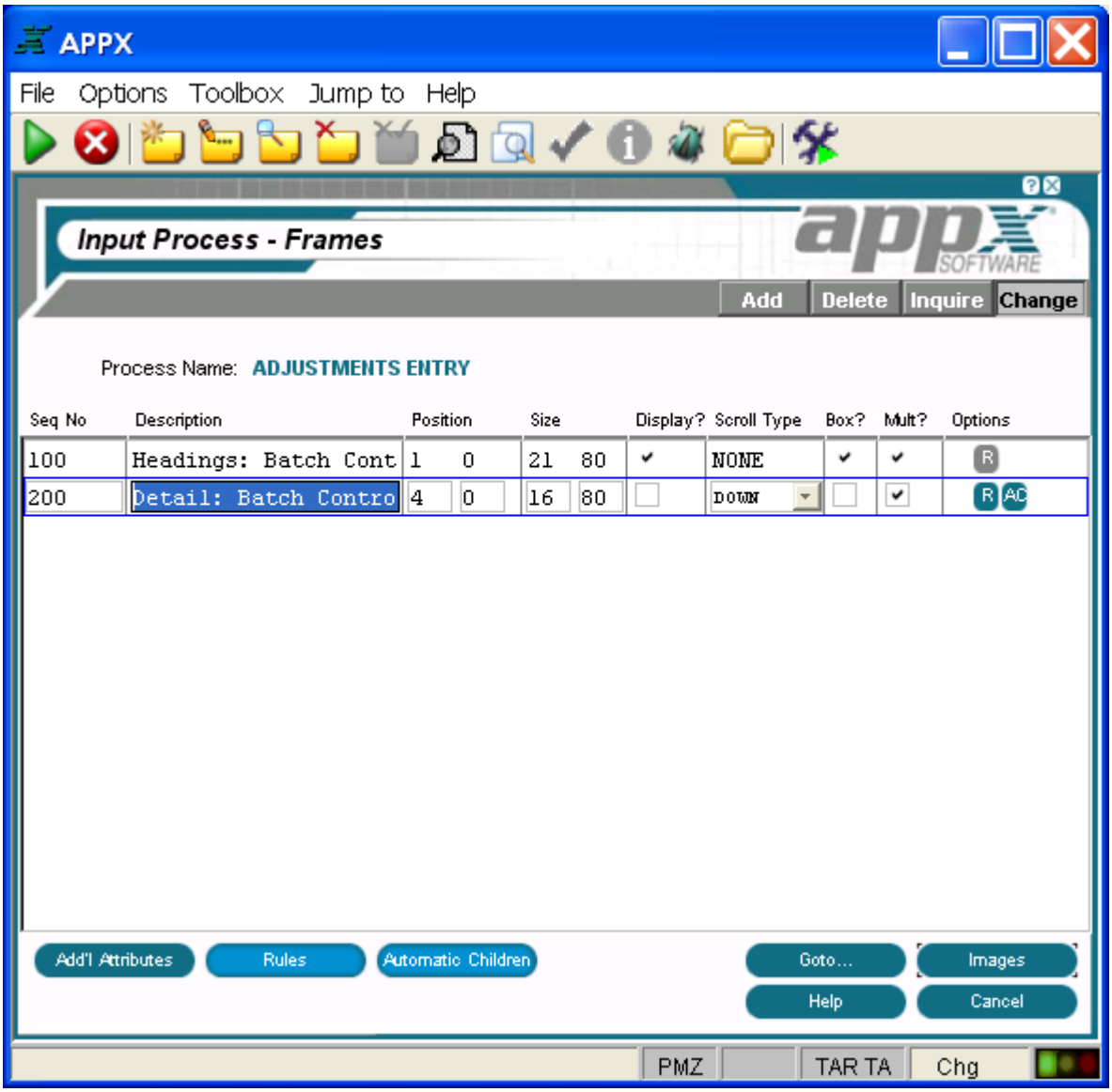
Refer to Using Event Points for more information about event points.



File Level Event Points for Rules Overlay

Input Frame Specifications

When you select the frames option (or press return) on the Input Processes screen, after completing specifications for an input process, the Input Process Frames screen is displayed as shown in below. Input frame specifications define attributes that govern both the visual presentation of a frame and the way it executes.



Input Process Frames Screen

The Input Process Frames screen contains the following fields:

Seq Nodisplays a sequence number that is defaulted by APPX and used to identify this input frame. The default sequence number can be overridden, but must be unique within the process. Sequence numbers determine the order of the frames in the process structure. The first frame that is defined in add mode is assigned sequence number *100*, and additional frames are assigned a number equal to the highest existing sequence number, plus *100*.

Description identifies this input frame. The description is for documentation purposes only.

Position fields determine the placement of the rows and columns of a frame relative to the rows and columns on the screen display. Row entries designate positioning relative to the top of the screen (or bottom if negative). Column entries designate positioning relative to the left of the screen. The default is *1, 1*. See Frame/Image Positioning for more information.

Size fields, which consist of three numeric characters, designate the number of rows and columns that comprise the displayed frame. This size may be greater than the size of the screen if panning capabilities are desired. The default is *21, 80*.

Display?,represented by 'yes' ☑ or 'no' ☐, indicates whether or not APPX stops and waits for the user to respond to the image. If 'yes' is selected, APPX does not stop, but goes on to the next image. If 'no' is selected, APPX stops on the image, even if no modifiable fields have been defined.

Scroll Type indicates whether or not the images on the frame scroll and, if so, the type of scrolling to be performed as described below. The default is *NONE. See* The Effect of Scrolling Frames on Screen and Page Positioning for a detailed discussion of scrolling frames.

NONE. The image on the frame does not scroll.

DOWN. APPX divides the frame into a grid of equal-sized regions based upon a calculated composite image size. The first image is placed into the upper left region in the frame. Succeeding images are placed in the region below the previous image until the column is complete. As each column is completed, the next image is placed at the top of the column immediately to the right of the completed column.

ACROSS. APPX divides the frame into a grid of equal-sized regions based upon a calculated composite image size. The first image is placed into the upper left region in the frame. Succeeding images are placed in the region to the right of the previous image until the row is complete. As each row is completed, the next image is placed in the far left-hand position of the row immediately below the completed row.

COLUMNAR. APPX divides the frame into columns based on the widest alternate image. The first image is placed into the upper left region in the frame. Succeeding images are placed immediately below the previous image until the column is complete. The column is considered complete if the next image cannot display in its entirety within the space available in the column. As each column is completed, the next image is placed at the top of the column immediately to the right of the completed column.

Box?, represented by 'yes' ☑ or 'no' ☐, indicates whether or not APPX draws a box around a frame/image before it displays to a user. The border does not consume rows or columns within the space that is defined for the frame/image, but does consume space on the screen. The default is 'no' but can be toggled to 'yes' by clicking the checkbox.

Mult? indicates whether multiple images can be defined and edited for this frame. Multiple images are used to present data entry images with different fields to users. For example, in an Employee input process, you may want to present one data entry image if the employee is a salaried employee and a different image if the employee is a paid an hourly wage.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), and AC (Automatic Children).

Buttons are provided at the bottom of each Input Process Frames screen for accessing the following options:

Additional Attributes - See the Input Frame Additional Attributes Option for details.

Rules - See the Input Frame Rules Option for details.

Automatic Children - See the Input Frame Automatic Children Option for details.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Images - See Input Image Specifications for details. This is the default option.

Help - Allows you to view online help text for a selected item.

Close or Cancel - In Inquire mode, Close allows you to end the current process. Otherwise, Cancel allows you to end the current process without saving changes, if any, to the current record.

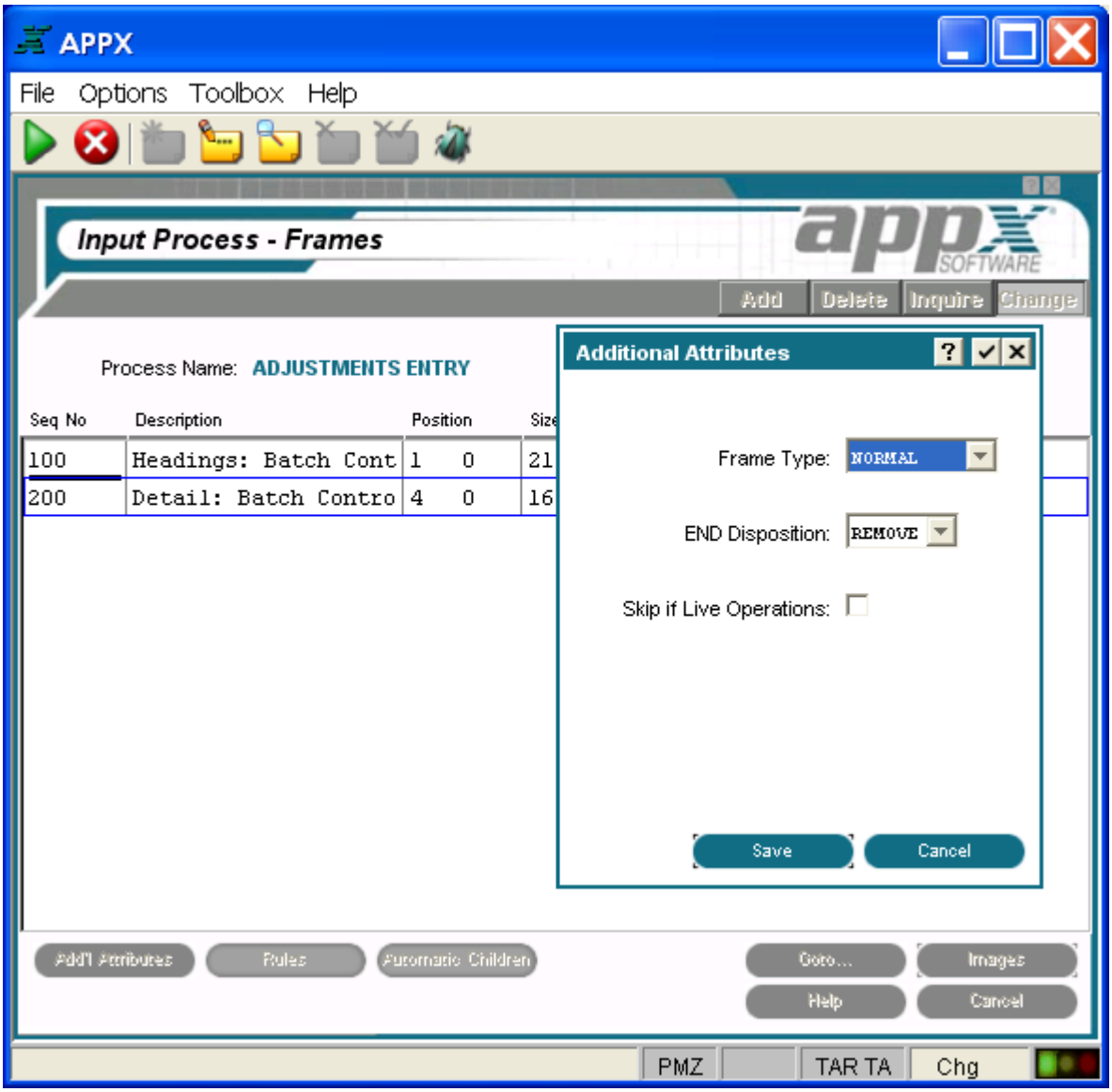
In addition, the menu bar provides the following pulldown menus:

Toolbox - See the Input Frame Toolbox Pulldown Menu for details.

Jump to - Same as the Process Jump to Pulldown Menu described in this manual.

Input Frame Additional Attributes Option

When you select the Additional Attributes option on the Input Process Frames screen, the input process frame Additional Attributes overlay is displayed as shown below, where you can access additional parameters.



Input Frame Additional Attributes Overlay

The input frame Additional Attributes overlay contains the following fields.

Frame Type governs the execution of an image or images for the frame. There are three frame types.

NORMAL ..... Executes the first (lowest numbered) alternate image unless another image is explicitly selected with statements and the predefined field ALTERNATE IMAGE NUMBER.

OPTIONAL ..... Executes the image that is identified by the *Normal Frame Type* above, with the following exception: If the value in the predefined field ALTERNATE IMAGE NUMBER is *0*, do not execute an image.

REPEATING ... Executes the image repeatedly until the value in the ALTERNATE IMAGE NUMBER is set to *0* by statements.

The default is *Normal.* See Frames for more information about optional and repeating frames.

END Disposition designates the effect on the image displayed for this frame of a user selecting the end ☒ option. There are three *END Disposition* options:

HOLD ..... Causes APPX to automatically control the disposition of the frame. The image for the frame displays until the process cycle completes (until all frames execute for one PCF record), at which time the image is removed.

CLEAR ..... Causes the contents of the frame to clear, but the image for the frame still exists and still obscures the contents of any prior images that it overlays on the screen.

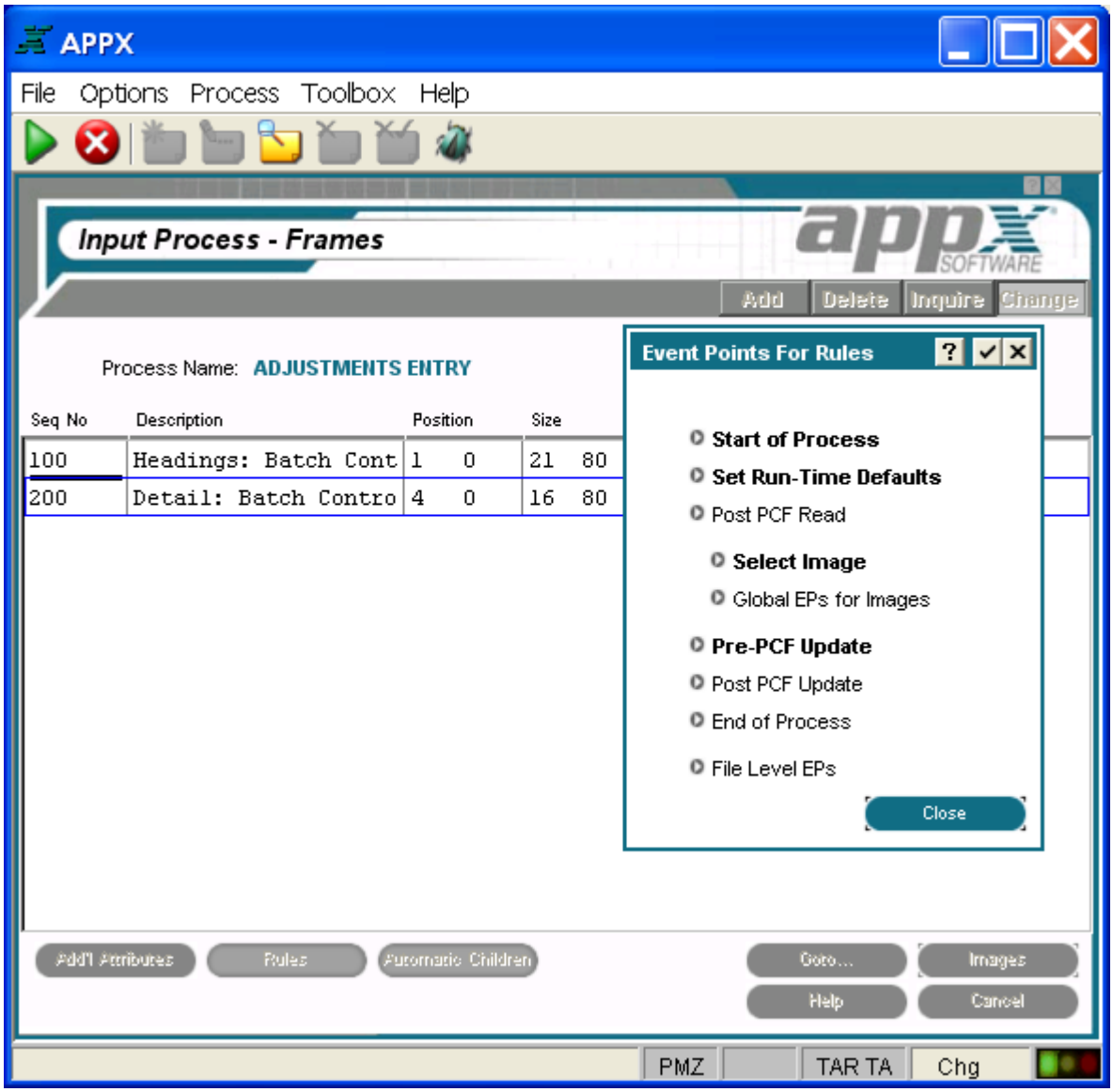
REMOVE ..... Causes the frame itself to be removed, and will no longer obscure the contents of any prior frames that it overlays on the screen.

The default is *REMOVE.*

Skip If Live Operations? determines whether or not the frame is exclusive to the initial setup and recovery processing phases of operation. If 'yes' ☑, the frame is not executed during the live operations phase. The default is 'no' ☐ but can be toggled to 'yes' by clicking the checkbox.

Input Frame Rules Option

When you select the Rules option on the Input Process Frames screen, the input process frame Event Points for Rules overlay is displayed as shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted.



Input Frame Event Points for Rules Overlay

The input frame Event Points for Rules overlay contains the following options:

Start of Process

Start of Process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the Event Points overlay.

Set Run-Time Defaults

Set Run-Time Defaults accesses the ILF editor for the Set Run-Time Defaults event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Read

Post PCF Read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the Event Points overlay.

Select Image

Select Image accesses the ILF editor for the Select Image event point. Upon completion, you are returned to the Event Points overlay.

Global EP's For Images

Global EP's for images calls the Global Event Points overlay shown below.

Global Event Points Overlay

This overlay provides options for four additional event points:

Start of Frame accesses the ILF editor for the Start of Frame event point. Upon completion, you are returned to the Global Event Points overlay.

Global Pre-Display accesses the ILF editor for the Global Pre-Display event point. Upon completion, you are returned to the Global Event Points overlay.

Global Option Intercept accesses the ILF editor for the Global Option Intercept event point. Upon completion, you are returned to the Global Event Points overlay.

End of Frame accesses the ILF editor for the End of Frame event point. Upon completion, you are returned to the Global Event Points overlay.

Pre-PCF Update

Pre-PCF Update accesses the ILF editor for the Pre-PCF Update event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Update

Post PCF Update accesses the ILF editor for the Post PCF Update event point. Upon completion, you are returned to the Event Points overlay.

End of Process

End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the Event Points overlay.

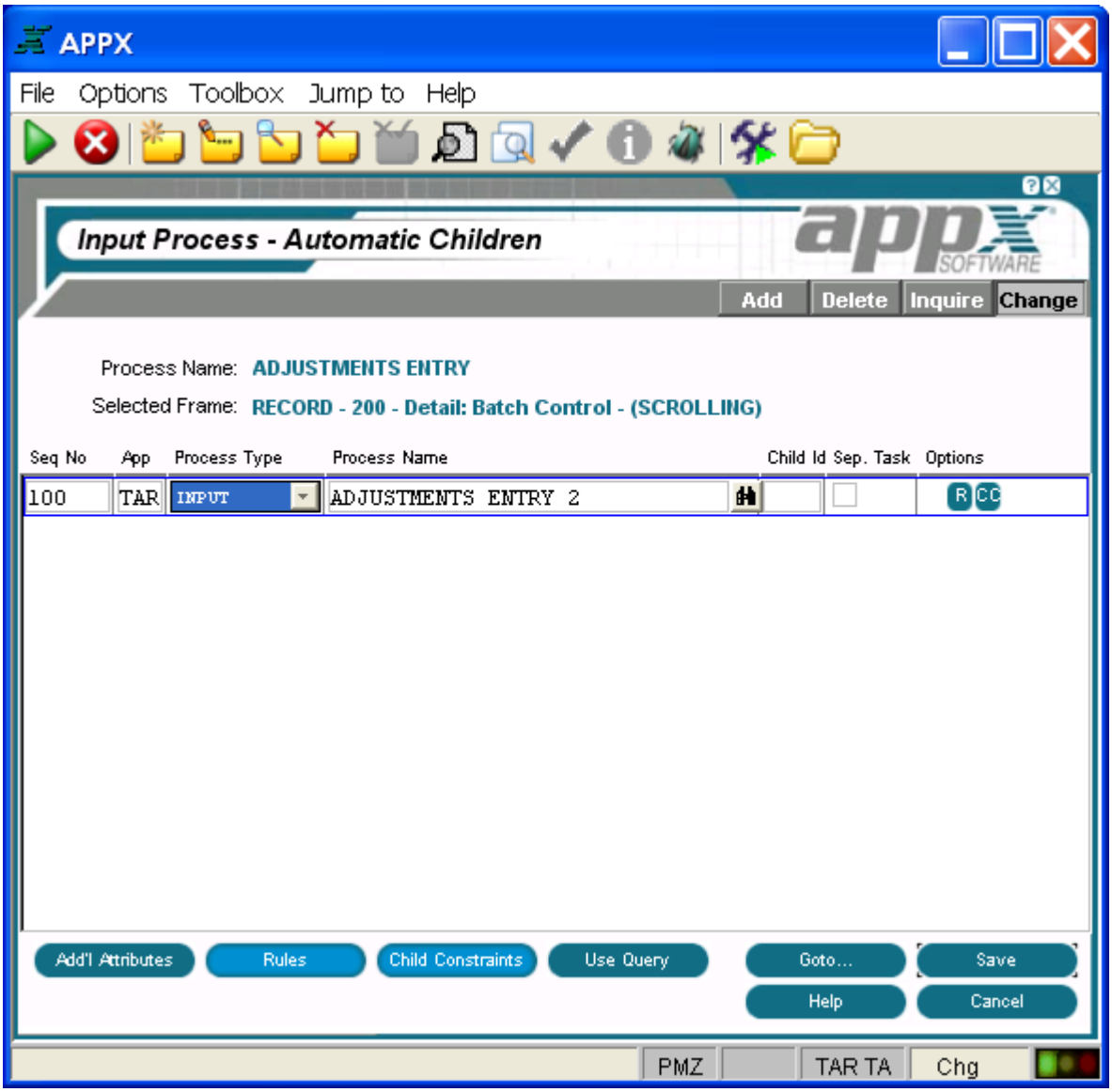
File Level EPs

File Level EP's provides access to the File Level Event Points for the PCF file. These event points are not directly associated with the process but with the PCF file. See the Files Rules Option for more information on using these event points.

Refer to Using Event Points for more information about event points.

Input Frame Automatic Children Option

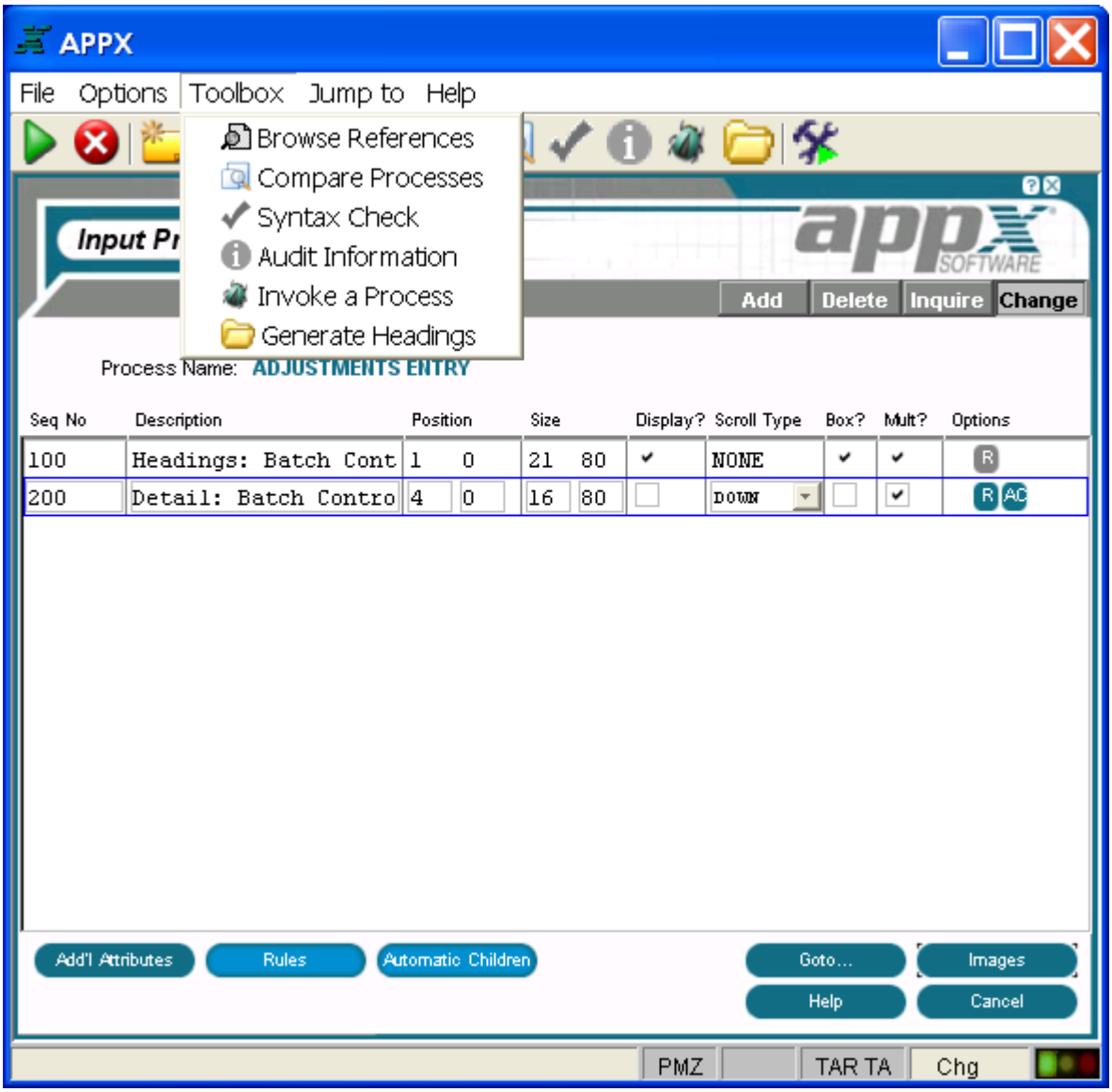
When you select the automatic children option from the Input Process Frames screen, the Input Process Automatic Children screen is displayed as shown below. This allows you to attach a specific process to the input process frame currently selected so that it invokes automatically following execution of the frame. See Automatic and Optional Child Invocations as well as Automatic and Optional Children for more information.



Input Process Automatic Children Screen

Input Frame Toolbox Pulldown Menu

When you select **Toolbox** from the menu bar on the Input Process Frames screen, the Toolbox Pulldown Menu appears as shown below. Note that each tool can also be accessed by selecting the corresponding icon on the screen toolbar.



Input Frames Toolbox Pulldown Menu

The input frames Toolbox Pulldown Menu offers the following options:

Browse References

The browse references option runs a modified version of 'Cross Reference - All' and produces a list of design components utilized by the current process. The results can be displayed interactively where links allow you to see the context of the references, edit the referenced component, and drill down to the child process. This option can be used to identify, and optionally edit, the file level event points utilized by this process.

Compare Processes

The compare processes option compares the current process to another process that you identify and produces a report listing any differences. You can also opt to browse the results interactively.

Syntax Check

The syntax check option allows you to create the Executable Module for the current process without running the process. If the Executable Module already exists and is still valid, this option is ignored if invoked. Note that this option (Option 97), like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox.

Audit Information

The audit information option allows you to see who created the current process and who changed it most recently. It also provides you with the date that the process was created and the date that it was last changed. Note that this option (Option 98), like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox. See Audit Information Overlay for an example of the overlay.

Invoke a Process

The invoke a process option is available to facilitate testing. When you select this option, APPX defaults to the current process but you may override the defaults to invoke any process. Note that this option, like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox. See Invoke a Process Overlay for details on using this option.

Generate Headings

The generate headings option generates a column headings frame for the input frame you are currently positioned to. However, the input frame must be positioned at row 5 or higher.

Input Image Specifications

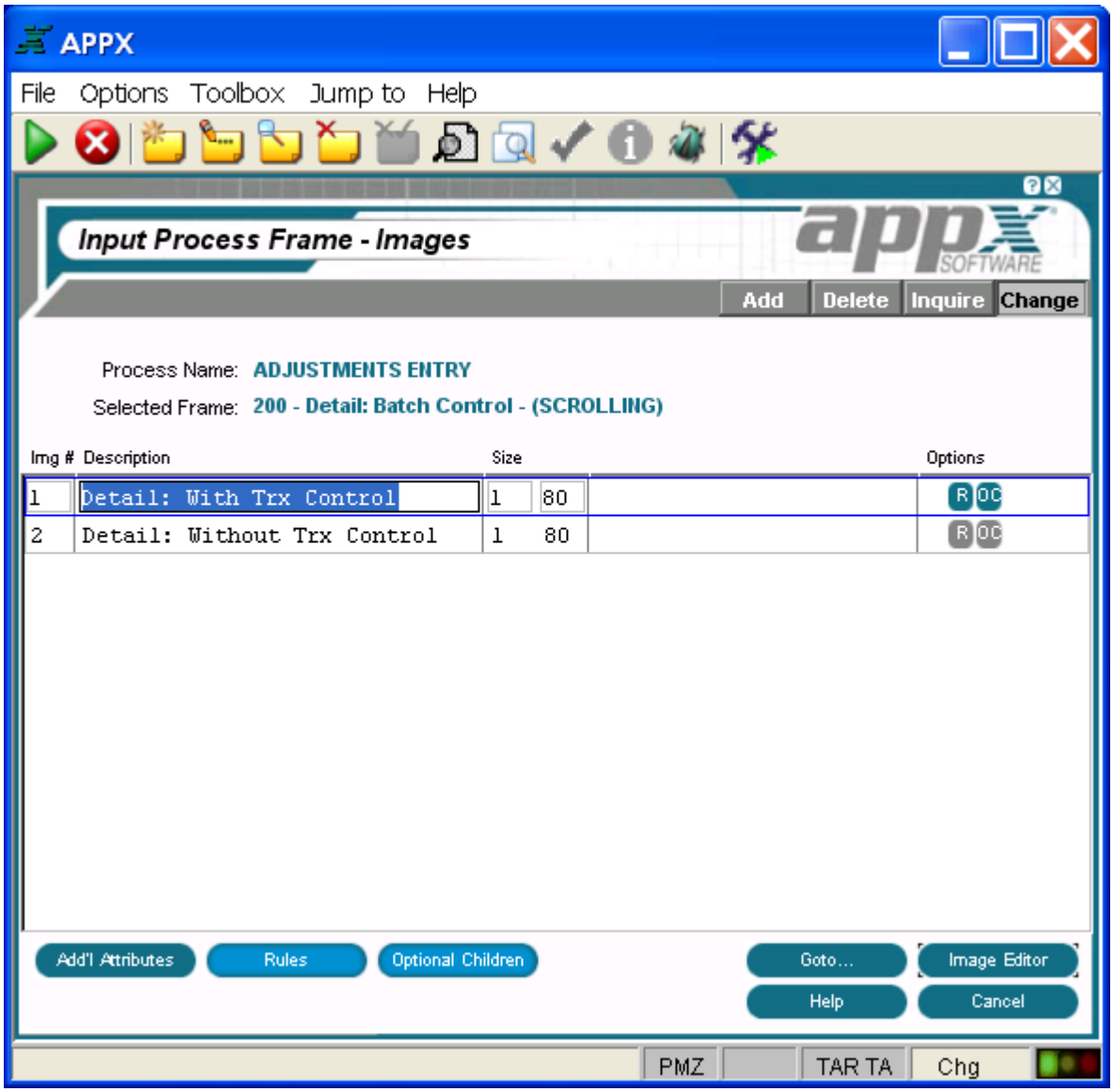
Input image specifications define the visual and operational attributes of each alternate image for an input frame. These specifications are determined, in part, by whether or not the currently selected frame is defined with a scroll type on the Input Process Frames screen. The scrolling input Images screen and the non-scrolling input Images screen are described separately in the following sections:

Scrolling Input Image Specifications

Non-Scrolling Input Image Specifications

Scrolling Input Image Specifications

When you select the images option (or press return) on the Input Process Frames screen for a frame with scrolling defined, the Scrolling Input Images screen is displayed as shown below.



Scrolling Input Images Screen

The scrolling input Images screen contains the following fields:

Img #displays a sequence number that is defaulted by APPX. The image number uniquely identifies each alternate image for the frame and is referenced when determining which image, if any, is to display. The first image that is defined in add mode is assigned alternate image number 1, and additional images are assigned a number equal to the highest existing image number, plus *1*. The default number can be overridden, but must be unique within the frame. Refer to the Images section for a discussion of alternate images.

Description identifies this alternate image. The description is for documentation purposes only.

Size designates the number of rows and columns that comprise the displayed image. The image cannot be larger than the frame to which it belongs. If blank, the size of the image defaults to the size of the frame. The default is blank. See Frame/Image Positioning for more information.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), and OC (Optional Children).

Buttons are provided at the bottom of each Images screen for accessing the following options:

Additional Attributes - See the Scrolling Input Image Additional Attributes Option for details.

Rules - See the Input Image Rules Option for details. This overlay is the same for both scrolling and non-scrolling frames.

Optional Children - See the Input Image Optional Children Option for details. This screen is the same for both scrolling and non-scrolling frames.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Image Editor - See the Scrolling Input Image in the Image Editor for details. This is the default option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

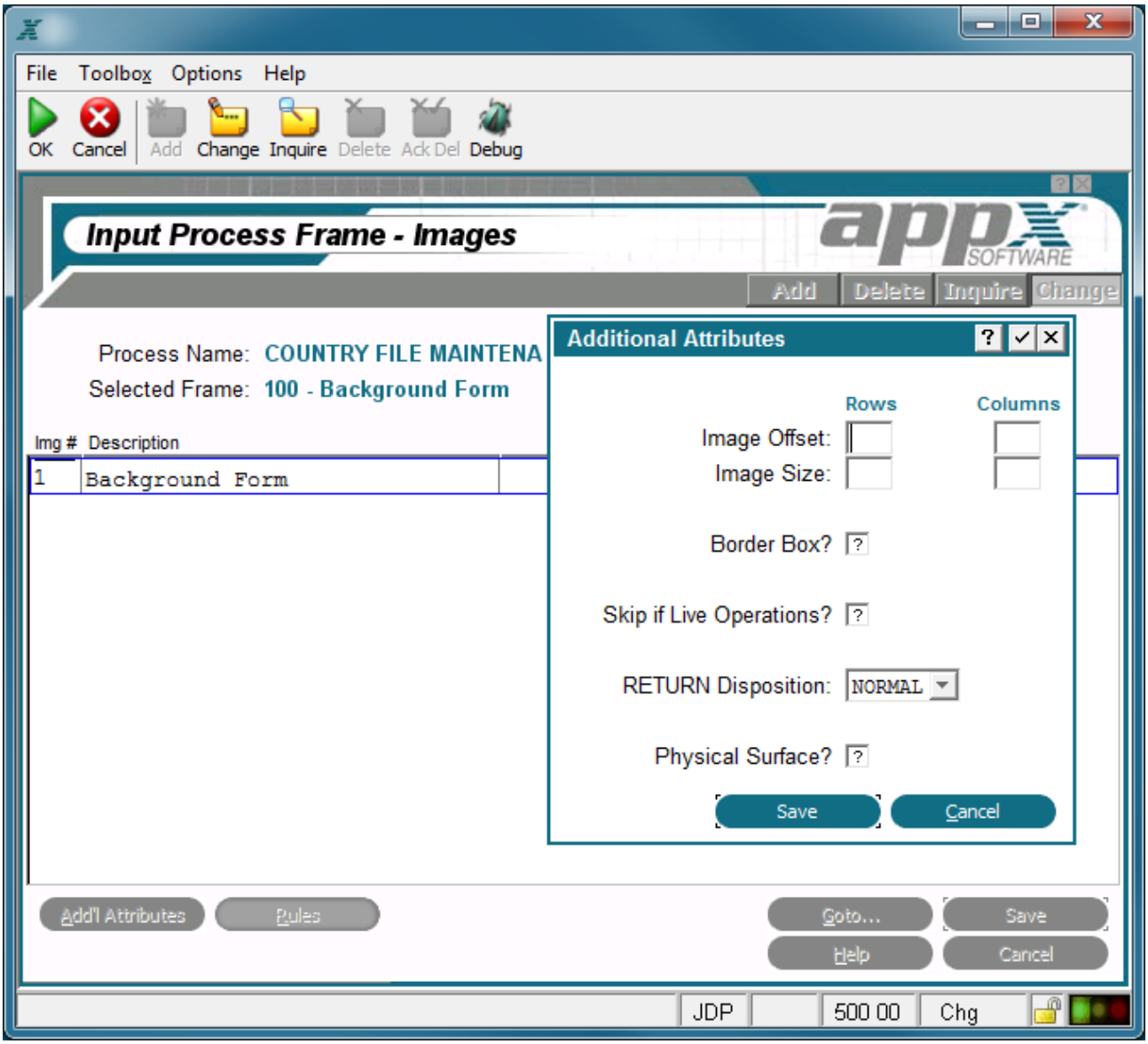
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Input Frame Toolbox Pulldown Menu except that there is no generate headings option at the image level.

Jump to - Same as the Process Jump to Pulldown Menu.

Scrolling Input Image Additional Attributes Option

When you select the Additional Attributes option on the Scrolling Input Images screen, the scrolling input Additional Attributes overlay is displayed as shown below, where you can access additional parameters.



Scrolling Input Additional Attributes Overlay

The scrolling input Additional Attributes overlay contains the following fields.

Image Offset: Row/Column (optional) determines the placement of the rows and columns of this image, relative to the frame. Row entries designate positioning, relative to the top of the frame. Column entries designate positioning relative to the left of the frame. If blank, the row/column position of the frame is assumed. The default is blank.

Image Size: Rows/Columns (optional) designates the number of rows and columns that comprise the displayed image. The image cannot be larger than the frame it belongs to. If blank, the size of the frame is assumed.

Border Box? Indicates whether or not APPX draws a box around this image before it displays to a user. The border does not consume rows or columns within the space that is defined for the image, but does consume space on the screen. If blank, the value for the frame is assumed. If the box specification is combined with an overline, an underline, or both, APPX replaces the top and/or bottom of the box with the overline and/or underline. This minimizes the space that is consumed by the border. The physical space on the screen that is consumed by the box is system-specific. The default is blank.

Skip if Live Operations? Enter a logical value to control whether or not this image is executed/viewed during Live Operations.

RETURN Disposition option designates the effect on the image displayed for this frame of a user pressing return or selecting enter. There are three RETURN Disposition options.

NORMAL: Causes APPX to automatically control the disposition of the frame. The image for the frame displays until the process cycle completes (until all frames execute for one PCF record), at which time the image is removed.

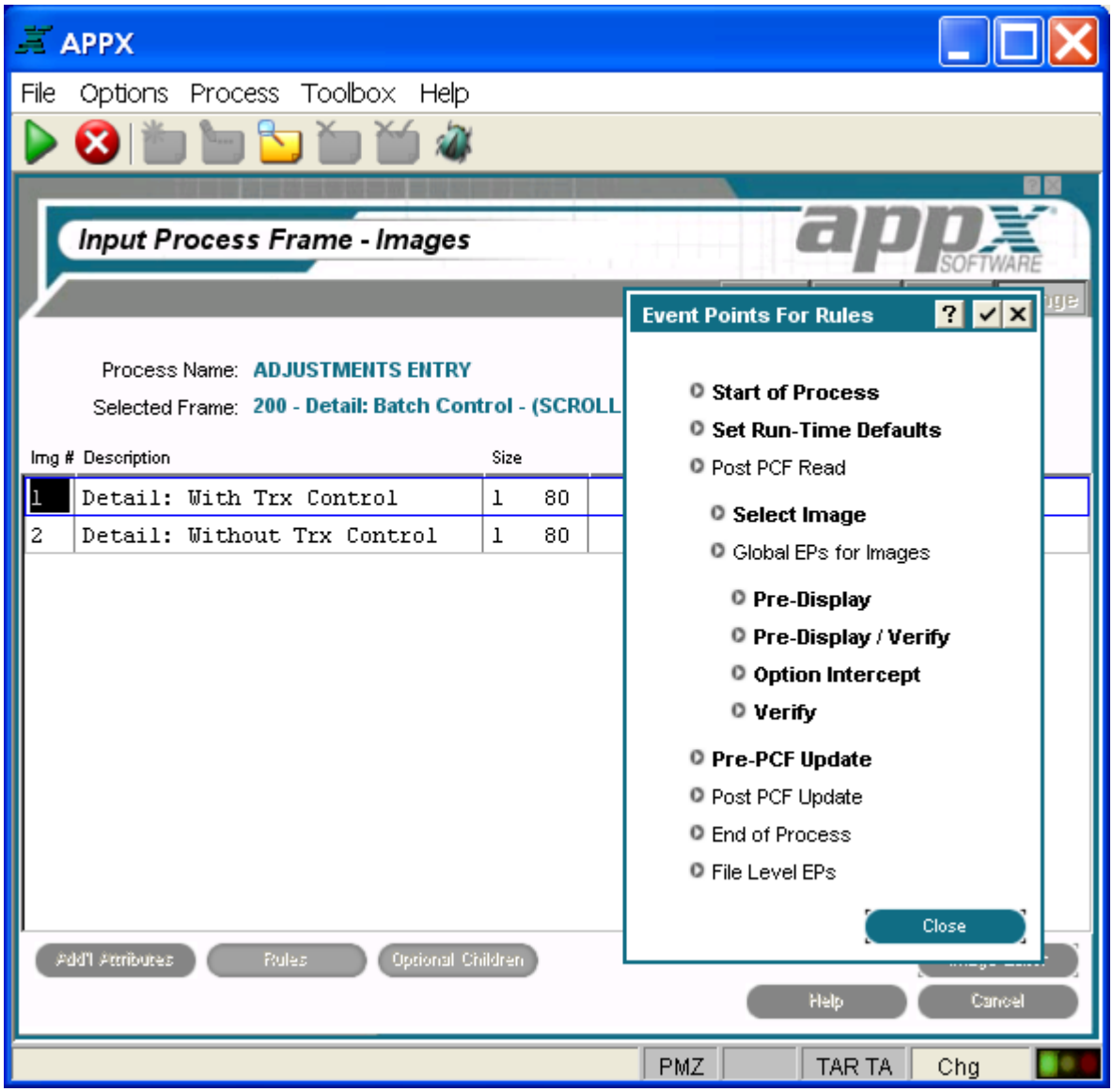
CLEAR: Causes the contents of the frame to clear, but the image for the frame still exists and still obscures the contents of any prior images that it overlays on the screen.

REMOVE: Causes the frame itself to be removed, and will no longer obscure the contents of any prior frames that it overlays on the screen.

Physical Surface? Enter a logic value to control whether or not this image is 'attached' to the physical surface. If an image is attached to a physical surface, it will always display in front of images that are not attached to the physical surface, and panning options will not apply. The image will always be 'seen' by the user even if the logical surface is panned far to the right or other images (not attached to the physical surface) are executed.

Input Image Rules Option

When you select the Rules option on either the Scrolling Input Images screen or the Non-Scrolling Input Images screen, the input image Event Points for Rules overlay is displayed as shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted.



Input Image Event Points for Rules Overlay

The input image Event Points for Rules overlay contains the following options:

Start of Process

Start of Process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the Event Points overlay.

Set Run-Time Defaults

Set Run-Time Defaults accesses the ILF editor for the Set Run-Time Defaults event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Read

Post PCF Read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the Event Points overlay.

Select Image

Select Image accesses the ILF editor for the Select Image event point. Upon completion, you are returned to the Event Points overlay.

Global EP's For Images

Global EP's For Images calls the Global Event Points overlay shown ibelow.

Global Event Points Overlay

This overlay provides options for four additional event points:

Start of Frame accesses the ILF editor for the Start of Frame event point. Upon completion, you are returned to the Global Event Points overlay.

Global Pre-Display accesses the ILF editor for the Global Pre-Display event point. Upon completion, you are returned to the Global Event Points overlay.

Global Option Intercept accesses the ILF editor for the Global Option Intercept event point. Upon completion, you are returned to the Global Event Points overlay.

End of Frame accesses the ILF editor for the End of Frame event point. Upon completion, you are returned to the Global Event Points overlay.

Pre-Display

Pre-Display accesses the ILF editor for the Pre-Display event point. Upon completion, you are returned to the Event Points overlay.

Pre-Display/Verify

Pre-Display/Verify accesses the ILF editor for the Pre-Display/Verify event point. Upon completion, you are returned to the Event Points overlay.

Option Intercept

Option Intercept accesses the ILF editor for the Option Intercept event point. Upon completion, you are returned to the Event Points overlay.

Verify

Verify accesses the ILF editor for the Verify event point. Upon completion, you are returned to the Event Points overlay.

Pre-PCF Update

Pre-PCF Update accesses the ILF editor for the Pre-PCF Update event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Update

Post PCF Update accesses the ILF editor for the Post PCF Update event point. Upon completion, you are returned to the Event Points overlay.

End of Process

End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the Event Points overlay.

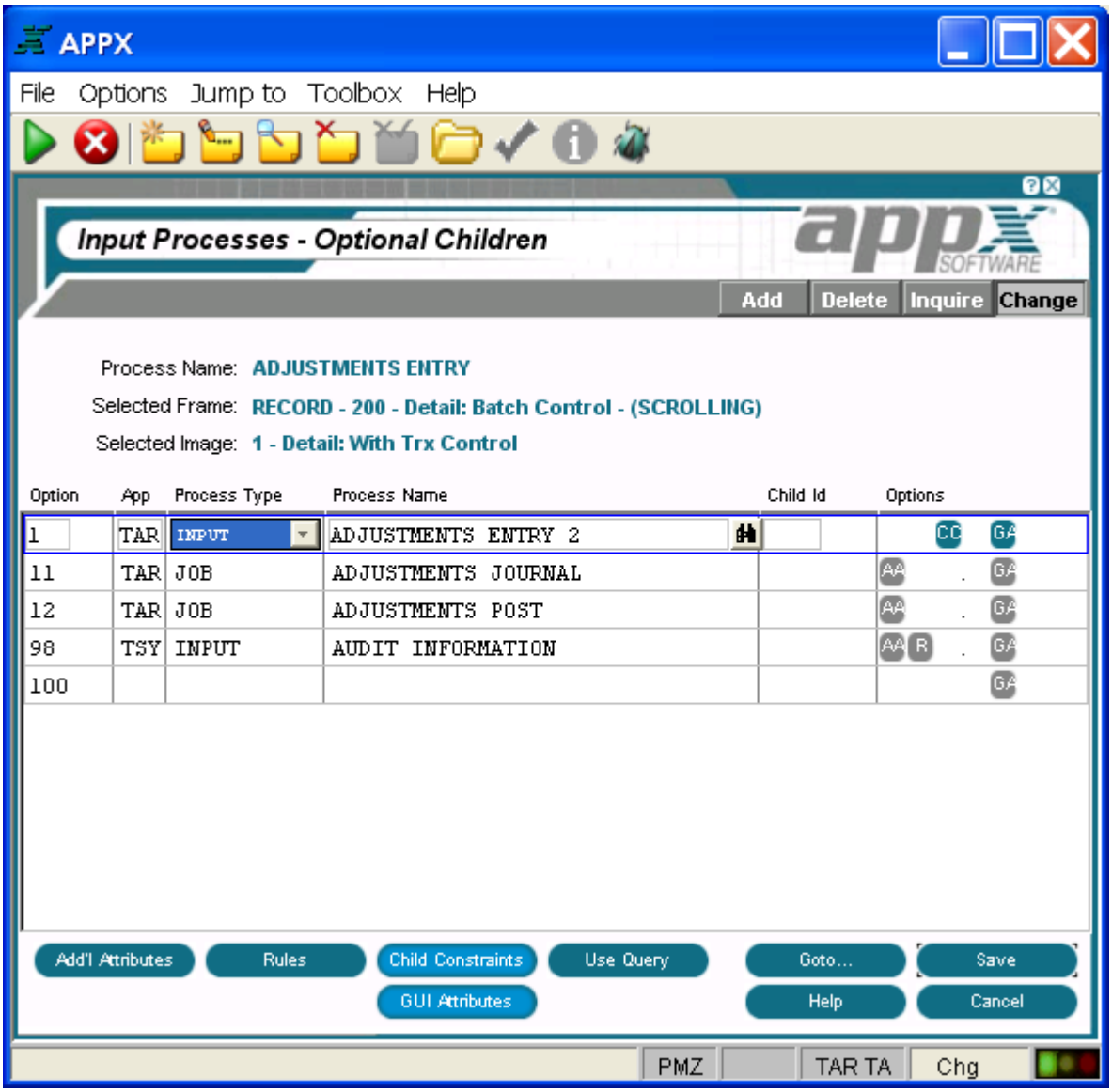
File Level EPs

File Level EP provides access to the File Level Event Points for the PCF file. These event points are not directly associated with the process but with the PCF file. See the Files Rules Option for more information on using these event points.

Refer to Using Event Points for more information about event points.

Input Image Optional Children Option

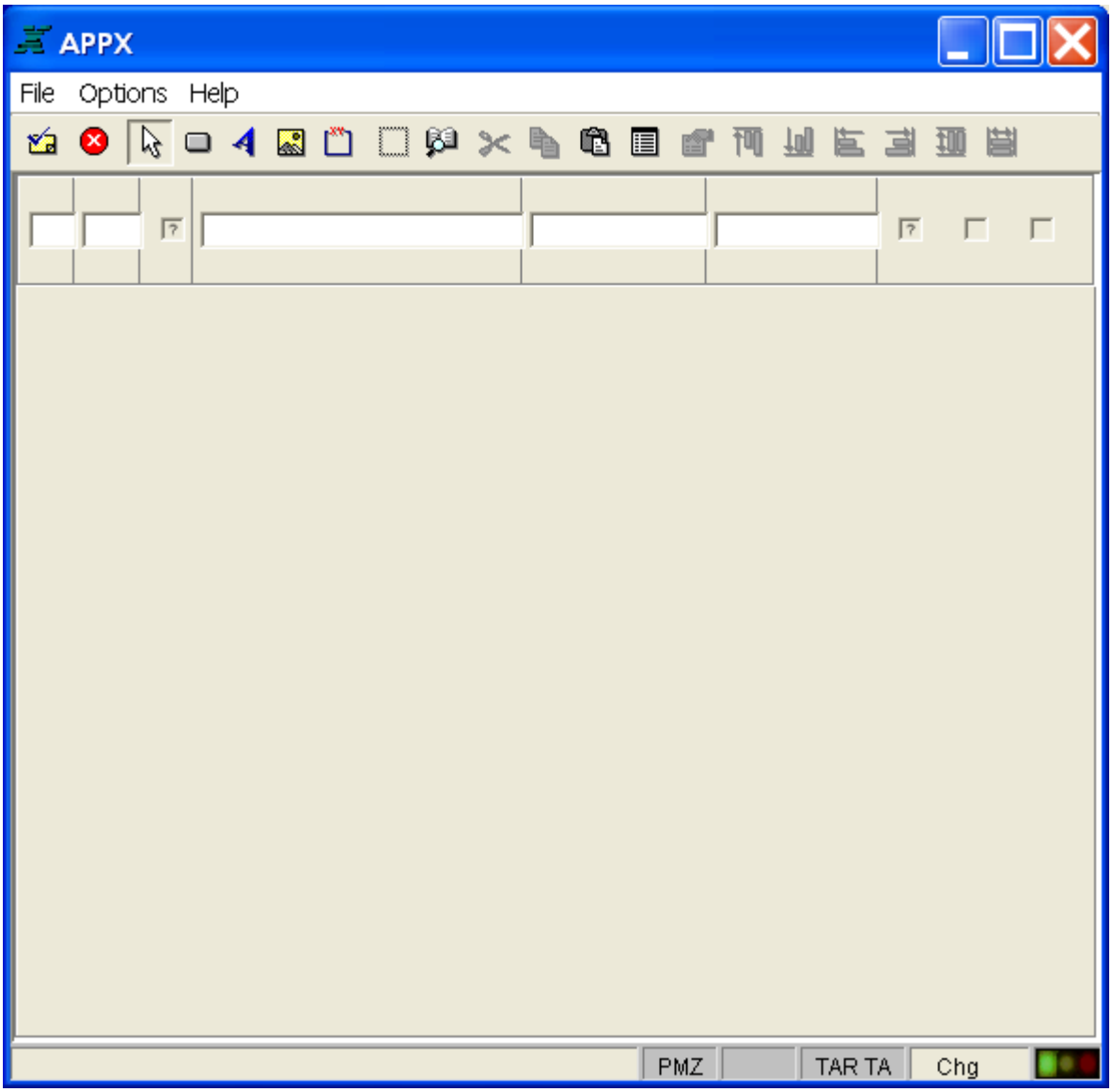
When you select the optional children option on either the Scrolling Input Images screen or the Non-Scrolling Input Images screen, the Input Process Optional Children screen is displayed as shown below. This allows you to define attributes to govern the discretionary invocation of another APPX process from an image in an input process. See Automatic and Optional Child Invocations as well as Automatic and Optional Children for more information.



Input Process Optional Children Screen

Scrolling Input Image in the Image Editor

After you complete specifications for an image on the Scrolling Input Images screen, you automatically enter the Image Editor when you press return or select the image editor option. The Image Editor, APPX's screen painting facility, is the facility used to format menus, inputs, outputs, and inquiry screens. As you design the input screen, you are seeing the image exactly as it will appear to your users. The figure below shows a scrolling input image being edited in the Image Editor.

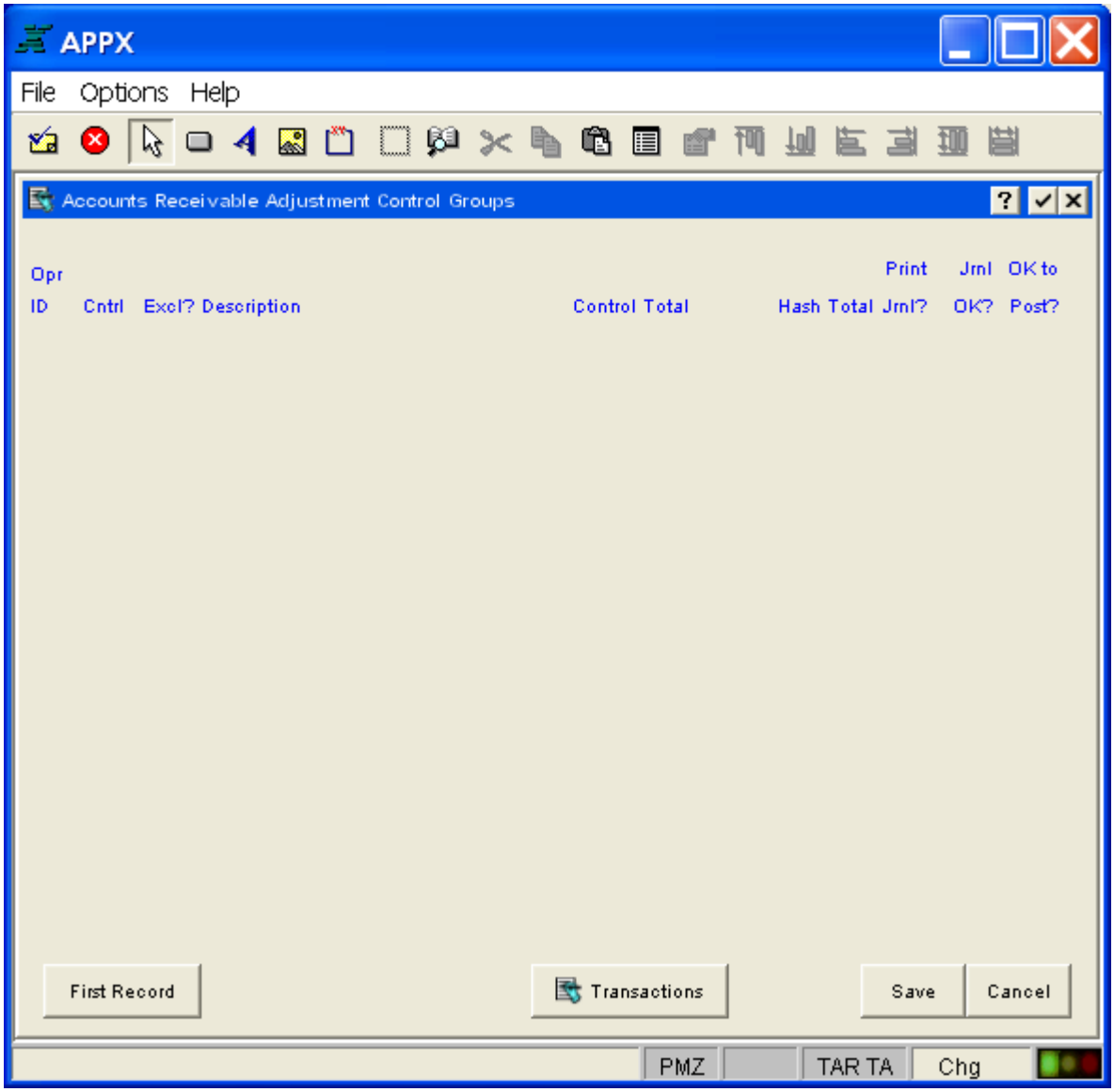


Scrolling Input Image in the Image Editor

The standard features of the Image Editor can be employed in character mode using only a keyboard. However, you need a mouse to take advantage of the GUI features within the Image Editor. GUI tools provide designers with the ability to create screen images complete with pictures, buttons, icons, wallpapers, and other graphical features. Another GUI tool is a data palette offering drag and drop selection and placement of data fields.

Basic functionality of the Image Editor is fully explored in Using the Image Editor and a complete discussion of its GUI features is presented in Using GUI Features of the Image Editor.

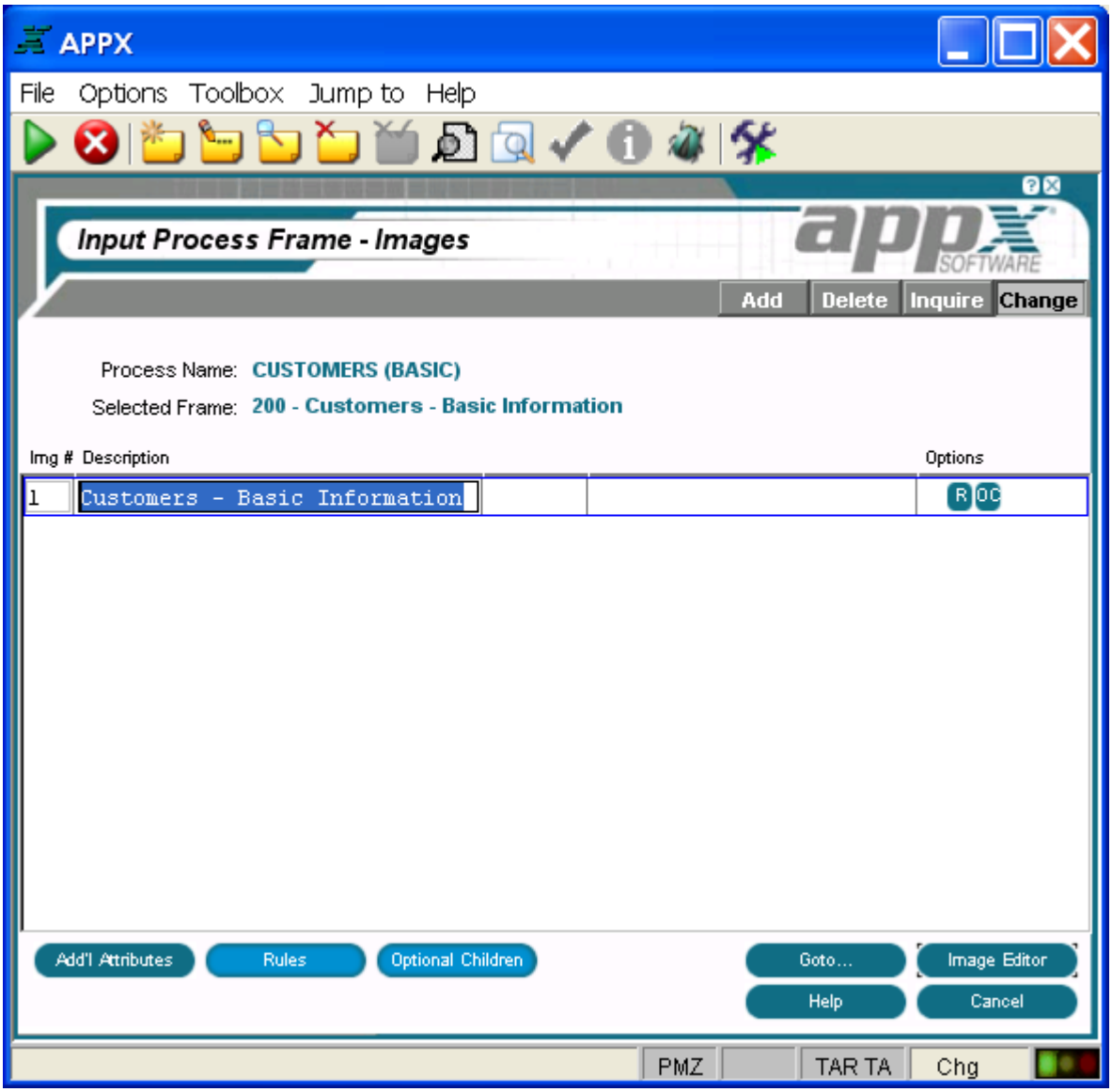
> Note that there is normally no need to identify the data fields in a scrolling image. Column headings are usually defined for the data fields in an image in an earlier display-only frame, such as that shown below. This particular image also includes buttons for the optional children attached to the scrolling image.



Input Image with Column Headings in the Image Editor

Non-Scrolling Input Image Specifications

When you select the images option (or press return) on the Input Process Frames screen for a frame with no scrolling defined, the Non-Scrolling Input Images screen is displayed as shown below.



Non-Scrolling Input Images Screen

The non-scrolling input Images screen contains the following fields:

Img # displays a sequence number that is defaulted by APPX. The image number uniquely identifies each alternate image for the frame and is referenced when determining which image, if any, is to display. The first image that is defined in add mode is assigned alternate image number *1*, and additional images are assigned a number equal to the highest existing image number, plus *1*. The default number can be overridden, but must be unique within the frame. Refer to the Images section for a discussion of alternate images.

Description identifies this alternate image. The description is for documentation purposes only.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), and OC (Optional Children).

Buttons are provided at the bottom of each Images screen for accessing the following options:

Additional Attributes - See the Non-Scrolling Input Image Additional Attributes Option for details.

Rules - See the Input Image Rules Option for details. This overlay is the same for both scrolling and non-scrolling frames.

Optional Children - See the Input Image Optional Children Option for details. This screen is the same for both scrolling and non-scrolling frames.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Image Editor - See the Non-Scrolling Input Image in the Image Editor for details. This is the default option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, Cancel allows you to end the current process without saving changes, if any, to the current record.

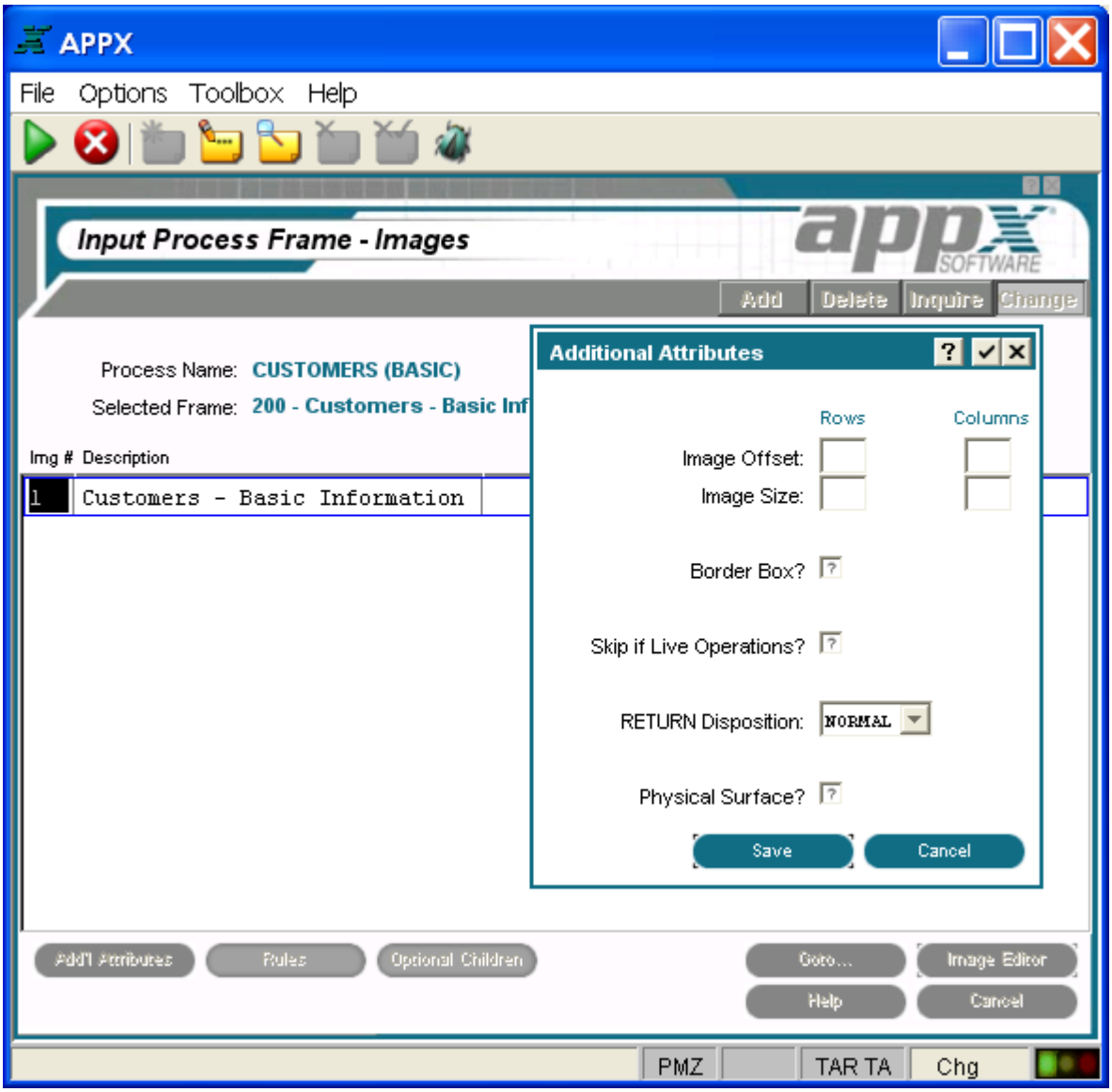
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Input Frame Toolbox Pulldown Menu except that there is no generate headings option at the image level.

Jump to - Same as the Process Jump to Pulldown Menu.

Non-Scrolling Input Image Additional Attributes Option

When you select the Additional Attributes option on the Non-Scrolling Input Images screen, the non-scrolling input Additional Attributes overlay is displayed as shown below, where you can access additional parameters.



Non-Scrolling Input Additional Attributes Overlay

The non-scrolling input Additional Attributes overlay contains the following fields.

Image Offset determines the placement of the rows and columns of this image, relative to the frame. Row entries designate positioning, relative to the top of the frame. Column entries designate positioning relative to the left of the frame. If blank, the APPX defaults to same row/column position as the frame. The default is blank. See Frame/Image Positioning for more information.

Image Size designates the number of rows and columns that comprise the displayed image. The image cannot be larger than the frame it belongs to. If blank, the size of the image defaults to the size of the frame. The default is blank.

Border Box? indicates whether or not APPX draws a box around this image before it displays to a user. The border does not consume rows or columns within the space that is defined for the image, but does consume space on the screen. If the box specification is combined with an overline, an underline, or

both, APPX replaces the top and/or bottom of the box with the overline and/or underline. This minimizes the space that is consumed by the border. The physical space on the screen that is consumed by the box is system-specific.

Skip If Live Operations? determines whether or not this image is exclusive to the initial setup and recovery processing phases of operation. If 'yes' or ☑ (Y using Character Mode), the image is not executed during the live operations phase.

RETURN Disposition option designates the effect on the image displayed for this frame of a user pressing return or selecting Enter ☑. There are three *RETURN Disposition* options.

NORMAL..... Causes APPX to automatically control the disposition of the frame. The image for the frame displays until the process cycle completes (until all frames execute for one PCF record), at which time the image is removed.

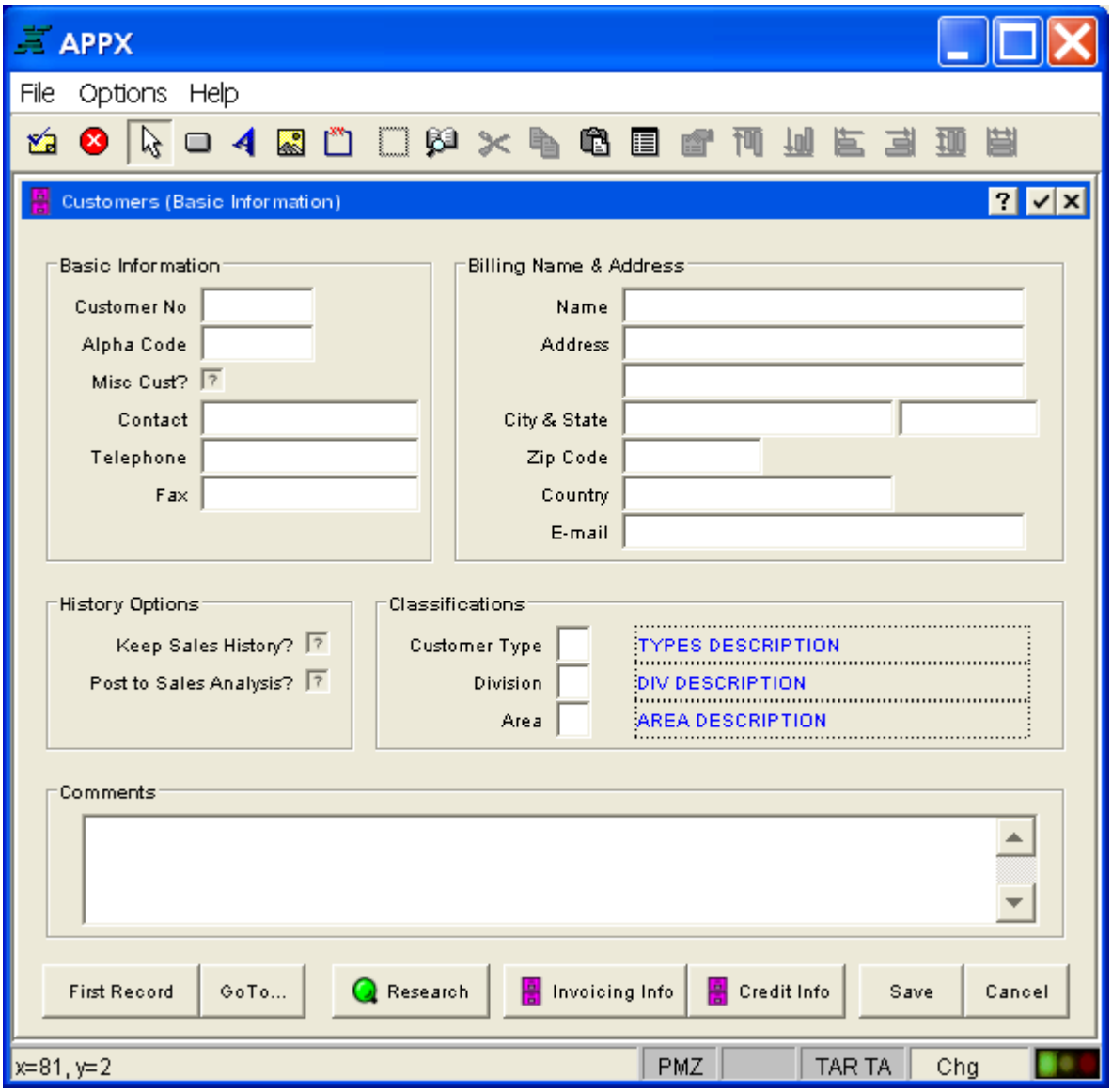
CLEAR..... Causes the contents of the frame to clear, but the image for the frame still exists and still obscures the contents of any prior images that it overlays on the screen.

REMOVE..... Causes the frame itself to be removed, and will no longer obscure the contents of any prior frames that it overlays on the screen.

Physical Surface? controls whether or not this image is 'attached' to the physical surface. Click the checkbox to toggle between values of 'yes' ☑, 'no' ☐, or 'unknown' ? (Y, N, or blank using Character Mode). 'Yes' indicates that the image will always display in front of images that are not attached to the physical surface and that panning options do not apply. The image will always be 'seen' by the user even if the logical surface is panned far to the right or other images not attached to the physical surface are executed.

Non-Scrolling Input Image in the Image Editor

After you complete specifications for an image on the Non-Scrolling Input Images screen, you automatically enter the Image Editor when you press return or select the image editor option. The Image Editor, APPX's screen painting facility, is the facility used to format menus, inputs, outputs, and inquiry screens. As you design the input screen, you are seeing the image exactly as it will appear to your users. The figure below shows a non-scrolling input image being edited in the Image Editor.



Non-Scrolling Input Image in the Image Editor

The standard features of the Image Editor can be employed in character mode using only a keyboard. However, you need a mouse to take advantage of the GUI features within the Image Editor. GUI tools provide designers with the ability to create screen images complete with pictures, buttons, icons, wallpapers, and other graphical features. Another GUI tool is a data palette offering drag and drop selection and placement of data fields.

Basic functionality of the Image Editor is fully explored in Using the Image Editor and a complete discussion of its GUI features is presented in Using GUI Features of the Image Editor.

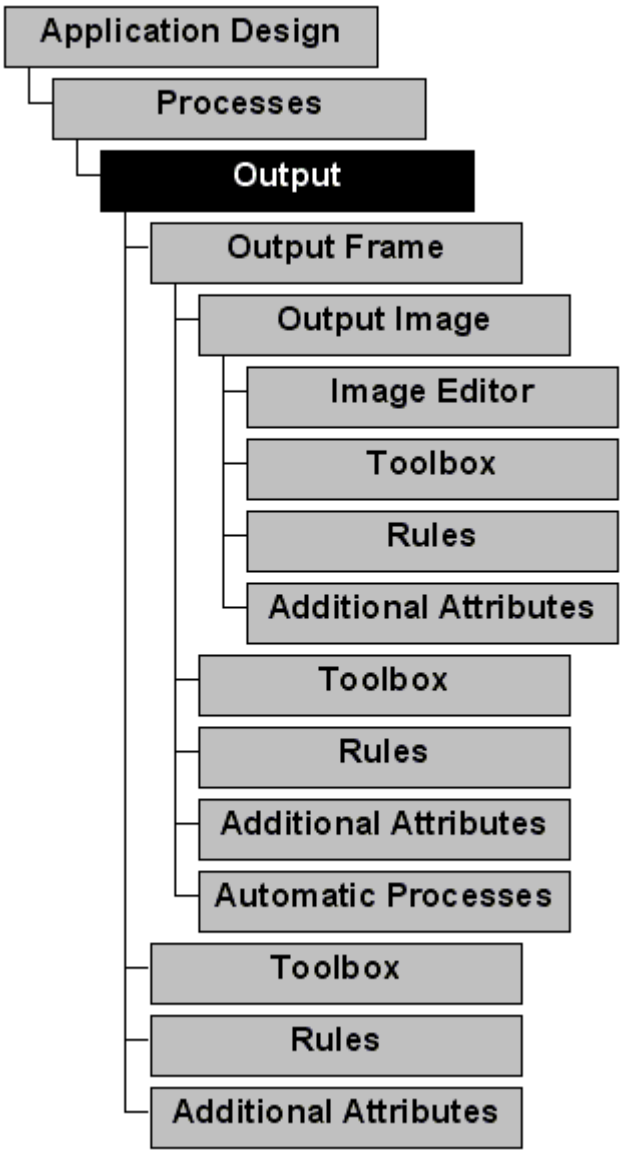
> Note that data fields in a non-scrolling image should normally be identified for the user by a label or other mechanism. This particular image also includes buttons for the optional children attached to the non-scrolling image.

CHAPTER 3-7

Output Processes

Introduction to Output Processes

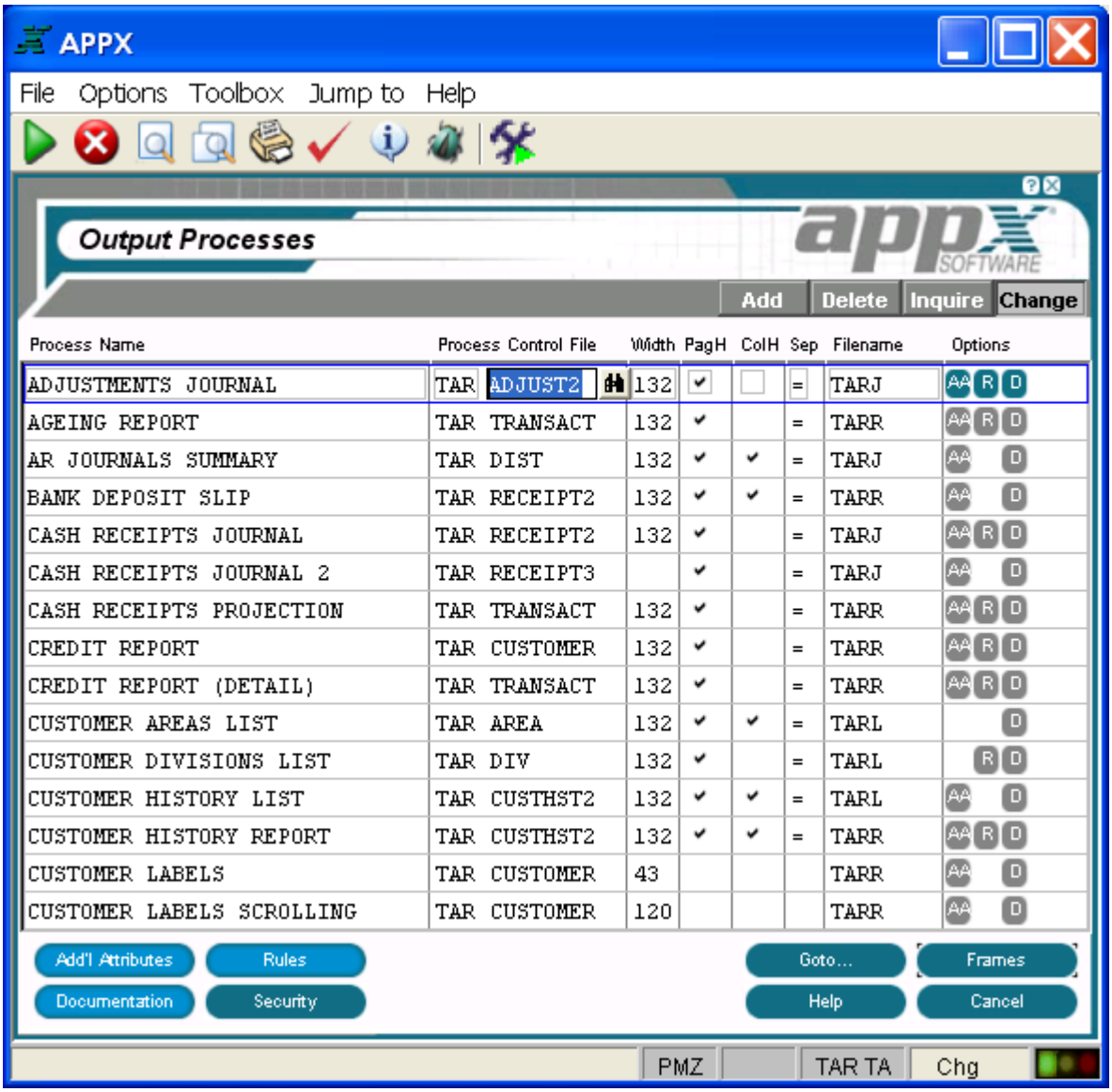
Output processes convey information from the database, either on the screen or in hard copy, according to a designer-defined format. Trial balances, product purchase history reports, and customer lists are all examples of output processes.



Output Process Definition

Output Process Specifications

Output process specifications establish the general attributes of an output process such as a process print file and process control file, the name of the report, and various format characteristics. The Output Processes screen, shown below, displays when you select outputs from the Application Design Specifications Menu.



Output Processes Screen

The Output Processes screen contains the following fields:

Process Name identifies a specific process and consists of up to 30 uppercase alphanumeric characters that must be unique within type and application.

Process Control File is optional for output processes. If present, it identifies a file by application ID and file name that is to be automatically managed by APPX during the execution of this process. APPX automatically reads, writes, rewrites, and deletes records in the process control file (PCF) during output process execution (and provides for updating the child PCF for any automatic children). If the PCF is left blank, the output process will execute once and then automatically end (as opposed to executing once for every record).

Width indicates the maximum number of characters across, or in other words the number of columns, to allocate for each row in the report format. APPX uses the value you enter here to produce standard images of the proper width. If blank, the default width of the form that the report prints on defaults to the form width which is defined in system administration. If the form is narrower than the width of the formatted report, APPX truncates the output. If the form is wider than the width of the report, however, APPX uses the larger width for standard images, but does not expand the format of the report itself. The default is 132.

PagH determines whether or not APPX automatically prints a standard page heading image. If 'yes' ☑, this image prints before any *Start of Page* frames for the report. Be careful not to also explicitly define a *Start of Page* frame with a standard page heading image, which could cause page headings to print twice at the top of each page in the report. If 'no' ☐, you can explicitly define a *Start of Page* frame with a standard page heading image or, alternatively, define your own page heading using a *Start of Page* frame. The default is 'yes'.

ColH determines whether or not APPX automatically prints a *Start of Page* frame with a standard column heading image. APPX generates column headings based upon specifications in the data dictionary for each item included in the output image. If 'yes' ☑, this image prints after any *Start of Page* frames for the report. Be careful not to also explicitly define a *Start of Page* frame with a standard column heading image, which would cause column headings to print twice for each page in the report. If 'no' ☐, you can explicitly define a *Start of Page* frame with a standard column heading image or, alternatively, define your own column headings using a *Start of Page* frame. The default is 'yes'. Refer to Standard Column Heading Image Generation for additional information.

Sep identifies one alphanumeric character that prints continuously across the report to separate standard page headings, page frames, and standard column headings from the body of the report. If blank, APPX does not print a heading separator. The default is =.

Filename establishes the name of the report file that is used to store the contents of the printed report. If necessary to guarantee uniqueness, APPX may append one or more characters to the value you enter here, or replace one or more of the ending characters. If two or more output processes *in the same subprocess family* are defined with identical *Print File* values, the processes share a common print file. They print as a single report, with continuous page numbers. If this specification is blank, APPX uses the last *Print File* that is active within the subprocess family. Refer to Process Lineage for a definition of subprocess family.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), D (Documentation), and S (Security).

Buttons are provided at the bottom of each Output Processes screen for accessing the following options:

Additional Attributes - See the Output Process Additional Attributes Option for details.

Rules - See the Output Process Rules Option for details.

Documentation - Same as the Process Documentation Option.

Security - Same as the Process Security Option.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Frames - See Output Frame Specifications for details. This is the default option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, Cancel allows you to end the current process without saving changes, if any, to the current record.

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Standard Column Heading Image Generation

If the *ColH* specification on the Output Processes screen is set to 'yes' for a process, APPX will generate a standard column heading image at runtime for the process.

APPX's standard column heading image consists of one double-line row of column heading text. This row is populated based upon the items painted on the first row of a related record class frame. If there is additional space available in the column heading row, APPX examines each subsequent row in the record class frame, in order. If a row contains an item that can be placed in an available space in a column heading, the item's text is added to the column heading image. As a result, the final column heading image is actually a composite of heading text for fields from any combination of rows on a record class image.

APPX applies the following guidelines when formatting text on a standard column heading image:

Single-line entries. If either line of the two-line *Column Hdgs* specification is blank, text occupies the line two (bottom) position in a column heading image.

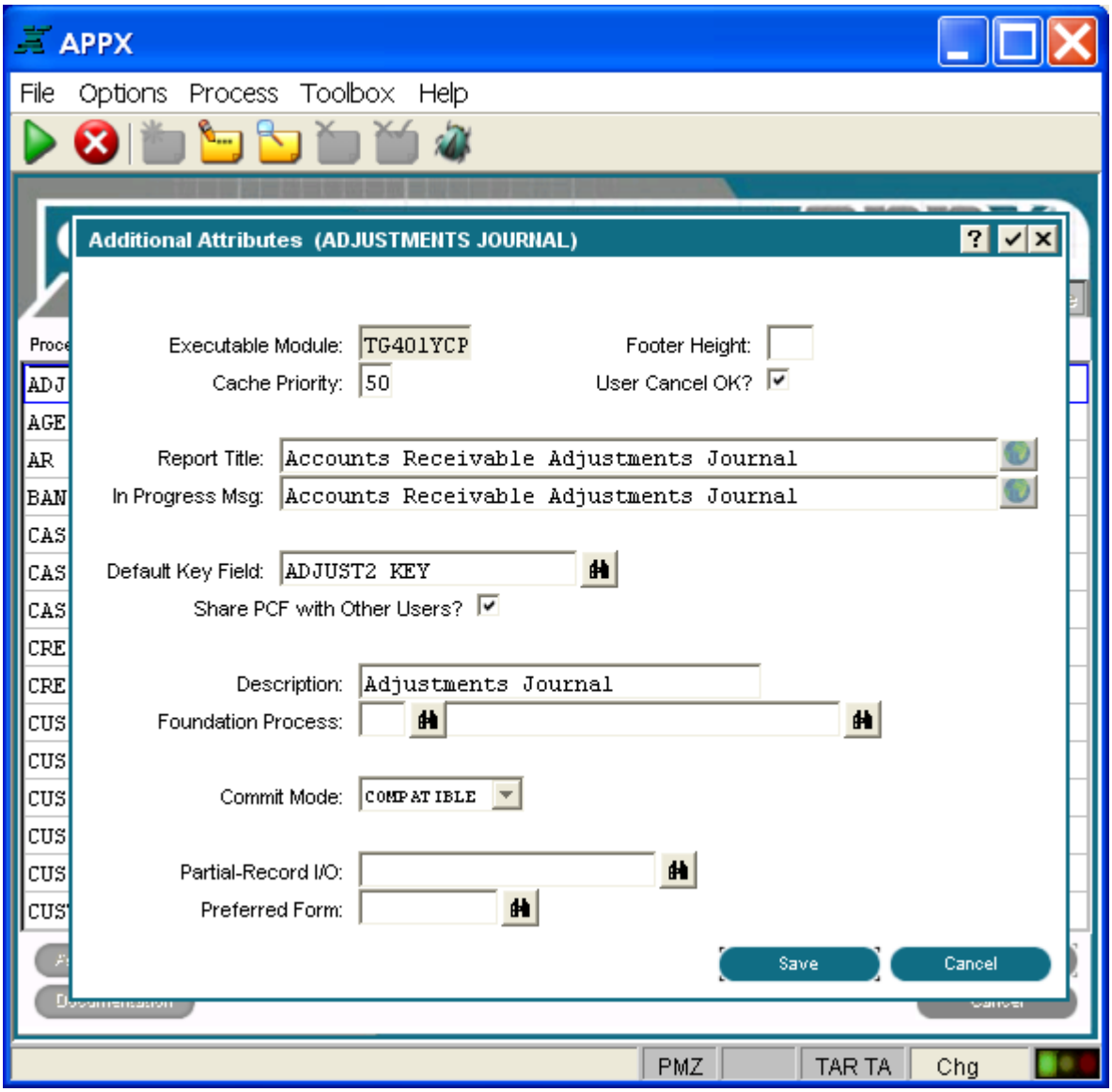
Justification. An item's justification depends on the type of item (numeric or logic, for example) and the value in the *Alignment* specification. Column headings for *Logic* items are always left-justified. Column headings for *Date/time*items are always left-justified. Column headings for *Alphanumeric* items are justified according to the *Alignment* specification in the data dictionary. Column headings for *Numeric* items are right-justified unless explicitly left-justified when painted on a screen in the APPX process facility.

Truncation. APPX truncates column heading text if the text is longer than the item it relates to, always maintaining at least one blank position between column headings. APPX never leaves a leading blank for a left-justified item, or a trailing blank for a right-justified item.

Underlines. For *Start of Range* class frames only, APPX places a single (dashed) line below column heading text for each item. The width of the underline is equal to the larger of the two lines of heading text for an item.

Output Process Additional Attributes Option

When you select the Additional Attributes option from the Output Processes screen, the Output Processes Additional Attributes overlay is displayed as shown below. This overlay permits the definition of more properties affecting the operation of the output process.



Output Processes Additional Attributes Overlay

The Additional Attributes overlay for Output processes contains the following fields:

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name. See Saving Executable Modules for more information.

Footer Height indicates the amount of space, in number of rows, to reserve on each page for printing the page footer. APPX uses this value to determine placement of *End of Page* frames. If blank, APPX does not reserve space for a page footer.

Cache Priority, represented by two numeric characters, establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is 50.

User Cancel OK? contains either 'yes' ☑ or 'no' ☐ and determines whether or not a user can press the cancel option key to stop the execution of this process. The default is 'yes'. You can conditionally control the user's ability to select the canceloption with statements and the predefined field CANCEL OK. You can toggle between 'yes' and 'no' by clicking on the checkbox.

Report Title defines the text that is used to name the report. This text automatically displays in the standard image for a *Start of Page* frame which is printed at the top of each page of the output.

In Progress Msg provides text for the message that displays to the screen while the report is executing in the foreground.

Default Key Field designates the specific keypath that is initially presented to a user invoking this process. If blank, the primary key is used. This specification is overridden by the default keypath that is defined for the child invocation of the process.

Share PCF with Other Users? determines whether other users can update the file concurrently. The default is 'yes' ☑ but can be toggled to 'no' ☐ by clicking the checkbox.

Description is incorporated in the message that displays on the screen when the output process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank. The Additional Attributes overlay for all types of processes contain this field. See *Process Definitio*n, for more information.

Foundation Process designates another output process (application name and process name) to provide *Start of Report, End of Report, Start of Page* and *End of Page* frames for the current output process. If this field is left blank, the report and page frames of the current process will be used. Note that if the current output process executes as a subprocess child of another output process, the process assumes the report and page frames of the parent process.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE .. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT . APPX will commit each modification as it is made. *This value will be implemented in a future release.

PCF CYCLE ..... APPX will commit modifications as each PCF record is processed.

END ..... APPX will only commit modifications at the end of the process family.

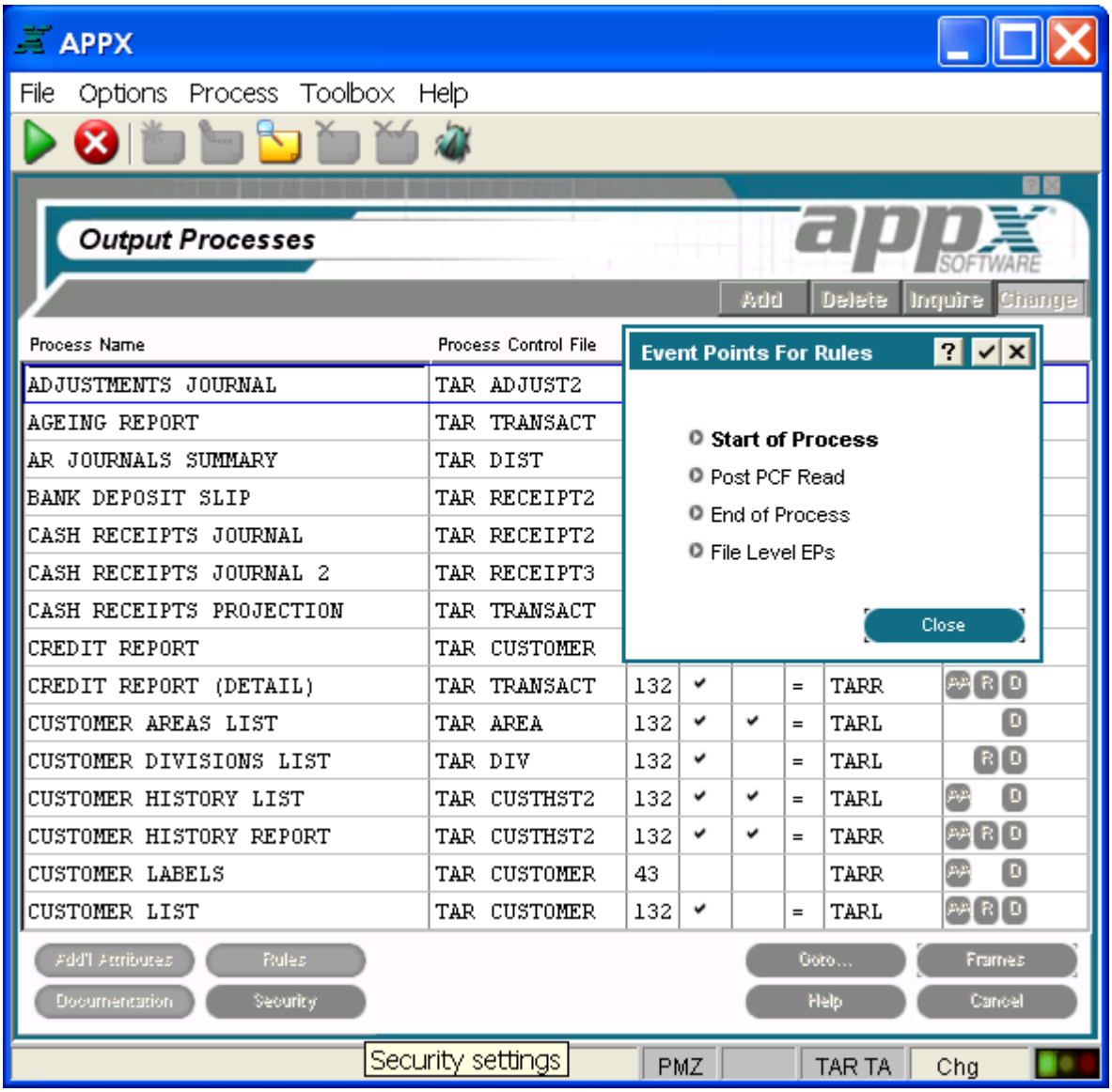
MANUAL ..... APPX will not automatically commit changes. You must use the COMMIT statement to do so.

Partial-Record I/O is used to specify a field from the PCF file so that instead of operating on the entire PCF record, APPX operates on the designated field only. If the field is a group header, then I/O will be performed on all members of the group. Utilizing partial-record I/O can greatly improve performance when the PCF is a table in an RDBMS. This is especially true when the table contains many columns, but relatively few are being utilized by the process. The scan option is available for field selection.

Preferred Form is used to help tune the Image Editor session to match form specifications when designing for PDF output.

Output Process Rules Option

When you select the Rules option from the Output Processes screen, the Output Processes Event Points for Rules overlay is displayed as shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted.



Output Processes Event Points for Rules Overlay

The Output Processes Event Points for Rules overlay contains the following options:

Start of Process

Start of Process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Read

Post PCF Read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the Event Points overlay.

End of Process

Accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the Event Points overlay.

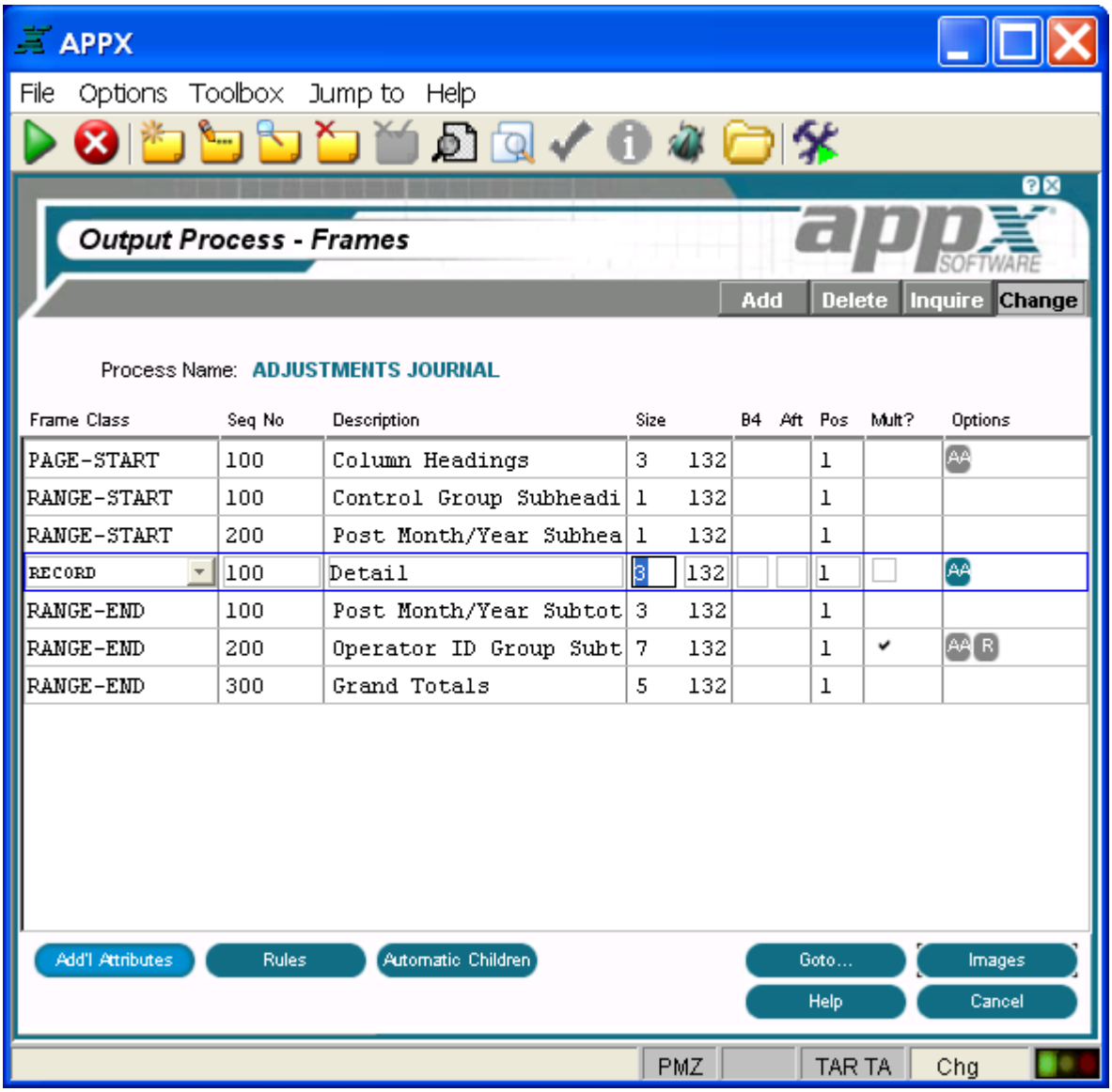
File Level EPs

File Level EPs provides access to the File Level Event Points for the PCF file. These event points are not directly associated with the process but with the PCF file. See the Files Rules Option for more information on using these event points.

Refer to Using Event Points for more information about event points.

Output Frame Specifications

When you select the frames option (or press return) on the Output Processes screen, after completing specifications for an output process, the Output Process Frames screen is displayed as shown below. Output frame specifications define attributes that govern both the visual presentation of a frame and the way it executes.



Output Process Frames Screen

The Output Process Frames screen contains the following fields:

Frame Class defines the type of frame with which you are working. Valid options are:

Report-Start frames print once at the beginning of a report. To print on a separate page, the designer should set *New Page After?* in Output Frame Additional Attributes for the last *Report-Start* frame.

Page-Start frames print once at the beginning of each page of a report. They are primarily used for page headings and column headings. Standard images for both of these are optionally available. See Standard Column Heading Image Generation for more information on column headings.

Range-Start frames print immediately before the first record for which the value in a specific sort field (the range field) changes. They are primarily used for subheadings and lower-level column headings. Standard images for both of these are optionally available. See Standard Column Heading Image Generation for more information on column headings.

Record frames manipulate and print information read from the process control file. They comprise the body of a report. *Record* frames can be defined to scroll.

Range-End frames print immediately after the last record in a series of records that have the same value in a specific sort field (the range field). They are primarily used for subtotals, and a standard subtotal image is optionally available.

Page-End frames print once at the conclusion of each page of a report.

Report-End frames print once at the conclusion of a report. To print on a separate page, the designer should set *New Page Before?* in Output Frame Additional Attributes for the first *Report-End* frame.

Seq No displays a sequence number that is defaulted by APPX and used to identify this output frame. The default sequence number can be overridden, but must be unique within each frame class for the process. Sequence numbers determine the order of the frames in the process structure. The first frame that is defined in add mode is assigned sequence number *100*, and additional frames are assigned a number equal to the highest existing sequence number, plus *100*.

Description identifies this output frame. The description is for documentation purposes only.

Size fields designate the number of rows and columns that comprise the frame. The row default is 1, and the column default corresponds to the report width entered for the output process, if any.

B4 indicates the number of blank lines to print before executing this frame. The default is *0.* In some cases, such as optional or repeating frames, it may be more appropriate to specify lines to skip at the image level. See the Scrolling or Non-Scrolling Image Additional Attributes options as applicable.

Aft indicates the number of blank lines to print subsequent to executing this frame. The default is *0.* In some cases, such as optional or repeating frames, it may be more appropriate to specify lines to skip at the image level. See the Scrolling or Non-Scrolling Image Additional Attributes options as applicable.

Pos designates the placement of the frame relative to the far left-side position of the report. See Frame/Image Positioning for more information.

Mult? A 'yes' ☑ in this field indicates that this output frame contains more than one image. If 'no' ☐ is selected, you will be unable to add more than one entry at the image level. The default is 'no' but can be toggled to 'yes' by clicking the checkbox.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes), R (Rules), and AC

Buttons are provided at the bottom of each Output Process Frames screen for accessing the following options:

Additional Attributes - See the Output Frame Additional Attributes Option for details.

Rules - See the Output Frame Rules Option for details.

Automatic Children - See the Output Frame Automatic Children Option for details.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Images - See Output Image Specifications for details. This is the default option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, Cancel allows you to end the current process without saving changes, if any, to the current record.

In addition, the menu bar provides the following pulldown menus:

Toolbox - See the Output Frame Toolbox Pulldown Menu for details.

Jump to - Same as the Process Jump to Pulldown Menu.

Output Frame Additional Attributes Option

When you select the Additional Attributes option on the Output Process Frames screen for a frame with frame class **Record**, the output process Record frame Additional Attributes overlay is displayed as shown below, where you can access additional parameters.

The Record overlay also applies for frames with frame class Report-Start, Page-Start, Page-End, or Report-End, except that these frame classes do not have a Scroll Type parameter.

See the figure at the end of this section for the overlay that applies for frames with frame class Range-Start or Range-End.

Output Record Frame Additional Attributes Overlay

The output Record frame Additional Attributes overlay contains the following fields.

Frame Type governs the execution of an image or images for the frame. There are three frame types.

NORMAL ..... Executes the first (lowest numbered) alternate image unless another image is explicitly selected with statements and the predefined field ALTERNATE IMAGE NUMBER.

OPTIONAL ..... Executes the image that is identified by the *Normal Frame Type* above with the following exception: If the value in the predefined field ALTERNATE IMAGE NUMBER is *0*, do not execute an image.

REPEATING ... Executes the image repeatedly until the value in the ALTERNATE IMAGE NUMBER is set to 0 by statements.

The default is Normal. See Frames for more information about optional and repeating frames.

Scroll Type indicates whether or not the images on the frame scroll and, if so, the type of scrolling to be performed. The field only appears for a **Record** frame. The *Scroll Type* options are:

NONE ..... The image on the frame does not scroll.

DOWN ..... APPX divides the frame into a grid of equal-sized regions, based upon a calculated composite image size. The first image is placed into the upper left region in the frame. Succeeding images are placed in the region below the previous image until the column is complete. As each column is completed, the next image is placed at the top of the column immediately to the right of the completed column.

ACROSS ..... APPX divides the frame into a grid of equal-sized regions, based upon a calculated composite image size. The first image is placed into the upper left region in the frame. Succeeding images are placed in the region to the right of the previous image until the row is complete. As each row is completed, the next image is placed in the far left-hand position of the row immediately below the completed row.

The default is None. It is uncommon to use scrolling images in output processes since the desired effect can usually be accomplished by reducing the size of the frame relative to the report width. See The Effect of Scrolling Frames on Screen and Page Positioning for a detailed discussion of scrolling frames.

New Page Before? determines whether or not to begin a new page before executing this frame. If the report is between pages before this frame executes, a 'yes' ☑ entry does not cause a blank page to print. The default is 'no' ☐.

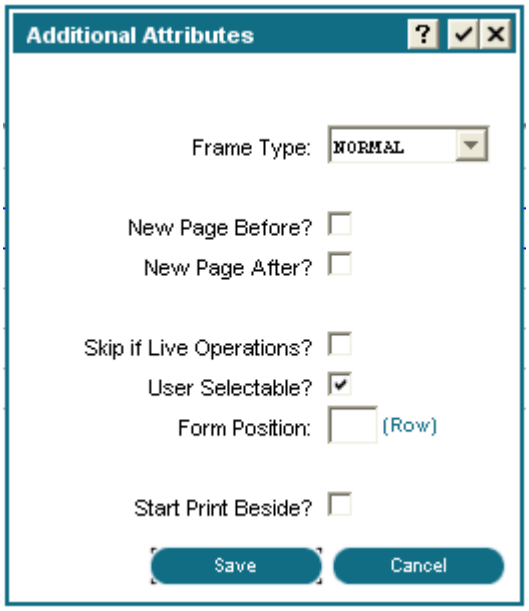
New Page After? determines whether or not to begin a new page subsequent to executing this frame. If the report is between pages after this frame executes, a 'yes' ☑ entry does not cause a blank page to print. The default is'no' ☐.

Skip If Live Operations? determines whether or not the frame is exclusive to the initial setup and recovery processing phases of operation. If 'yes' ☑, the frame does not execute during the live operations phase. If 'no' ☐, the frame executes during all phases of operation. The default is'no'.

Form Position (Row) designates the placement of the frame on the printed format. When implemented, the row is defined relative to the rows on the printed page (unless Print Beside is in effect, in which case the row is relative to the Print Beside buffer). See Frame/Image Positioning for more information.

Start Print Beside? A 'yes' ☑ in this checkbox tells APPX to print subsequent frames to the right of this frame if physically possible. See the Print Beside section for more information about this feature.

When you select the Additional Attributes option on the Output Process Frames screen for a frame with frame class **Range-Start** or **Range-End**, a slightly different Additional Attributes overlay is displayed as shown below.



Output Range-Start and Range-End Frame Additional Attributes Overlay

The output Range-Start and Range-End frame Additional Attributes overlay contains the same fields described above for a Record frame, except that there is no Scroll Type field. Also, it contains the following field that is unique to Range-Start and Range-End frames:

User Selectable? indicates whether or not a user can control printing of the frame through a query. If 'no' ☐, the user cannot turn off this frame in the query. If 'yes' ☑, the user can optionally cause the frame to print or not. The default is 'yes'.

Output Frame Rules Option

When you select the Rules option on the Output Process Frames screen for any frame regardless of frame class, the output process frame Event Points for Rules overlay is displayed as shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted.

Output Frame Event Points for Rules Overlay

The output frame Event Points for Rules overlay contains the following options:

Start of Process

Start of Process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Read

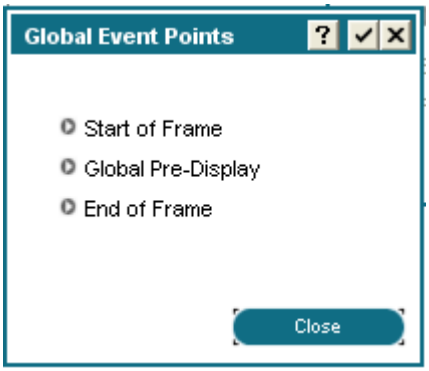
Post PCF Read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the Event Points overlay.

Select Image

Select Image accesses the ILF editor for the Select Image event point. Upon completion, you are returned to the Event Points overlay.

Global EP's For Images

Global EP's for images calls the Global Event Points overlay shown below.



Global Event Points Overlay

This overlay provides options for three additional event points:

Start of Frame

accesses the ILF editor for the

Start of Frame

event point. Upon completion, you are returned to the Global Event Points overlay.

Global Pre-Display accesses the ILF editor for the Global Pre-Display event point. Upon completion, you are returned to the Global Event Points overlay.

End of Frame accesses the ILF editor for the End of Frame event point. Upon completion, you are returned to the Global Event Points overlay.

End of Process

End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the Event Points overlay.

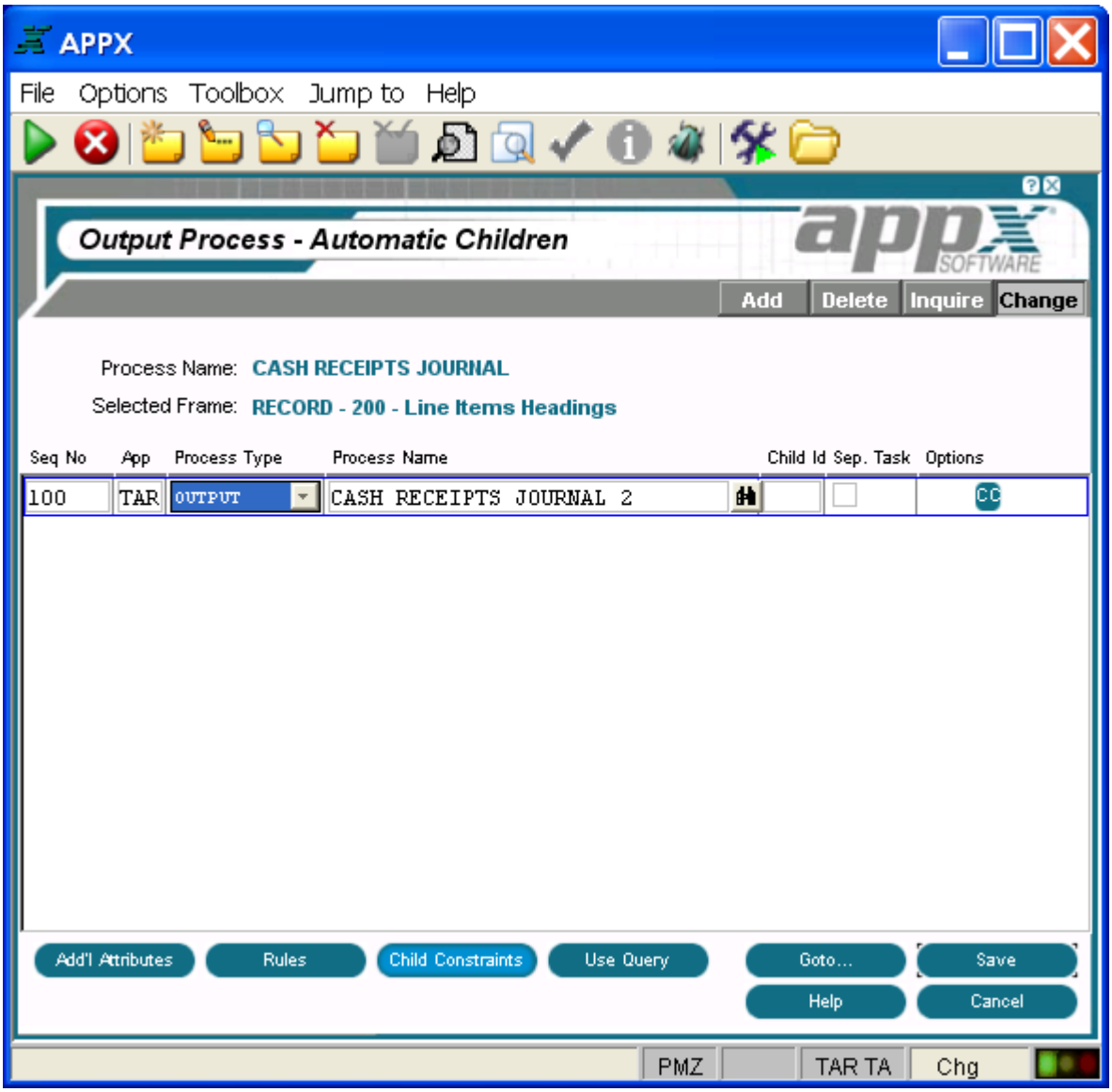
File Level EPs

File Level EPs provides access to the File Level Event Points for the PCF file. These event points are not directly associated with the process but with the PCF file. See the Files Rules Option for more information on using these event points.

Refer to Using Event Points for more information about event points.

Output Frame Automatic Children Option

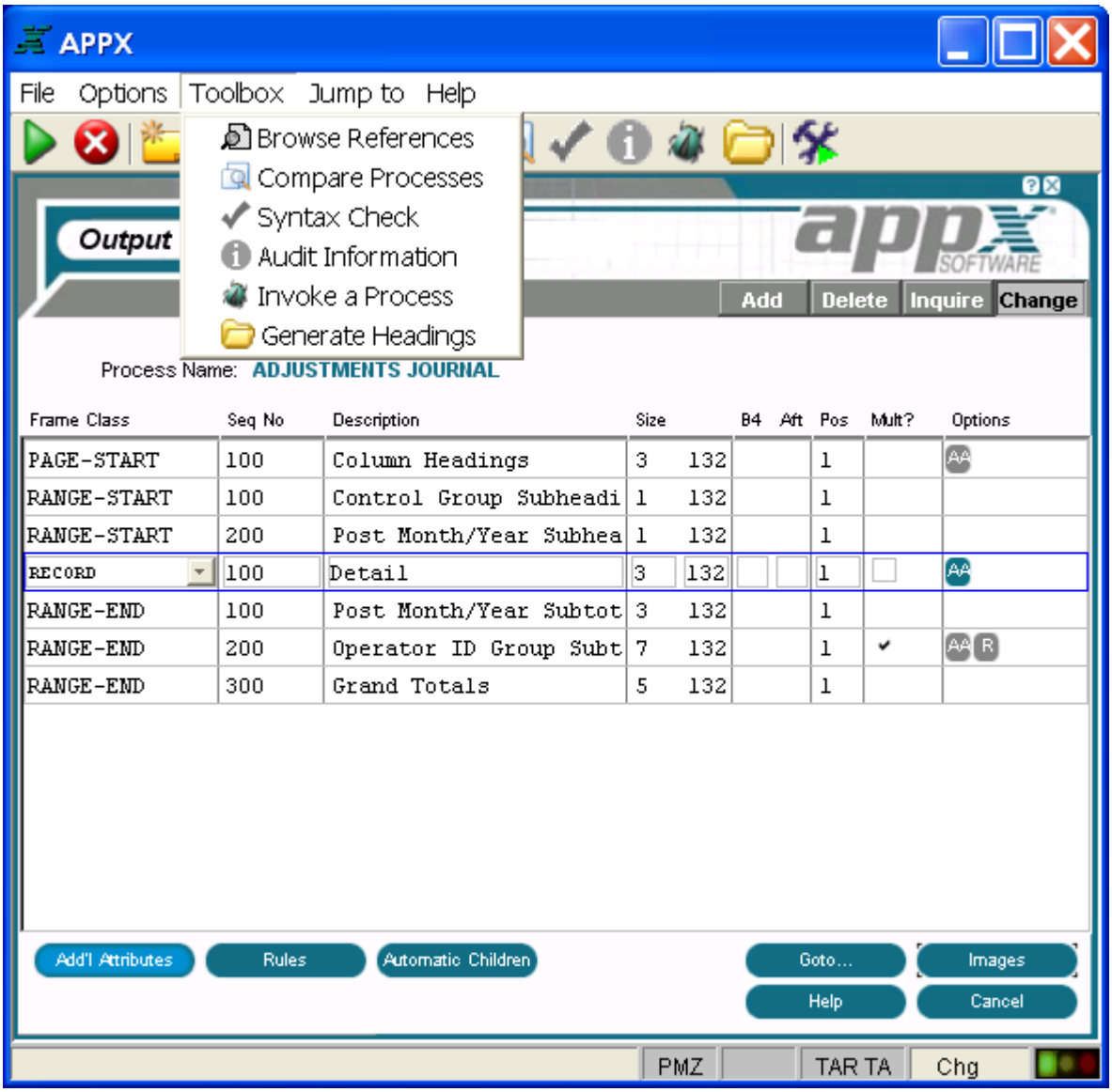
When you select the automatic children option on the Output Process Frames screen for any frame regardless of frame class, the Output Process Automatic Children screen is displayed as shown below. This allows you to attach a specific process to the output process frame currently selected so that it invokes automatically following execution of the frame. See Automatic and Optional Child Invocations as well as Automatic and Optional Children for more information.



Output Process Automatic Children Screen

Output Frame Toolbox Pulldown Menu

When you select **Toolbox** from the menu bar on the Output Process Frames screen, the Toolbox Pulldown Menu appears as shown below. Note that each tool can also be accessed by selecting the corresponding icon on the screen toolbar.



Output Frames Toolbox Pulldown Menu

The output frames Toolbox Pulldown Menu offers the following options:

Browse References

The Browse References option runs a modified version of 'Cross Reference - All' and produces a list of design components utilized by the current process. The results can be displayed interactively where links allow you to see the context of the references, edit the referenced component, and drill down to the child process. This option can be used to identify, and optionally edit, the file level event points utilized by this process.

Compare Processes

The Compare Processes option compares the current process to another process that you identify and produces a report listing any differences. You can also opt to browse the results interactively.

Syntax Check

The Syntax Check option allows you to create the Executable Module for the current process without running the process. If the Executable Module already exists and is still valid, this option is ignored if invoked. Note that this option (Option 97), like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox.

Audit Information

The Audit Information option allows you to see who created the current process and who changed it most recently. It also provides you with the date that the process was created and the date that it was last changed. Note that this option (Option 98), like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox. See Audit Information Overlay for an example of the overlay.

Invoke a Process

The Invoke a Process option is available to facilitate testing. When you select this option, APPX defaults to the current process but you may override the defaults to invoke any process. Note that this option, like any Toolbox option with a value greater than 90, is available for use directly from any screen in Application Design without going to the Toolbox. See Invoke a Process Overlay for details on using this option.

Generate Headings

The Generate Headings option generates a column headings frame for the output frame you are currently positioned to.

Output Image Specifications

Output image specifications define the visual and operational attributes of each alternate image for an output frame. These specifications are determined, in part, by whether or not the currently selected frame is defined with a scroll type in the Output Frame Additional Attributes accessed from the Output Process Frames screen. However, it is unusual to employ scrolling in an output process.

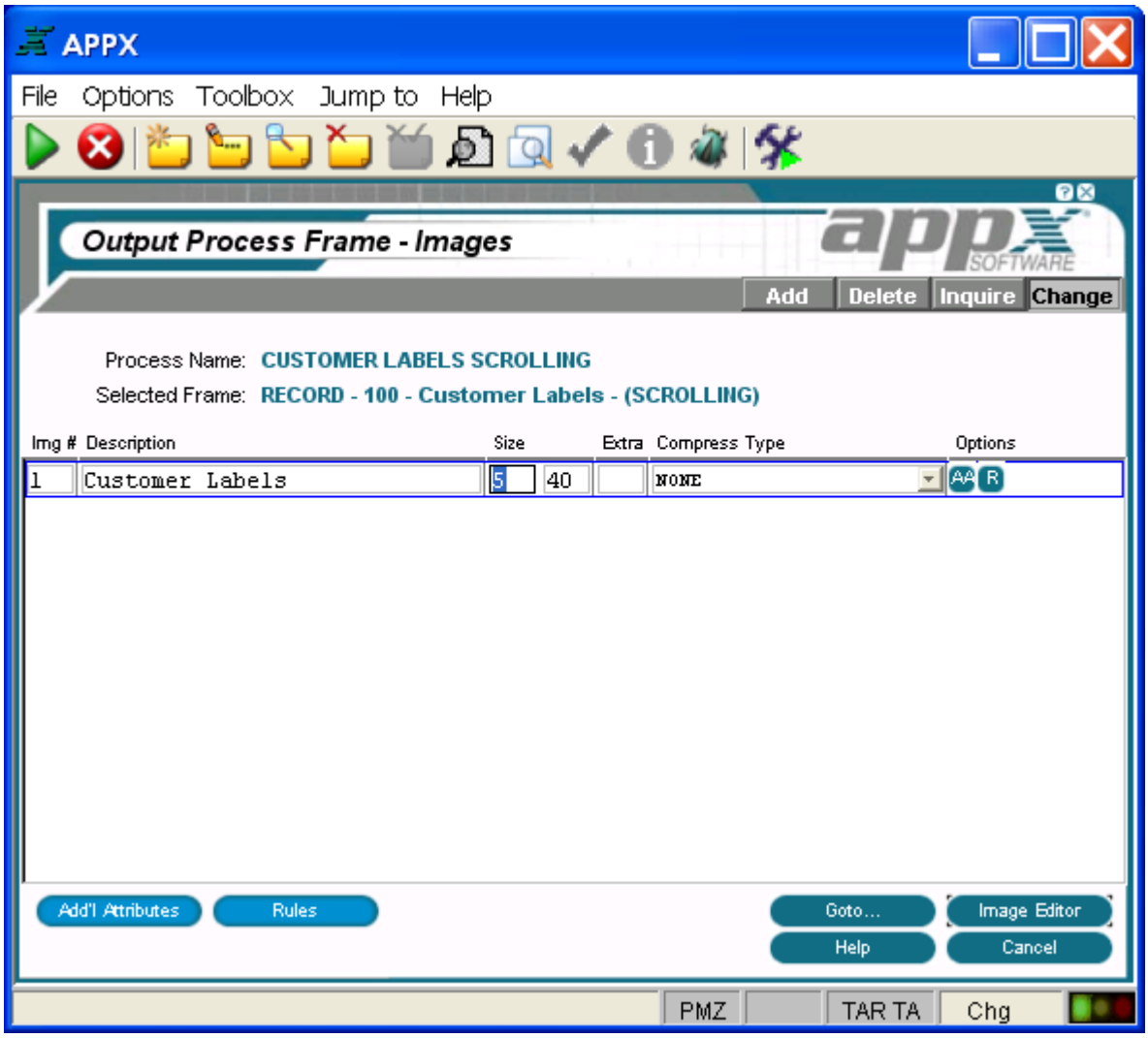
The scrolling output Images screen and the non-scrolling output Images screen are described separately in the following sections:

Scrolling Output Image Specifications

Non-Scrolling Output Image Specifications

Scrolling Output Image Specifications

When you select the Images option (or press Return) on the Output Process Frames screen for a frame with scrolling defined in Additional Attributes, the Scrolling Output Images screen is displayed as shown below. Note that it is uncommon to use scrolling images in output processes since the desired effect can usually be accomplished by reducing the size of the frame relative to the report width.



Scrolling Output Images Screen

The scrolling output Images screen contains the following fields:

Img # displays a sequence number that is defaulted by APPX. The image number uniquely identifies each alternate image for the frame and is referenced when determining which image, if any, is to display. The first image that is defined in add mode is assigned alternate image number *1*, and additional images are assigned a number equal to the highest existing image number, plus *1*. The default number can be overridden, but must be unique within the frame. Refer to the Images section for a discussion of alternate images.

Description identifies this alternate image. The description is for documentation purposes only.

Size designates the number of rows and columns that comprise the displayed image. The image cannot be larger than the frame to which it belongs. If blank, the size of the image defaults to the size of the frame. The default is blank. See Frame/Image Positioning for more information.

Extra indicates the number of extra lines or rows to add to the size of the image. For scrolling frames only, APPX computes the composite image size based upon the *Size* entry and this entry.

Compress Type indicates whether or not to suppress blank lines in an image and, if so, the type of lines to compress. The *Compress Type* options are:

NONE ..... Do not compress.

EMBEDDED BLANK LINES ... Compress embedded blank lines.
(However, the image still occupies the full number of rows.)

TRAILING BLANK LINES ..... Compress trailing blank lines.

EMBEDDED/TRAILING ..... Compress embedded and trailing blank lines.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes) and R (Rules).

Buttons are provided at the bottom of each Images screen for accessing the following options:

Additional Attributes - See the Scrolling Output Image Additional Attributes Option for details.

Rules - See the Output Image Rules Option for details. This overlay is the same for both scrolling and non-scrolling frames.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Image Editor - See the Output Image in the Image Editor for details. This is the default option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, Cancel allows you to end the current process without saving changes, if any, to the current record.

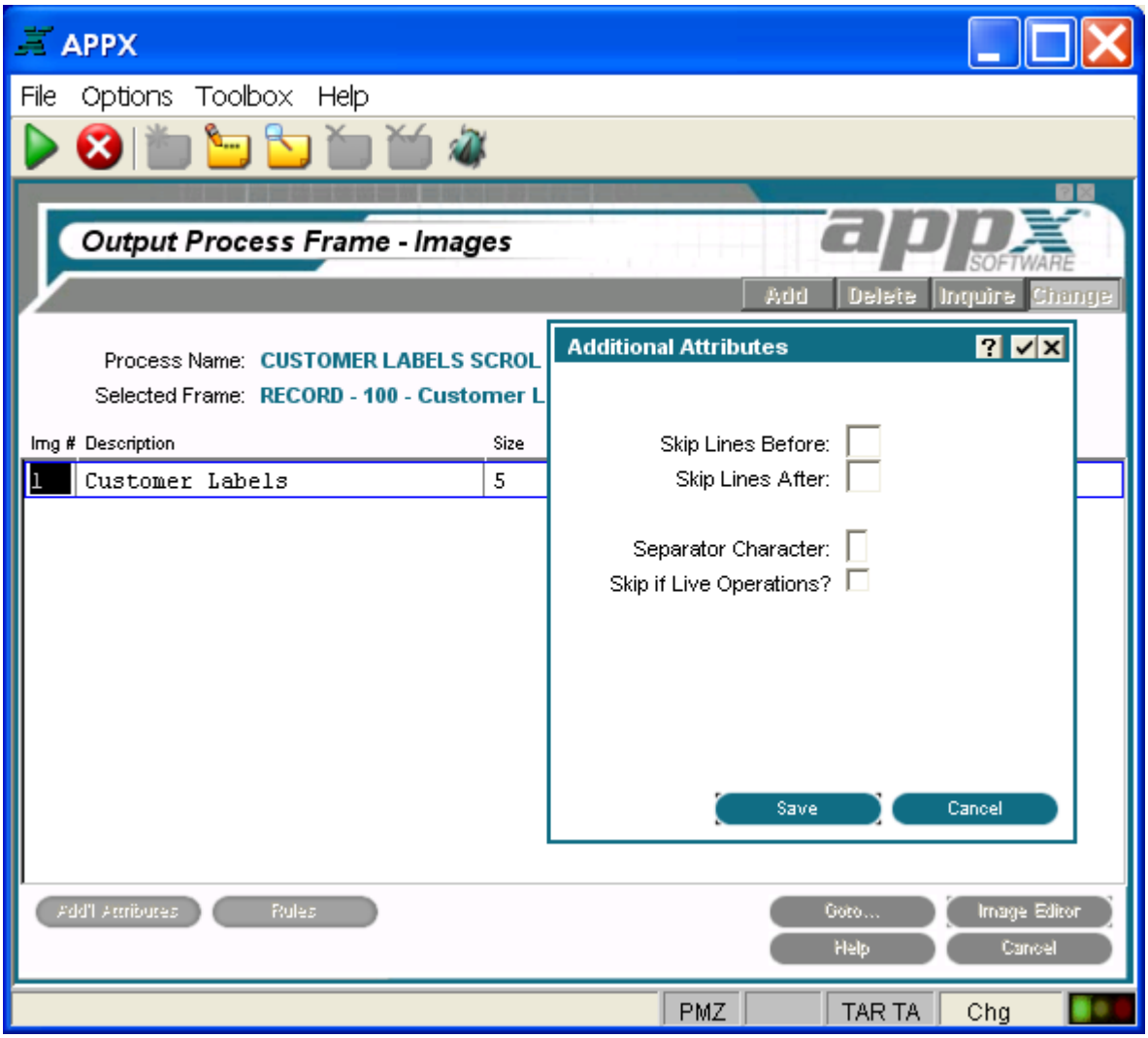
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Output Frame Toolbox Pulldown Menu except that there is no Generate Headings option at the image level.

Jump to - Same as the Process Jump to Pulldown Menu.

Scrolling Output Image Additional Attributes Option

When you select the Additional Attributes option on the Scrolling Output Images screen, the scrolling output image Additional Attributes overlay is displayed as shown below, where you can access additional parameters.



Scrolling Output Image Additional Attributes Overlay

The scrolling output image Additional Attributes overlay contains the following options:

Skip Lines Before represents the number of lines to be skipped prior to the image being printed.

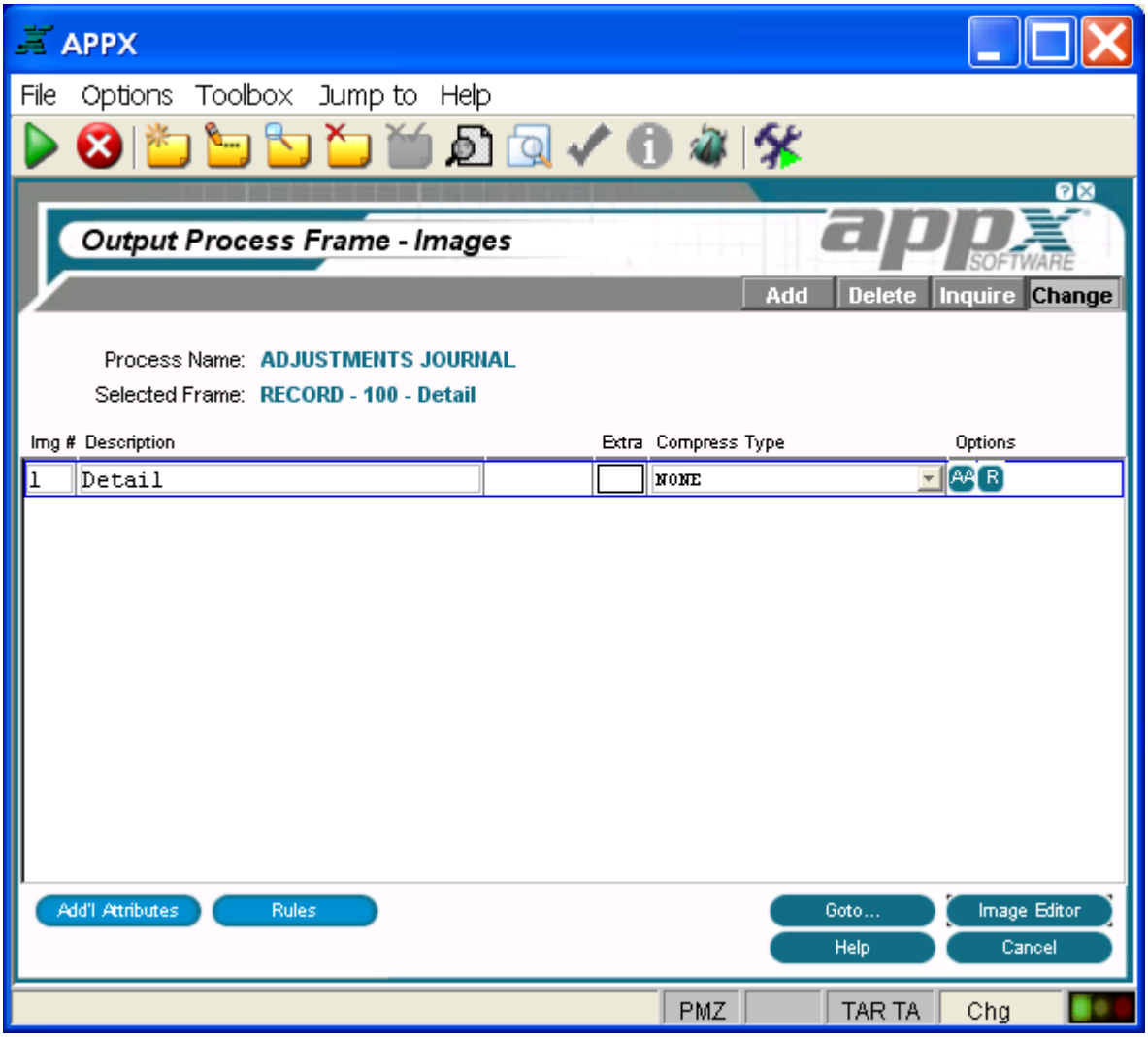
Skip Lines After defines the number of lines to be skipped after the image is printed.

Separator Character indicates whether a continuous line of a designated character (usually -, =, or *) should be following this image to separate it from the rest of the report. This field is optional and leaving it blank indicates that no separation line is to be printed.

Skip If Live Operations? determines whether the frame is exclusive to the initial setup and recovery processing phases of operation. If 'yes' ☑, the frame is not executed during live operations. If 'no' ☐, the frame executes during all phases of operation. The default is'no'.

Non-Scrolling Output Image Specifications

When you select the images option (or press return) on the Output Process Frames screen for a frame with no scrolling defined in Additional Attributes, the Non-Scrolling Output Images screen is displayed as shown below. Most output images are non-scrolling.



Non-Scrolling Output Images Screen

The non-scrolling output Images screen contains the following fields:

Img #displays a sequence number that is defaulted by APPX. The image number uniquely identifies each alternate image for the frame and is referenced when determining which image, if any, is to display. The first image that is defined in add mode is assigned alternate image number *1*, and additional images are assigned a number equal to the highest existing image number, plus *1*. The default number can be overridden, but must be unique within the frame. Refer to the Images section for a discussion of alternate images.

Description identifies this alternate image. The description is for documentation purposes only.

Extra indicates the number of extra lines or rows to add to the size of the image. For scrolling frames only, APPX computes the composite image size based upon the *Size* entry and this entry.

Compress Type indicates whether or not to suppress blank lines in an image and, if so, the type of lines to compress. The *Compress Type* options are:

NONE ..... Do not compress.

EMBEDDED BLANK LINES ..... Compress embedded blank lines.
(However, the image still occupies the full number of rows.)

TRAILING BLANK LINES ..... Compress trailing blank lines.

EMBEDDED/TRAILING ..... Compress embedded and trailing blank lines.

Options are indicators that are present whenever the options they denote have been defined. Options applicable to this screen are AA (Additional Attributes) and R (Rules).

Buttons are provided at the bottom of each Images screen for accessing the following options:

Additional Attributes - See the Non-Scrolling Output Image Additional Attributes Option for details.

Rules - See the Output Image Rules Option for details. This overlay is the same for both scrolling and non-scrolling frames.

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Image Editor - See the Output Image in the Image Editor for details. This is the default option.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, Cancel allows you to end the current process without saving changes, if any, to the current record.

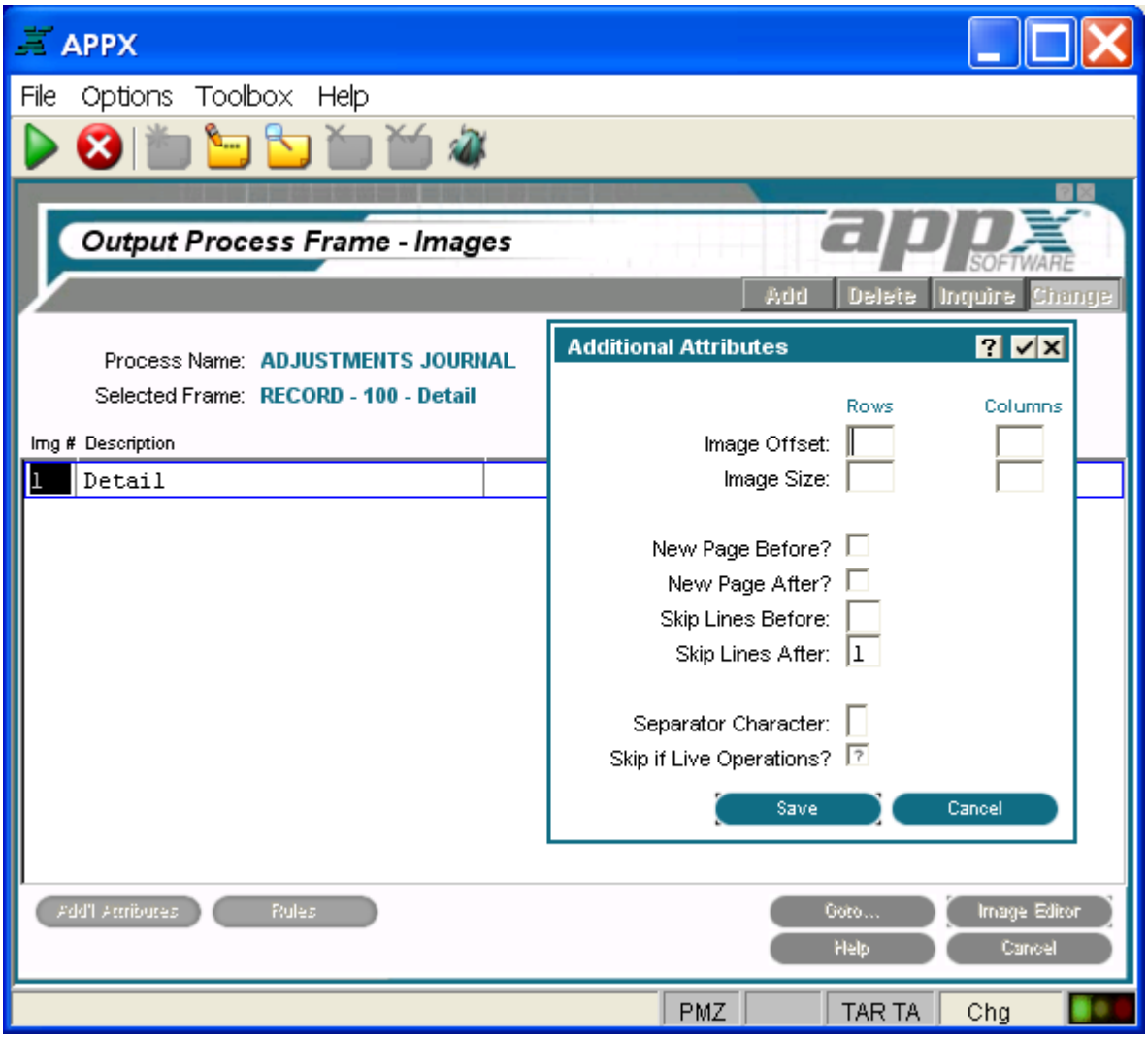
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Output Frame Toolbox Pulldown Menu except that there is no generate headings option at the image level.

Jump to - Same as the Process Jump to Pulldown Menu.

Non-Scrolling Output Image Additional Attributes Option

When you select the Additional Attributes option on the Non-Scrolling Output Images screen, the non-scrolling output image Additional Attributes overlay is displayed as shown below, where you can access additional parameters.



Non-Scrolling Output Image Additional Attributes Overlay

The non-scrolling output image Additional Attributes overlay contains the following options:

Image Offset determines the placement of the rows and columns of this image, relative to the frame. Row entries designate positioning, relative to the top of the frame. Column entries designate positioning relative to the left of the frame. If blank, the APPX defaults to same row/column position as the frame. The default is blank. See Frame/Image Positioning for more information.

Image Size designates the number of rows and columns that comprise the displayed image. The image cannot be larger than the frame it belongs to. If blank, the size of the image defaults to the size of the frame. The default is blank.

New Page Before? indicates whether or not a new page should be started before each time this image is printed. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

New Page After? indicates if a new page should be started after the image is printed. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Skip Lines Before represents the number of lines to be skipped prior to the image being printed.

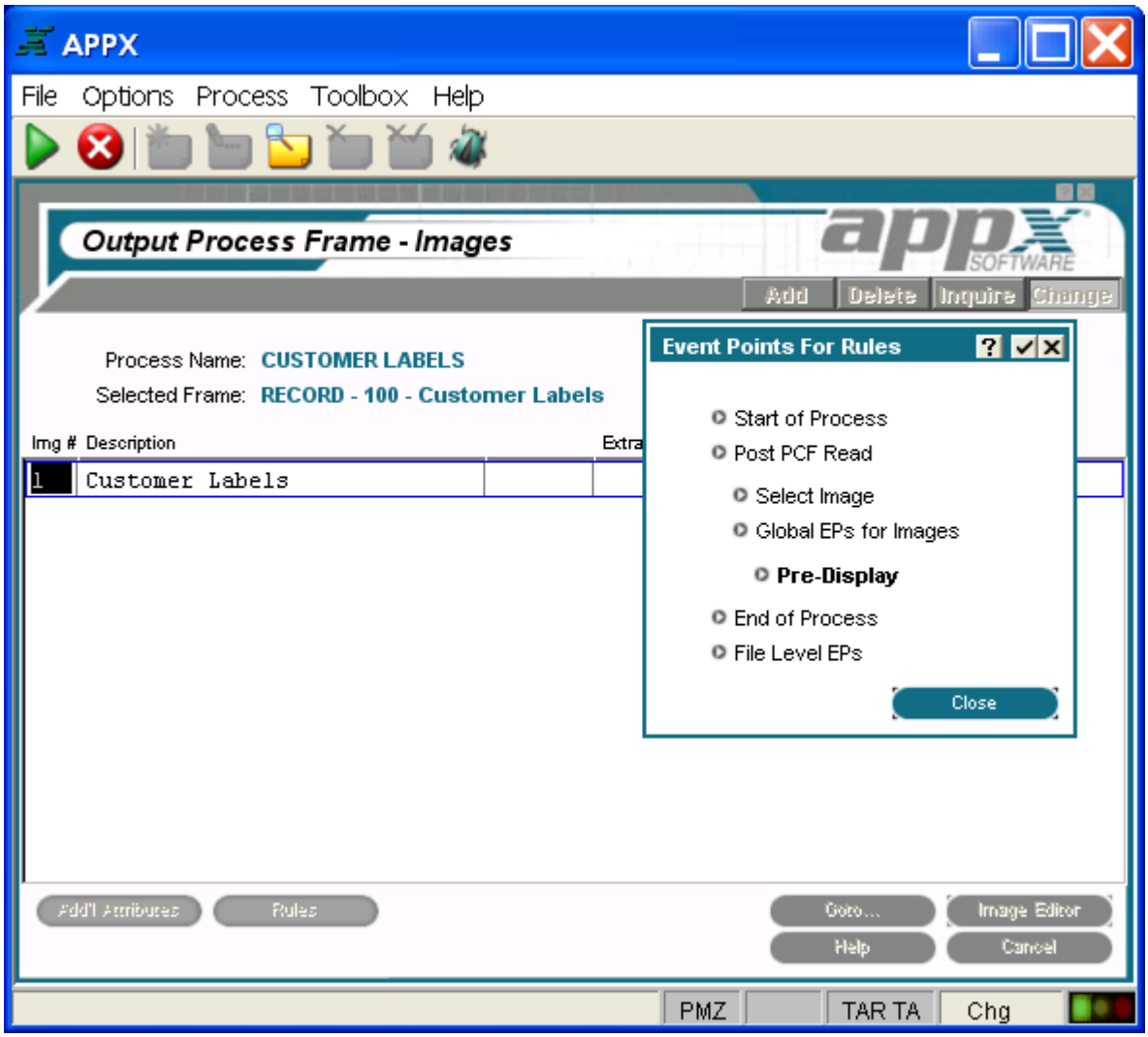
Skip Lines After defines the number of lines to be skipped after the image is printed.

Separator Character indicates whether a continuous line of a designated character (usually -, =, or *) should be following this image to separate it from the rest of the report. This field is optional and leaving it blank indicates that no separation line is to be printed.

Skip If Live Operations? determines whether the frame is exclusive to the initial setup and recovery processing phases of operation. If 'yes' ☑, the frame is not executed during live operations.

Output Image Rules Option

When you select the Rules option on either the Scrolling Output Images screen or the Non-Scrolling Output Images screen, the output image Event Points for Rules overlay is displayed as shown below. This overlay provides options to access the ILF Editor for APPX event points.If statements are defined in an event point, the respective text on the screen is highlighted.



Output Image Event Points for Rules Overlay

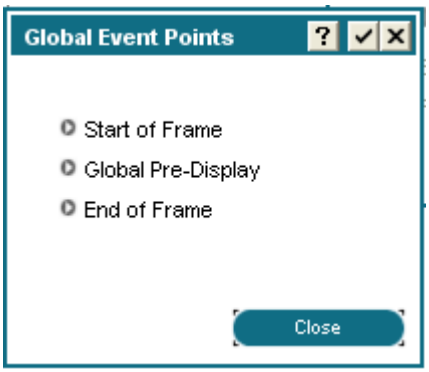
The output image Event Points for Rules overlay contains the following options:

Start of Process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the Event Points overlay.

Post PCF Read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the Event Points overlay.

Select Image accesses the ILF editor for the Select Image event point. Upon completion, you are returned to the Event Points overlay.

Global EP's for Images calls the Global Event Points overlay shown below.



Global Event Points Overlay

This overlay provides options for three additional event points:

Start of Frame accesses the ILF editor for the Start of Frame event point. Upon completion, you are returned to the Global Event Points overlay.

Global Pre-Display accesses the ILF editor for the Global Pre-Display event point. Upon completion, you are returned to the Global Event Points overlay.

End of Frame accesses the ILF editor for the End of Frame event point. Upon completion, you are returned to the Global Event Points overlay.

Pre-Display accesses the ILF editor for the Pre-Display event point. Upon completion, you are returned to the Event Points overlay.

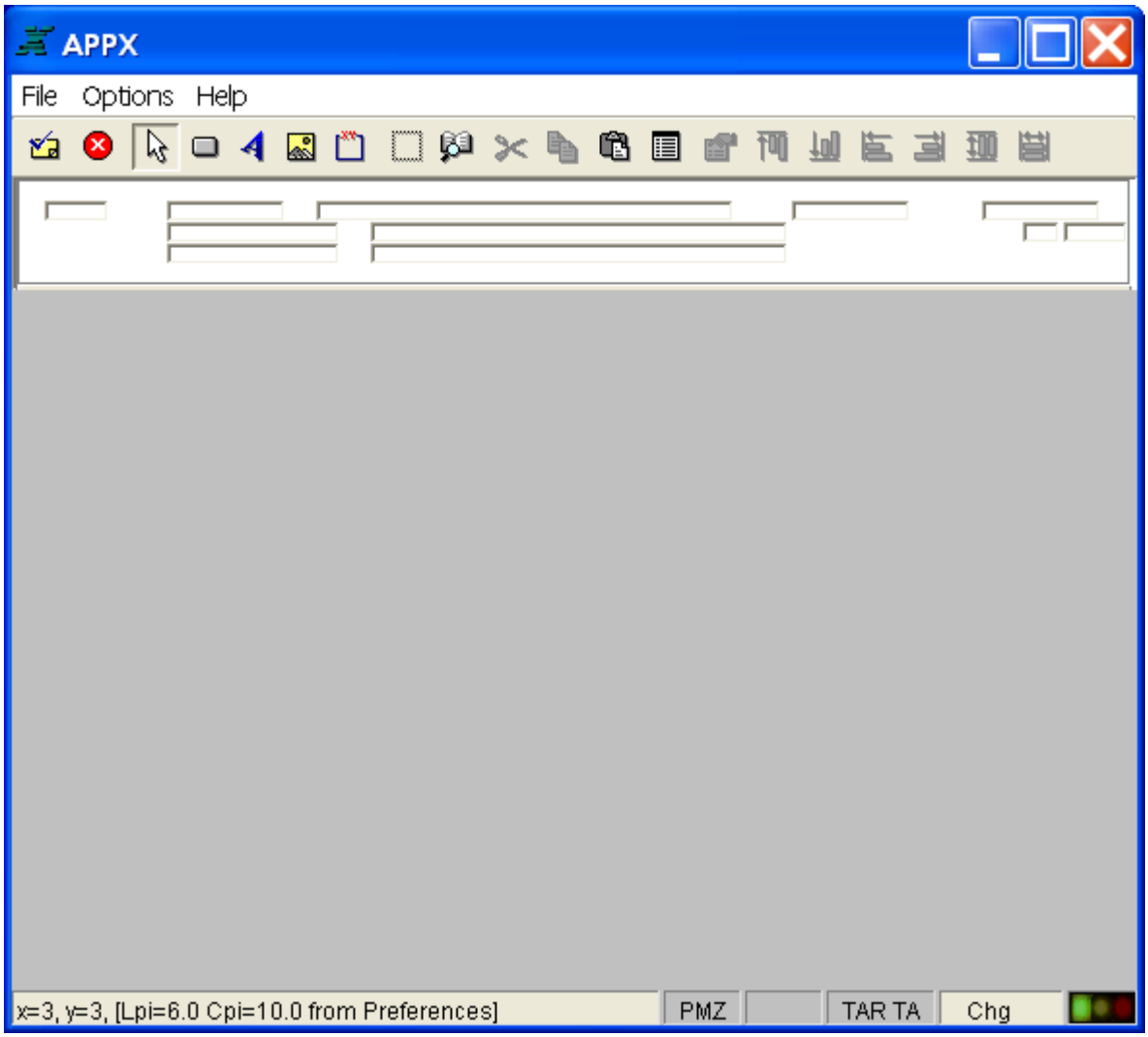
End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the Event Points overlay.

File Level EPs provides access to the File Level Event Points for the PCF file. These event points are not directly associated with the process but with the PCF file. See the Files Rules Option for more information on using these event points.

Refer to Using Event Points for more information about event points.

Output Image in the Image Editor

After you complete specifications for an image on the Scrolling Output Images screen or the Non-Scrolling Output Images screen, you automatically enter the Image Editor when you press return or select the image editor option. The Image Editor, APPX's screen painting facility, is the facility used to format menus, inputs, outputs, and inquiry screens. The figure below shows a sample output image being edited in the Image Editor.



Output Image in the Image Editor

The standard features of the Image Editor can be employed in character mode using only a keyboard. However, you need a mouse to take advantage of the GUI features within the Image Editor. GUI tools provide designers with the ability to create screen images complete with pictures, buttons, icons, wallpapers, and other graphical features. Another GUI tool is a data palette offering drag and drop selection and placement of data fields.

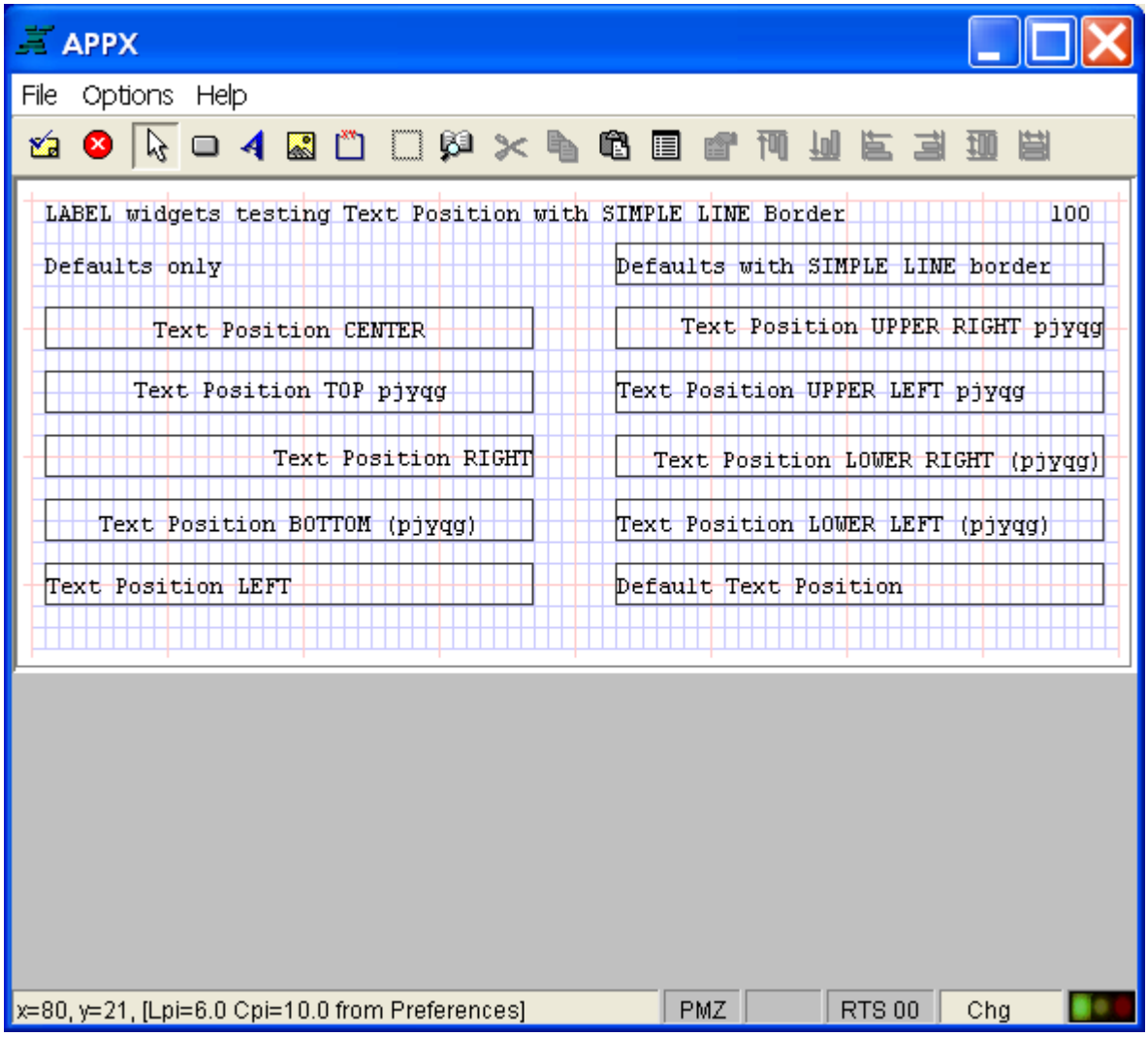
Basic functionality of the Image Editor is fully explored in Using the Image Editor and a complete discussion of its GUI features is presented in Using GUI Features of the Image Editor. Not all the GUI attributes available for menus and inputs can be used for outputs and inquiries with the 4.2 release of APPX. However, widget control types that have been implemented for outputs and inquiries include Label, Box, and Picture. Data widget control types include Label, Raw Text, and Picture. Window properties and global window properties can also be defined.

To display an output image in the Image Editor as it will appear to your users, specify the PDF form in the *Preferred Form* field of the Output Process Additional Attributes. APPX will compute the lines per inch (lpi) and characters per inch (cpi) for display from the specifications for that form in System Administration. If there is no preferred form specified, APPX will use your client preferences, as shown above. See Designing GUI Output for more information.

In order to print graphical attributes, you must specify "PDF" in the *Print Format* field and identify a PDF form in the *Form* field on the print disposition screen. See Printing PDF Output for more information.

Designing GUI Output

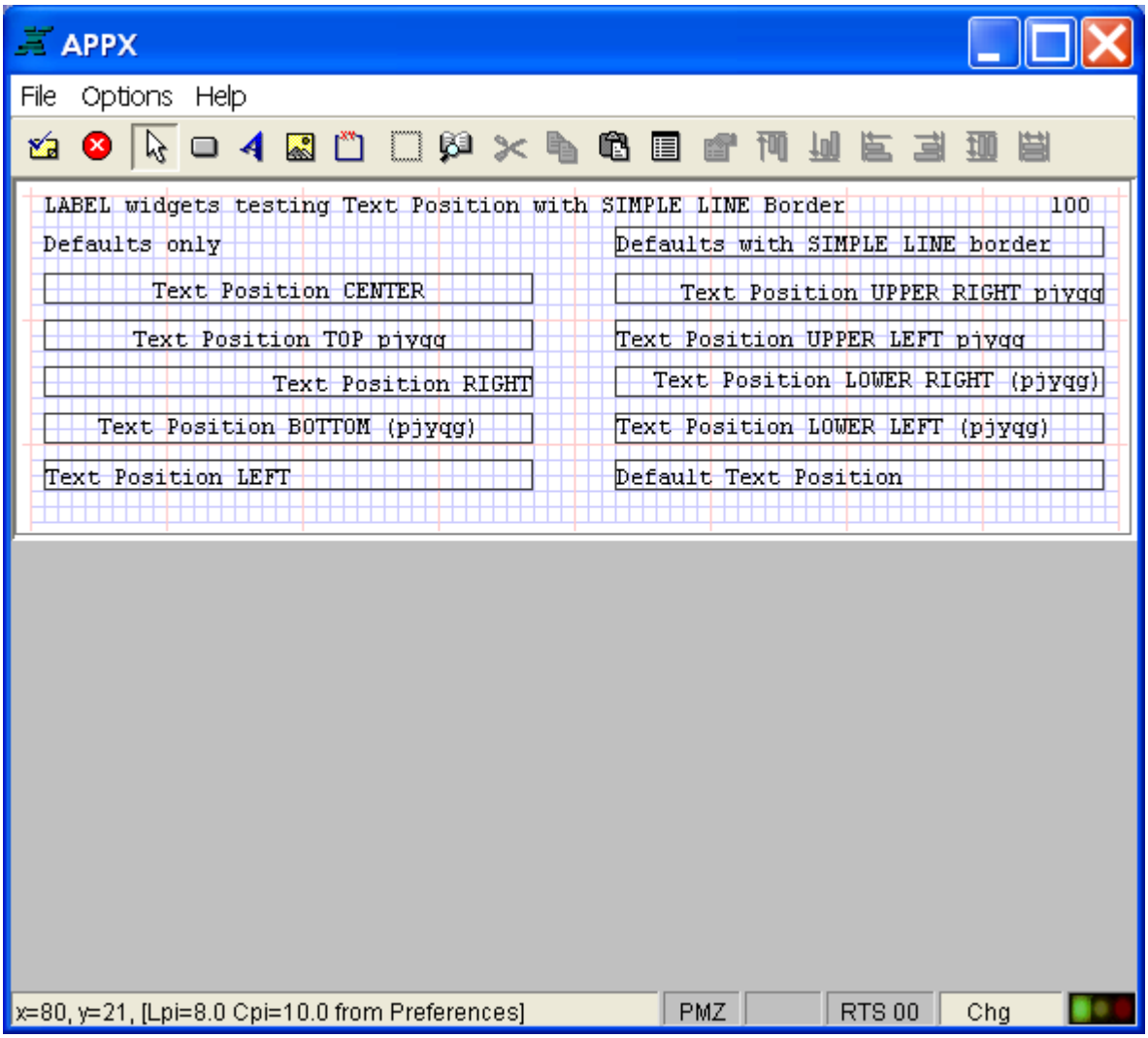
One of the first things that you may notice is that the Image Editor looks different when you are designing GUI output or inquiry processes. The figure below shows a 21x80 image with the grid turned on.



Output Image with Grid Turned On (21x80 at 6 lpi, 10 cpi)

Notice that only about 2/3 of the screen is used to display 21 rows. To some, the screen may look 'squished' since 21 rows are displayed in about 2/3 of the space that is used to display 21 rows when designing an input or menu process. Why is this? Aspect ratio! We want the Image Editor to show the output image in exactly the same proportions that it will print at. For example, if you were to draw a box that looked square using the Image Editor, you would expect a square box to print. Notice on the status line that the output image is displayed at 6 lines per inch (lpi) and 10 characters per inch (cpi), anticipating that you will print the report using a form with those specifications.

The figure below looks even more 'squished'. What happened?



Output Image with Grid Turned On (21x80 at 8 lpi, 10 cpi)

Notice that the aspect ratio of this output image is based on 8 lpi and 10 cpi. But, WYSIWYG (what you see is what you get) prevails!

So, how can you control the aspect ratio of an output image in the Image Editor at design time? There are two ways. Effective with APPX 4.2, an output process has a field in Additional Attributes called *Preferred Form*. If you specify a FORM name in the *Preferred Form* field, then APPX will compute the lpi and the cpi from the definition for that FORM in System Administration. It can then display the output image using an aspect ratio that corresponds to the FORM specs. Or, while on the output image in Application Design, you can select the **File** menu on the menu bar and then select **Preferences**. The lpi and the cpi can be set as a client preference by double-clicking on the appropriate *Value* cell (*printRowsPerInch* and *printColsPerInch*, respectively). So, if you design all of your reports to print at 6 lpi and 12 cpi, simply set the preference and APPX will remember it from that point on.

Printing PDF Output

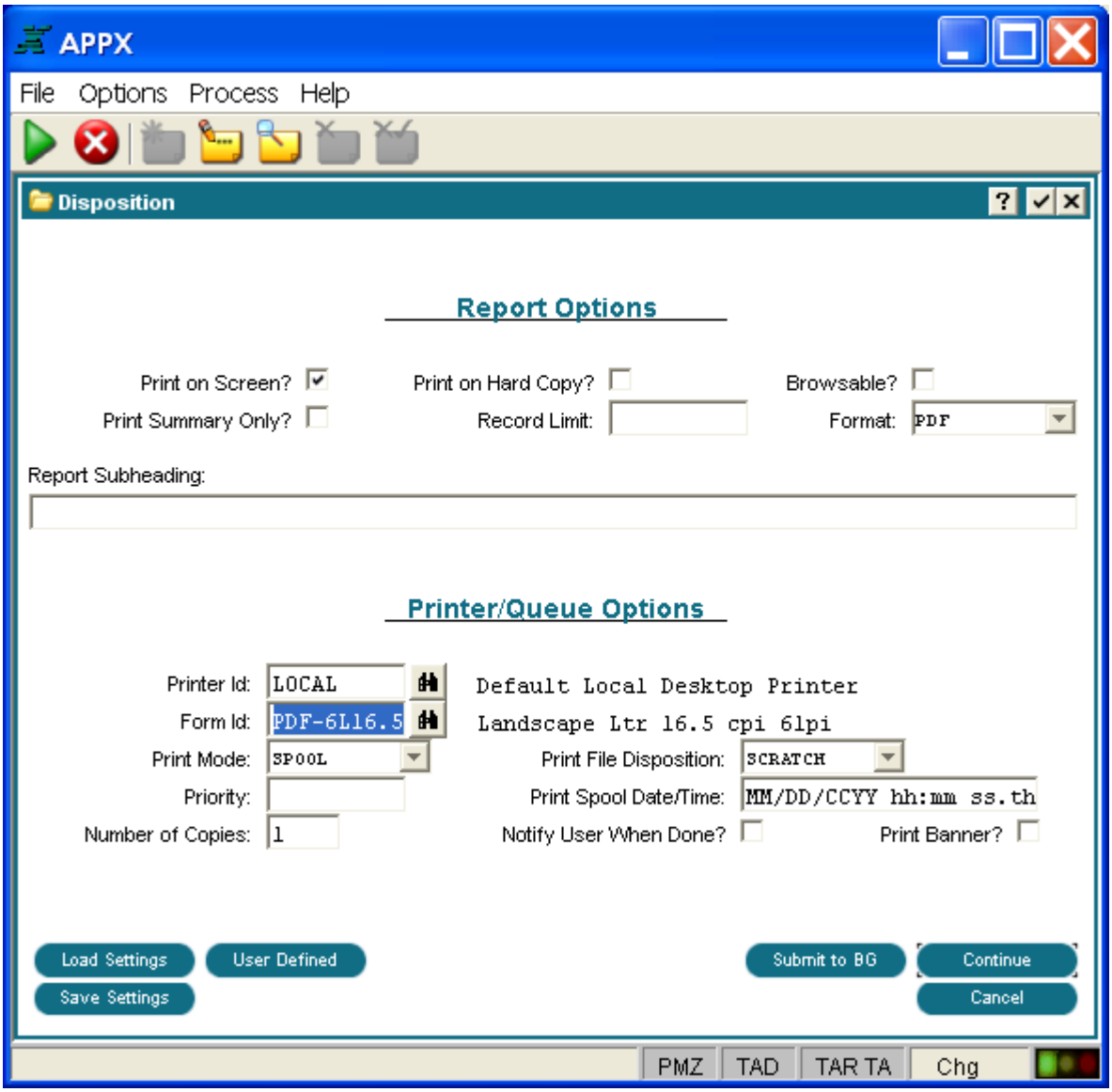
If you want to print an existing report as a PDF document, here is what you should do:

Define a FORM in System Administration. Specify that the form type is PDF and fill in the form attributes. PDF documents are page oriented so the FORM attributes relate to a page of output. You will need to define the paper size. You can also specify left and right margins and top and bottom margins. If you take the paper size and subtract the margins, what's left is the printable area of the page. The length of the printable area will be divided by the number of lines specified to determine the lines per inch (lpi). The width of the printable area will be divided by the number of characters per line to determine the pitch (cpi). So if you specify 8.5" x 11" for the paper size and you specify a top and bottom margin of 0.5" and you specify that there are 60 printable lines on the page, APPX will figure out that the resulting lpi is 6. If you specify a left and right margin of 0.25" and you specify that there are 80 characters per line, APPX will figure out that the desired pitch is 10 cpi.

On the print disposition screen, when you run any existing report, specify that the *Print Format* is "PDF" and select the appropriate PDF form definition (see the example below).

If you specify Print on Screen and you are connected via a remote client, the printer that you specify must be defined within APPX System Administration as a "LOCAL" printer because APPX will transfer the PDF document to the client and launch Acrobat Viewer in a separate viewer to display the report. Meanwhile, the APPX session will display the PDF Print on Screen Dialog discussed in the next section. The old APPX print on screen utility is not used to view PDF output. If you are connected via a remote client, you must be using the Java client if you expect to view a PDF document via Print on Screen. The win32 client is not able to perform the transfer of the PDF document or launch Acrobat Viewer on your remote desktop. However, if you are running the win32 client directly on the server, then you can print PDF documents to the screen as long as Acrobat Viewer is installed on the server.

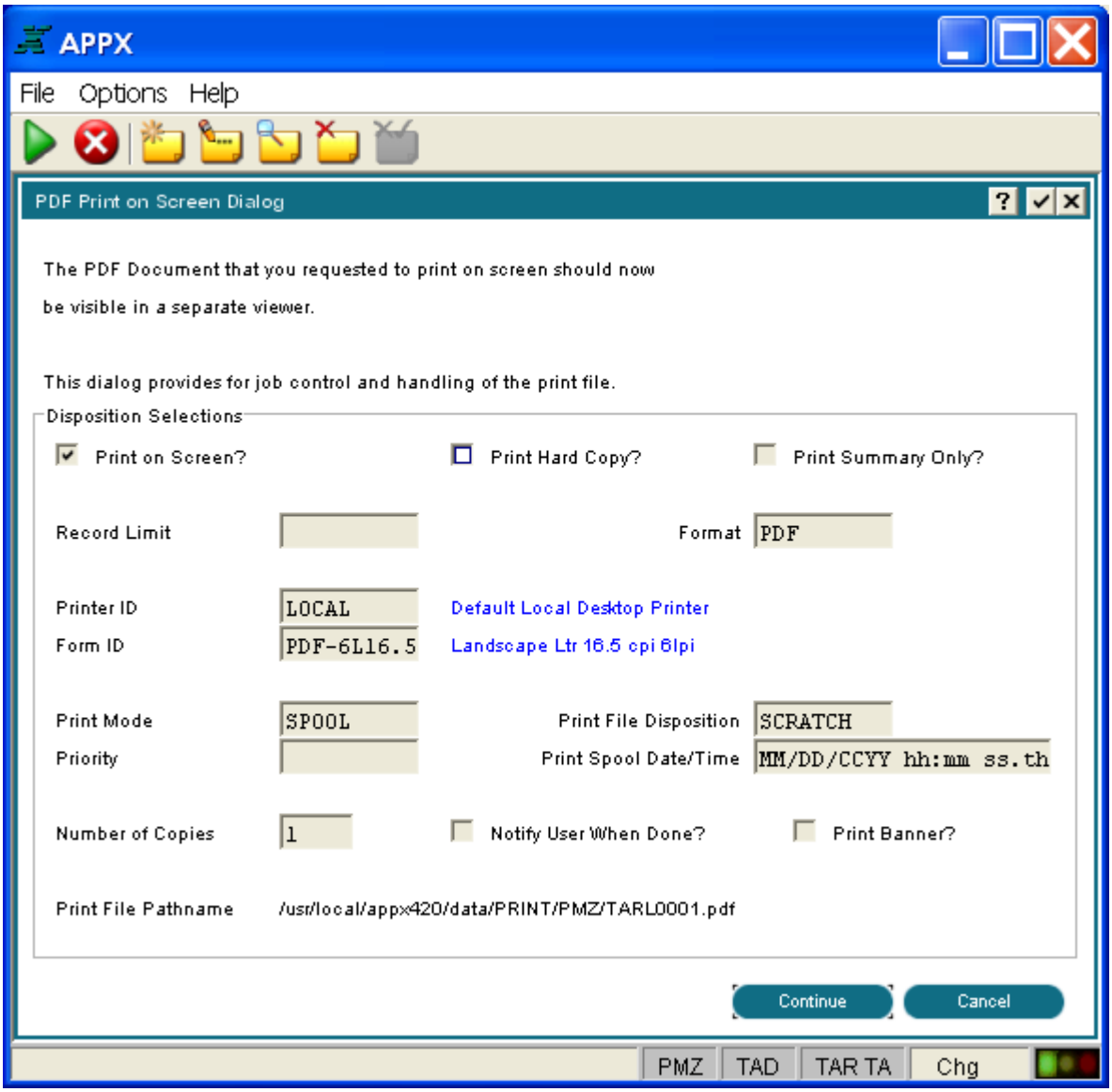
If you specify Print Hard copy, you may print to a Local printer or a server printer. But, obviously, you must have Acrobat Reader installed on your server and/or desktop if you expect to be able to print PDF output



Print Disposition Screen for PDF Output

PDF Print on Screen Dialog

As discussed in the previous section, Printing PDF Output, if you specify Print on Screen when you are printing in PDF format, APPX will transfer the PDF document to the client and launch Acrobat Viewer in a separate viewer to display the report. APPX will then display the PDF Print on Screen Dialog, shown below.



PDF Print on Screen Dialog

The Continue and Cancel buttons are provided to control the remainder of the job in the event the job has multiple steps. In previous releases of APPX, you could run a report to the screen, select Cancel while viewing the report, and the APPX job would cancel without running the remainder of the steps. The PDF Print on Screen Dialog serves primarily to provide such functionality and maintain compatibility with existing jobs. While the PDF output appears on the screen using a PDF viewer, the dialog appears on the APPX screen for you to acknowledge or cancel.

Also, you can still control the print file by use of this screen. APPX will queue the PDF document to a server printer or upload a copy of the PDF document to your client and queue it on a local printer only after you acknowledge the Print on Screen dialog.

Keep in mind that the server prints the PDF document if you specify hard copy and select a server printer. The PDF document is only uploaded to the client if you are displaying it on the screen or if you are printing to a local printer. So, you could display it on screen and, after acknowledging the dialog, print the document on a server printer. While you may elect to print the document from within the PDF viewer, that is not necessarily the preferred method for printing. If you select hard copy within APPX, then the number of copies can be honored, the Print File disposition will relate to the copy of the print file on the server and can be honored, and Print Mode can be honored. When you close the PDF viewer on your client, the APPX Client will remove the PDF file. After printing to your local printer, the PDF file should also be removed.

Notice that the pathname of the server print file is provided on the dialog screen. The name of the print file after it is uploaded to the client is known only by the client. However, the titlebar of the Acrobat Viewer will show the client print file name.

HTML Elements in PDF Output

When designing an APPX output process, the APPX image editor allows for the specification of GUI attributes for each field. These GUI attributes apply to the entire field. However, occasionally, it is desirable to provide a finer level of control over the formatting of the contents of a field. For example, it might be desirable to print an individual word or phrase within a field with a bold typeface. HTML tags provide the capability to format individual words or phrases within a field.

HTML tags may be embedded within an ALPHA field or a TEXT field to specify how the field value is to be formatted when printed.

The field must be added to the image with a widget type of LABEL or TEXT AREA.

The field value must begin with an HTML tag, e.g. <HTML>. The entire contents of the field will then be considered to be HTML text. HTML tags embedded within the field will supplement the GUI attributes that are defined at the field level.

HTML tags are not case sensitive. They may be entered as upper case or lower case.

If no widget is specified or if a RAW TEXT widget type is specified, the contents of the field will be printed without formatting. A RAW TEXT widget type can be used to print the unformatted field value including any html tags.

The label value of a LABEL widget may contain HTML tags as a way of formatting the label value when printed.

Standard APPX text formatting within a TEXT field is compatible with html formatting as follows:

- An APPX end-of-paragraph character ("" - xB6/182) has the same effect as a <br> element.
- An APPX required space character ("_" - x5F/95) has the same effect as a   (no break space).

When an ALPHA field that contains end-of-paragraph characters ("") or underline characters ("_") is printed, these characters are not interpreted as text formatting characters and are instead printed like any other characters regardless of whether the field contains HTML elements.

Top Level Elements

HTML - HTML document

```
<HTML>...</HTML>
```

The HTML element contains the entire html document. A field whose content is to be formatted by embedded html tags must begin with an HTML element starting in position 1. The end tag of an HTML element is optional.

Generic Block Level Elements:

Block level elements print a leading line break before the block and a trailing line break after the block. This results in double line spacing between block level elements. However, a block level element which is the first element after the HTML element does not print a leading line break. Another exception is that a CENTER element never prints a leading line break resulting in single line spacing between a CENTER element and the preceding block level element. A block level element may not be nested within another block level element. If a block level element is not terminated by an ending tag and another block level element is encountered, then the termination of the first block level element is implied and a trailing line break is printed.

CENTER - Centered block <CENTER>...</CENTER> Text within a CENTER block is formatted and then centered horizontally within the width of the output widget. If the centered text block contains line breaks, then each line of text is centered within the width of the output widget. H1 - Level-one heading <H1>...</H1> The H1 element defines a level-one heading. The level-one heading is the highest level heading and has the largest and boldest font size of the six possible heading levels. A document generally has a single level-one heading representing the most important heading level. An H1 heading is equivalent to <FONT SIZE=21><B>...</B></FONT> H2 - Level-two heading <H2>...</H2> The H2 element defines a level-two heading. A level-two heading is less important than a level-one heading and more important than a level-three heading. The font size of a level-two heading is smaller than a level-one heading and larger than a level-three heading. An H2 heading is equivalent to <FONT SIZE=20><B>...</B></FONT> H3 - Level-three heading <H3>...</H3> The H3 element defines a level-three heading. A level-three heading is less important than a level-two heading and more important than a level-four heading. The font size of a level-three heading is smaller than a level-two heading and larger than a level-four heading. An H3 heading is equivalent to <FONT SIZE=19><B>...</B></FONT> H4 - Level-four heading <H4>...</H4> The H4 element defines a level-four heading. A level-four heading is less important than a level-three heading and more important than a level-five heading. The font size of a level-four heading is smaller than a level-three heading and larger than a level-five heading. An H4 heading is equivalent to <FONT SIZE=18><B>...</B></FONT> H5 - Level-five heading <H5>...</H5> The H5 element defines a level-five heading. A level-five heading is less important than a level-four heading and more important than a level-six heading. The font size of a level-five heading is smaller than a

level-four heading and larger than a level-six heading. An H5 heading is equivalent to <FONT SIZE=17><B>...</B></FONT> H6 - Level-six heading <H6>...</H6> The H6 element defines a level-six heading. A level-six heading is less important than a level-five heading. A level-six heading is the least important of the six headings. An H6 heading is equivalent to <FONT SIZE=16><B>...</B></FONT> P - Paragraph <P>...</P> The P element defines a paragraph. Extra white space is compressed out of the text and a word that does not fit on the end of a line is wrapped to the beginning of the next line. PRE - Preformatted text <PRE>...</PRE> The PRE element is used to print preformatted text. Preformatted text is printed with a fixed space font. White space is not compressed out and long lines are not wrapped.

Special Inline Elements:

A - Anchor <A HREF=uri>...</A> The A element is an anchor for a hypertext link that is to be embedded in the pdf document. The HREF attribute specifies a hypertext link to a web page, an image, or other types of files. Example: <A HREF="http://www.appx.com">the APPX web site</A> BR - Line break
 The BR element forces a break in the current line. Printing of text continues on the next line. FONT - Font change <FONT SIZE=n>...</FONT>
<FONT SIZE="+n">...</FONT>
<FONT SIZE="-n">...</FONT>
<FONT COLOR=#xxxxxx>...</FONT> The FONT element allows for the font size to be adjusted thru the use of the SIZE attribute and allows for the font color to be specified thru the use of the COLOR attribute. For more information on the use of this element, please refer to the section on font size below. SUB - Subscript _{...} The SUB element prints the text within the block as a subscript. SUP - Superscript ^{...} The SUP element prints the text within the block as a superscript.

Phrase Elements:

EM - Emphasis <EM>...</EM> The EM element is used to print emphasized text. The APPX implementation of EM is the same as using the I tag for italics. STRONG - Strong emphasis <STRONG>...</STRONG> The STRONG element is used to print text with strong emphasis. The APPX implementation of STRONG is the same as using the B tag for bold.

Font Style Elements:

B - Bold text <B>...</B> The BOLD element is used to print text in a bold typeface. BIG - Big text <BIG>...</BIG> The BIG element is used to print text in the next larger font size relative to the font size of the preceding text. If there is no larger font size, then BIG is ignored. BIG is the same as specifying a relative font size of +1, i.e. <FONT SIZE="+1">...</FONT>. I - Italic text <I>...</I> The I element is used to print text in italics. SMALL - Small text <SMALL>...</SMALL> The SMALL element is used to print text in the next smaller font size relative to the font size of the preceding text. If there is no smaller font size, then SMALL is ignored. SMALL is the same as specifying a relative font size of -1, i.e. <FONT SIZE="-1">...<.FONT> TT - Teletype text <TT>...</TT> The TT element is used to print text in a teletype (monospaced) font. U - Underlined text <U>...</U> The U element is used to print underlined text.

Font Size

The base font size for a report is determined at runtime from the FORM record specified for the report. The base font size is specified as a point size in the FORM record in APPX System Administration or, if not specified, is calculated based on the various page layout specifications in the FORM record.

The report's base font size is applied to each field printed on the report. However, individual fields on a report may be scaled up or down relative to the report's base font size by specifying a font scale at design time. The base font size equates to a font scale of 100% or <font size=10>. APPX output processes support 28 font sizes (scale values). All 28 font sizes are relative to the base font size of the report.

HTML tags can be used to vary the size of text within an individual field. There are a variety of ways that HTML tags can be used to increase or decrease the font size of all text or a portion of the text within an individual field.

"Absolute" font sizes are also supported thru the use of the FONT tag with the SIZE attribute, i.e.<FONT SIZE=n> where n=1 to 28.

"Relative" font sizes are supported thru the use of the FONT tag with the SIZE attribute, i.e.<FONT SIZE="+n"> or <FONT SIZE="-n">

Relative font sizes can also be specified by using a BIG tag to specify that the enclosed text should be printed one size larger than the current font size. <BIG>...</BIG> is the same as <FONT SIZE="+1">...</FONT>. BIG tags can be nested in which case the inner text is one size larger than the outer text.

Relative font sizes can also be specified by using a SMALL tag to specify that the enclosed text should be printed one size smaller than the current font size. <SMALL>...</SMALL> is the same as <FONT SIZE="-1">...</FONT>. SMALL tags can be nested in which case the inner text is one size smaller than the outer text.

The H1 thru H6 tags correspond to font sizes 21 thru 16 and are rendered with a bold attribute.

Font Size Table

The following table shows the font indexes and their associated font scale factor that are available for use in output processes:

Absolute Font Size <FONT SIZE=n>	Heading Font Size	APPX Font Scale
1		25%
2		33%
3		50%
4		66%
5		75%
6		80%
7		85%
8		90%

Absolute Font Size <FONT SIZE=n>	Heading Font Size	APPX Font Scale
9		95%
10		100%
11		105%
12		110%
13		115%
14		120%
15		125%
16	H6	130%
17	H5	140%
18	H4	150%
19	H3	175%
20	H2	200%
21	H1	300%
22		400%
23		500%
24		600%
25		700%
26		800%
27		900%
28		1000%

Font Color

font color=#nnnnnn where #nnnnnn is a RGB hex value.

font color=name is not supported.

The following table is a quick reference of the 16 basic colors. A more complete list of standard colors can be found at the W3 Schools web site.

Color	RGB Specification
aqua	#00FFFF
black	#000000
blue	#0000FF
fuchsia	#FF00FF
gray	#808080

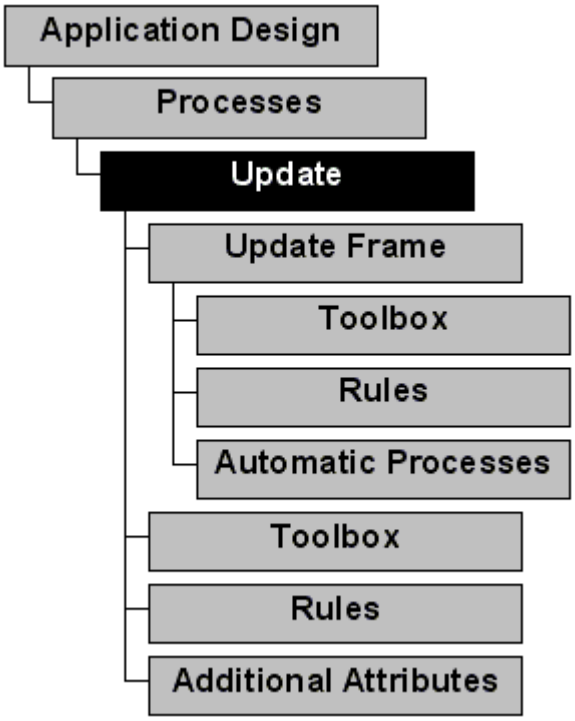
Color	RGB Specification
green	#008000
lime	#00FF00
maroon	#800000
navy	#000080
olive	#808000
purple	#800080
red	#FF0000
silver	#C0C0C0
teal	#008080
white	#FFFFFF
yellow	#FFFF00

CHAPTER 3-8

Update Processes

Introduction to Update Processes

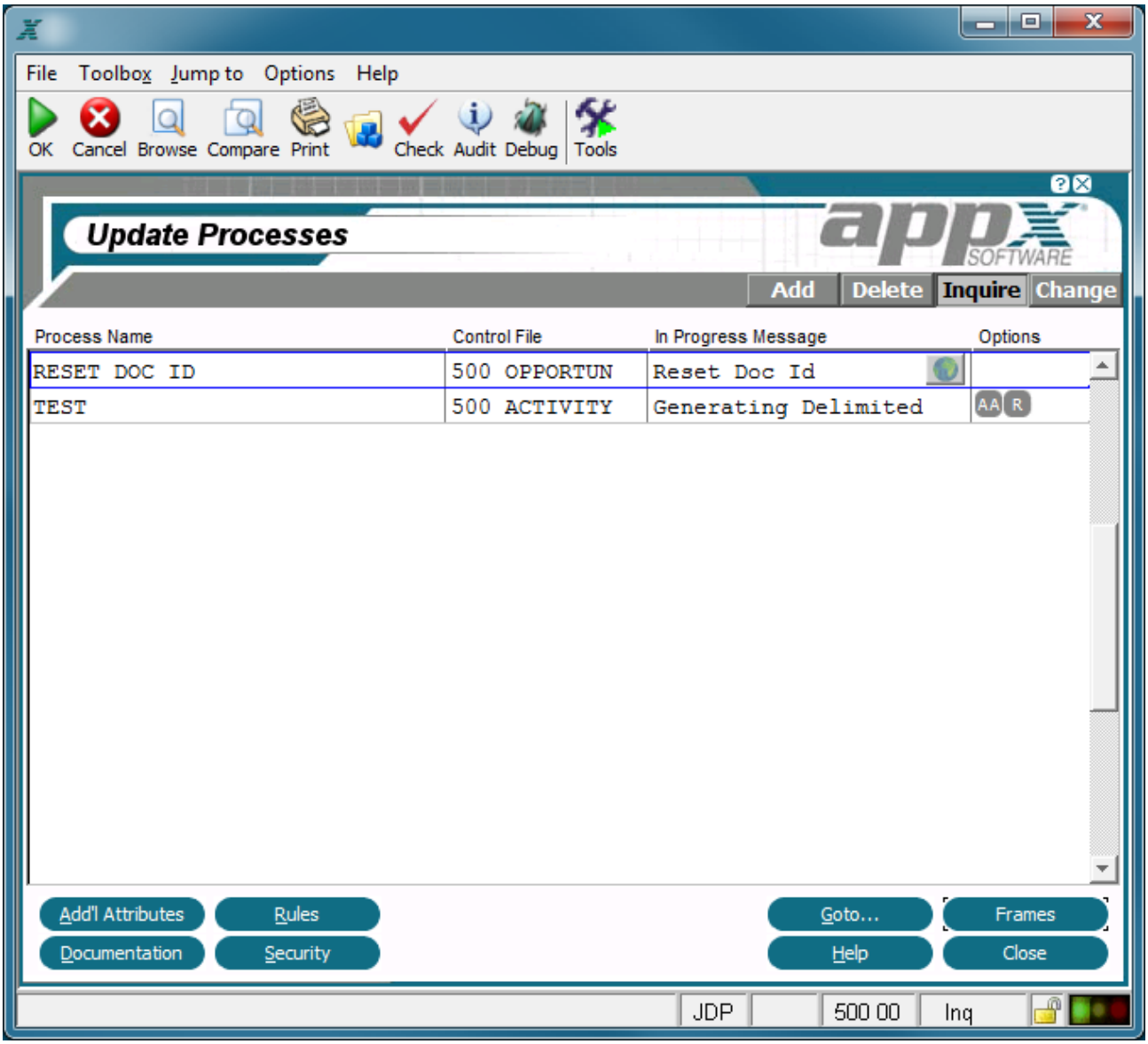
Update processes modify a database by adding, deleting, or changing information in one or more files.



Update Process Definition

Update Process Specifications

Update process specifications establish the general attributes of an update process, including log file and PCF specifications. The Update Processes screen is shown below.



Update Processes Screen

The Update Processes screen contains the following fields.

Process Name identifies a specific process and must be unique within type and application.

App/PCF Name identifies a file by application ID and file name that is to be automatically managed by APPX during the execution of this process. APPX automatically reads the process control file (PCF) during update process execution. However, ILF code must be used to write, rewrite, or delete records.

The **In Progress Message** field may contain up to 60 alphanumeric characters and provides text for the message that displays on the screen while the job process executes in the foreground.

Opts are indicators that are present whenever documentation (T), rules (R) or additional attributes (AA) have been defined for this process.

The Update Processes screen contains the following options as described in the corresponding sections:

Additional Attributes

Rules

Documentation

Security

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Frames - Will take you to the next level of the Update specification.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Update Process Toolbox Option

The toolbox overlay appears on the screen when you invoke the Toolbox option from the Update process screen. The overlay contains a number of features such as Documentation Management and Security Management that will assist you with designing and invoking an update process. The options listed in the Toolbox overlay are described briefly below. See *Process Definition* for a more detailed explanation of the options listed on the Toolbox overlay.

Documentation Option

When you select the Documentation option from the Toolbox overlay, you will first see the Documentation overlay which allows you to select between user or technical documentation. Once you have entered your documentation, you are returned to the Update Processes screen.

Security Option

The Security option allows you to identify the APPX security code to which a user must have rights in order to run the update process. The security code must be four numeric characters. If blank, there are no restrictions.

Database Management Option

The Database Management option allows you to add new files or maintain existing ones without leaving update process design.

Process Management Option

The Process Management option allows you to add other types of processes or maintain existing ones without leaving process design for update processes.

Design Transfer Option

The Design Transfer option allows you to copy the attributes from a process that you have already designed and apply it to a new process.

Cross Reference Option

The Cross Reference option enables you to determine the location and frequency of a selected domain, file, field, application ID, process or ILF statement within a specific database.

Reference Browser Option

The Reference Browser option runs a modified version of 'Cross Reference - All' and produces a list of design components utilized by the currently selected update process. The results can be displayed interactively where links allow you to see the context of the references, edit the referenced component and drill down to the child process. This option can be used to identify, and optionally edit, the file level event points utilized by this update process.

Syntax Check Option

This feature allows you to create the Executable Module for the current update process without actually running it. If the Executable Module for the update process is valid this option is ignored when invoked. Note that this option (Option 97), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

View Audit Info Option

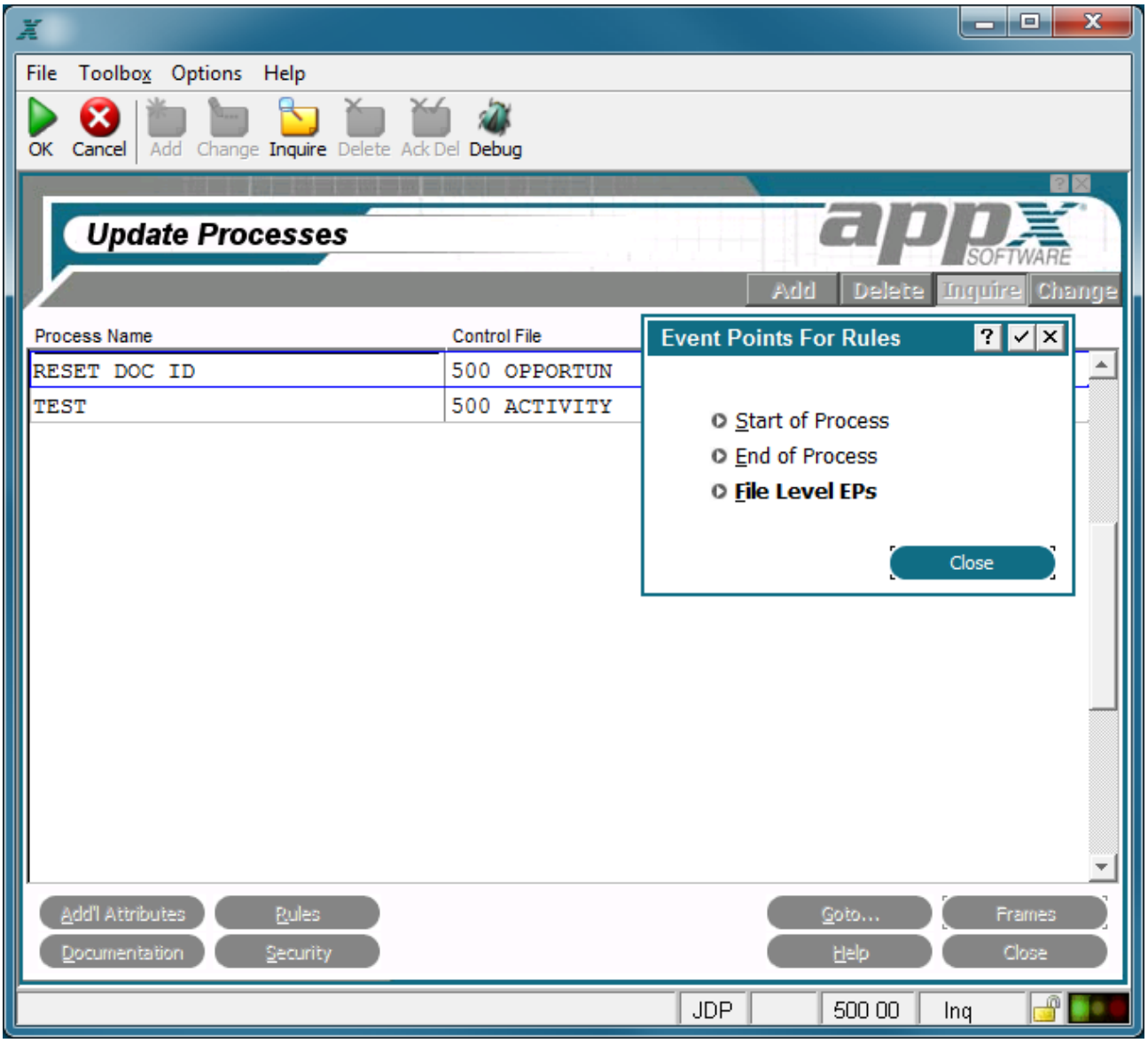
This feature allows you to see who created the currently selected update process and who changed it most recently. It also gives the date of creation and the date it was last changed. Note that this option (Option 98), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

Invoke a Process Option

This feature is available to facilitate testing. It allows you to invoke any process; the currently selected update process using the Test Database defined in system administration is the default. Note that this option (Option 99), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

Update Process Rules Option

Selecting the Rules option accesses the update process Event Points For Rules overlay which allows you to select from a variety of options that access the ILF Editor for APPX event points. The update Event Points overlay is shown below.



Update Event Points Overlay

The update Event Points overlay contains the following options:

Start of Process

Start of Process, which is common to all types of processes, accesses the ILF editor for the *Start of Process* event point. Upon completion, you are returned to the process Event Points overlay.

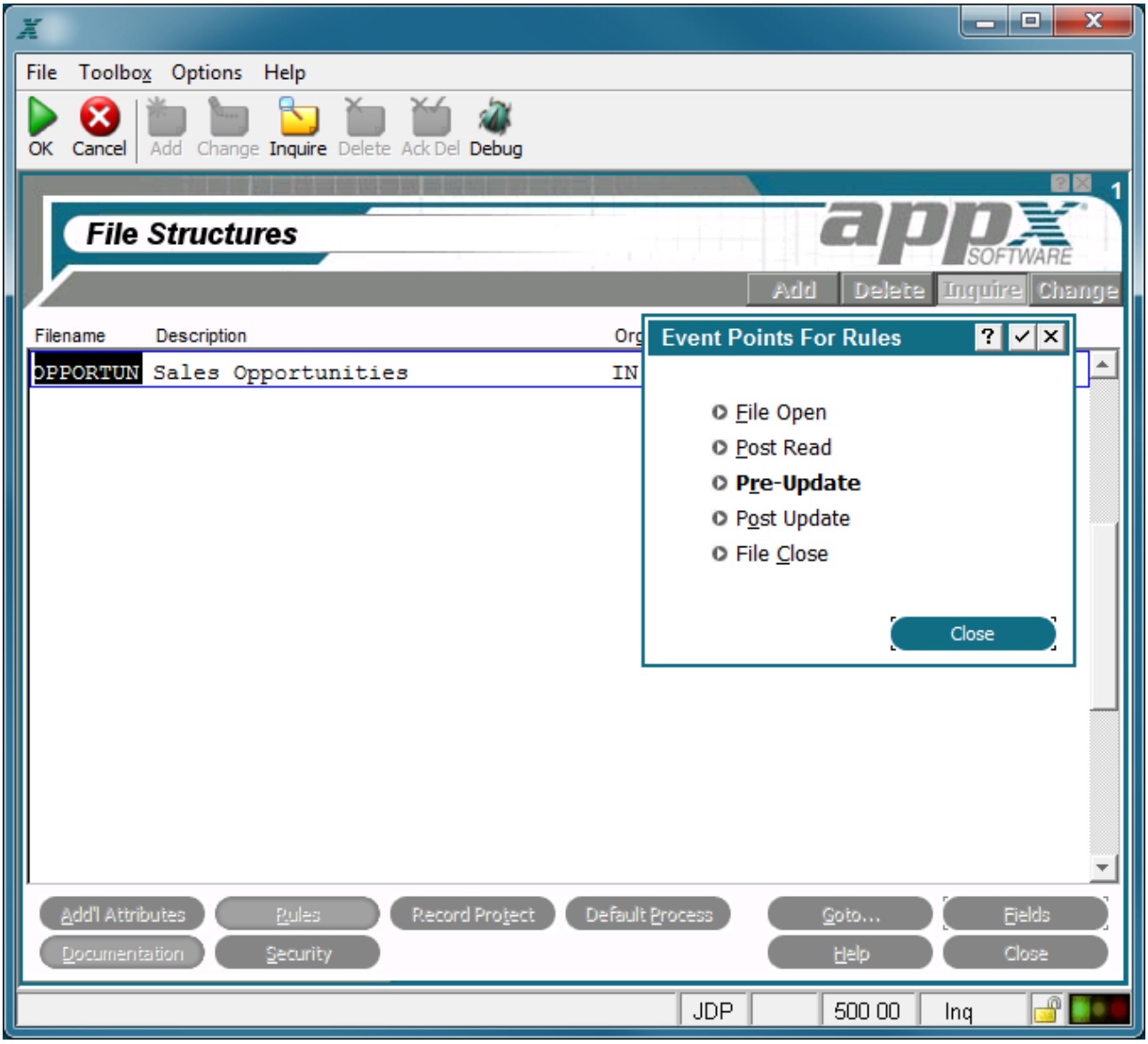
End of Process

End of Process, which is common to all types of processes,accesses the ILF editor for the *End of Process* event point. Upon completion, you are returned to the process Event Points overlay.

PCF Level EPs

PCF Level EPs provides access to the File Level Event Points for the PCF file. This overlay is shown below. These Event Points are not directly associated with the process but with the PCF file. See the *Rules Option* section of *Files and Fields* for more information on using PCF Level Event Points.

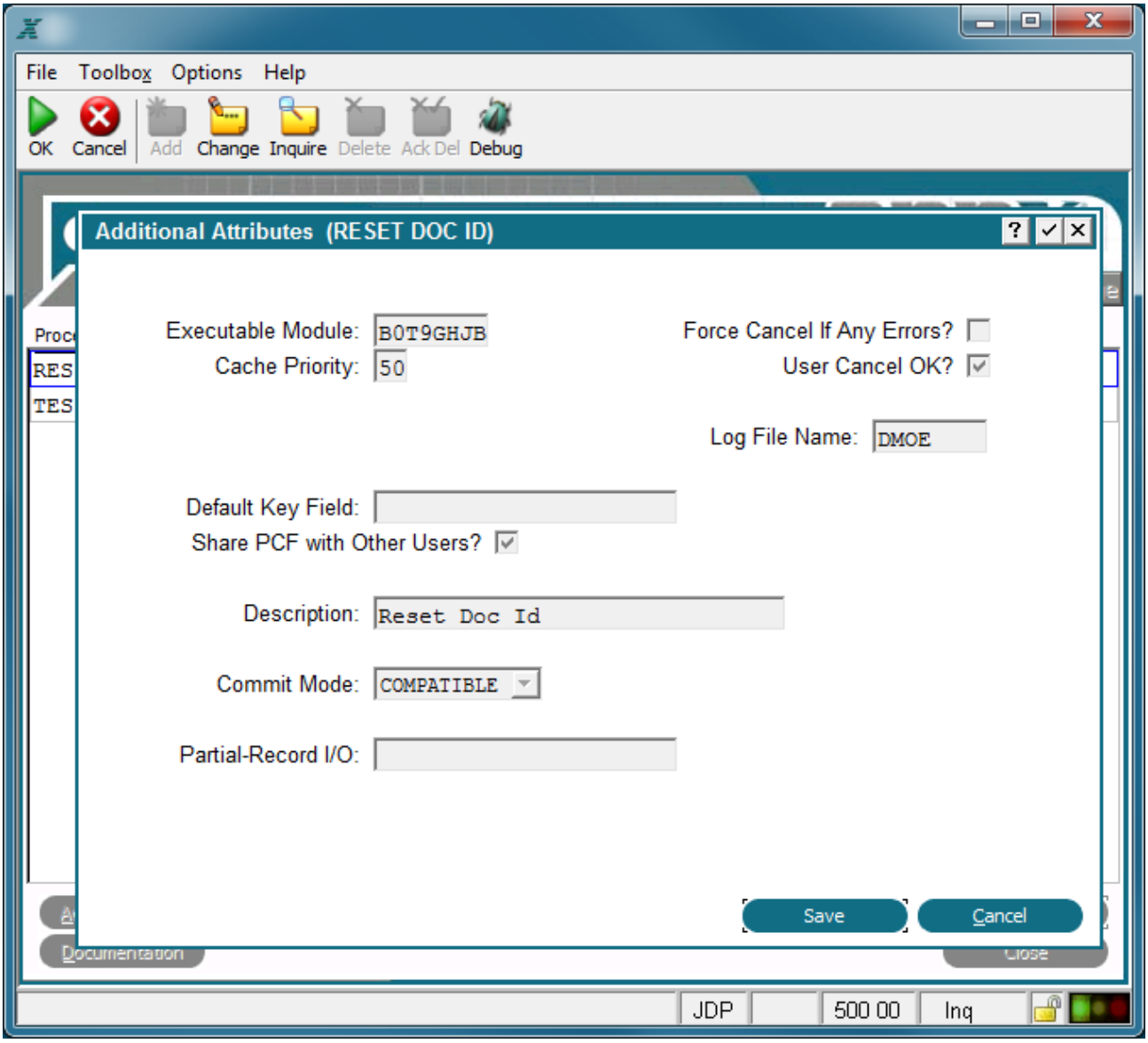
Refer to Using Event Points for more information.



Event Points for Rules Overlay

Update Process Additional Attributes Option

The Additional Attributes option accesses the Update Process Additional Attributes overlay, shown below, from which you can alter the standard EM attributes.



Update Processes Additional Attributes Overlay

The update Additional Attributes overlay contains the following fields:

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected update process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name.

Force Cancel if Any Errors? Controls whether or not the user is forced to cancel the process if any errors are written to the log file. If 'yes' ☑, the user is forced to cancel after the subprocess family completes.

Cache Priority establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is *50.* This field is common to the Additional Attributes overlay for all types of processes. See *Process Definitio*n, for more information.

User Cancel OK? contains either a 'yes' ☑ or 'no' ☐ and determines whether or not a user can select the

Log File Name establishes the name of the file that is used to store the list of error and warning messages generated during the execution of the update process family. If necessary to guarantee uniqueness, APPX may append one or more characters to the value entered here, or replace one or more of the ending characters. This field may contain up to eight alphanumeric characters. If two or more update processes *in the same subprocess family* are defined with identical *Log File Name* values, the processes share a common log file. They print as a single log, with continuous page numbers. If this specification is blank, APPX uses the last *Log File Name* that is active within the subprocess family. Refer to *Overview of Appx Processes* for a definition of a subprocess family.

Default Key Field designates the specific keypath to the PCF that is used in executing the defined update process. If you did not link this update process to a query process, the key determines the order the records process in. A default keypath that is defined for the invocation of a child process, if any, overrides this specification.

Share PCF With Other Users? contains either 'yes' ☑ or 'no' ☐ and determines whether or not other users can *update* the file concurrently. The default is 'yes'.

Description is incorporated in the message that displays on the screen when the currently selected update process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank. See *Process Definitio*n, for more information.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT*. APPX will commit each modification as it is made.
***This value will be implemented in a future release.**

PCF CYCLE. APPX will commit modifications as each PCF record is processed.

END. APPX will only commit modifications at the end of the process family.

MANUAL. APPX will not automatically commit changes. You must use the COMMIT statement to do so.

Partial-Record I/O is used to specify a field from the PCF file so that instead of operating on the entire PCF record, APPX operates on the designated field only. If the field is a group header, then I/O will be performed on all members of the group. Utilizing partial-record I/O can greatly improve performance when the PCF is a table in an RDBMS. This is especially true when the table contains many columns, but relatively few are being utilized by the process. The scan option is available for field selection.

Update Frame Specifications

Frame specifications define attributes and statements unique to frames that manipulate fields from each record in a PCF, or perform start- or end-of-range processing. The update Frames overlay displays when you select Enter. The update Frames overlay contains the following fields.

Frame Class defines the type of frame with which you are working. Valid options are **Range-Start** frames print immediately before the first record for which the value in a specific sort field (the range field) changes. **Record** frames manipulate information read from the process control file. **Range-End** frames execute immediately after the last record in a series of records that have the same value in a specific sort field (the range field).

Seq No displays a sequence number that is defaulted by APPX and used to identify the frame. The default sequence number can be overridden, but must be unique within each frame class for the process. Sequence numbers determine the order of the frames in the process structure. The first frame that is defined in add mode is assigned sequence number *100*, and additional frames are assigned a number equal to the highest existing sequence number, plus *100*.

Descriptive identifies this record frame. The field is for documentation purposes only.

Opts are indicators that are present whenever documentation (T), rules (R), or automatic processes (AP) have been defined for this frame.

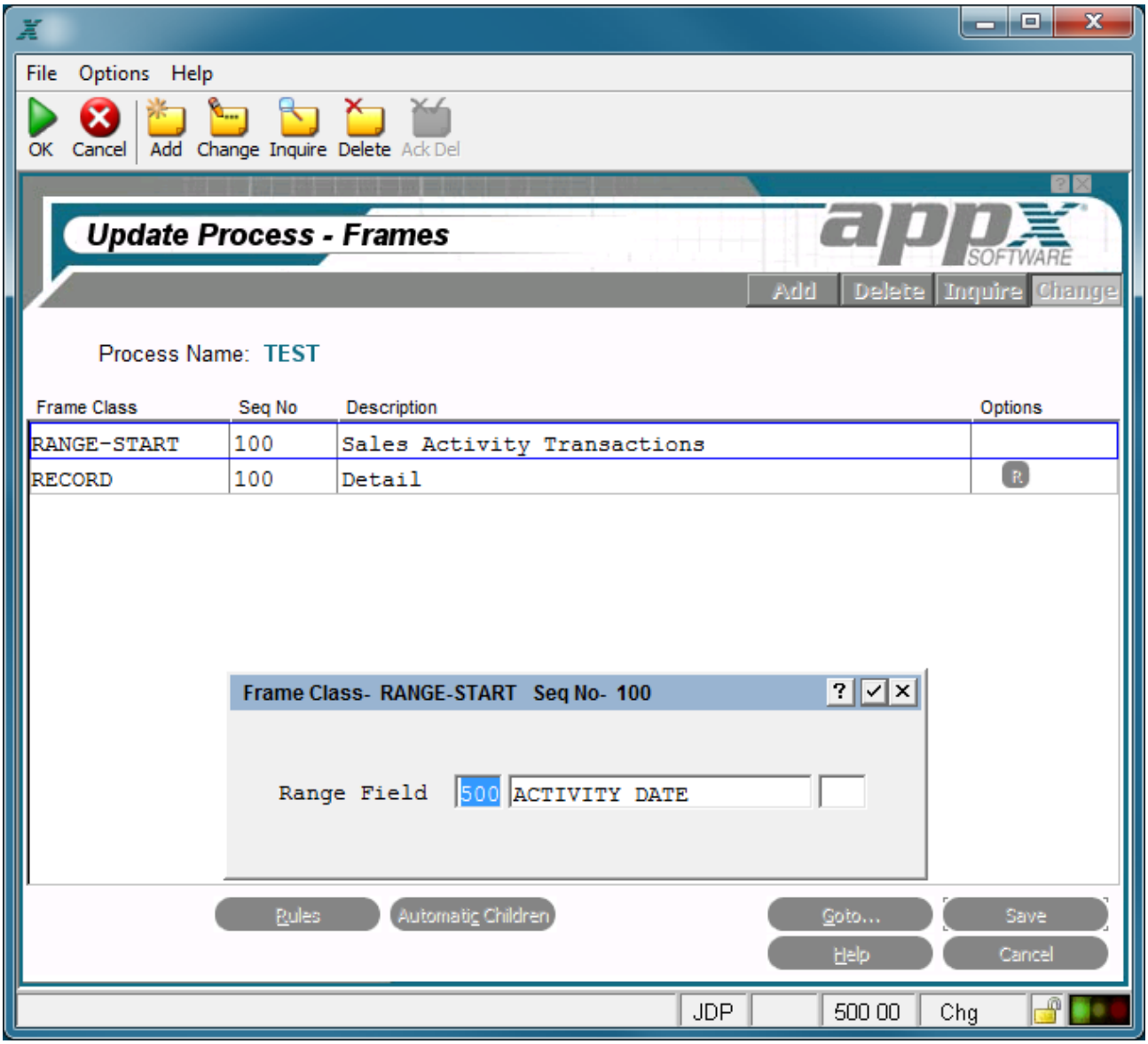
The update Frames overlay contains the following options as described in the corresponding sections:

Toolbox

Rules

Automatic Processes

If Frame Class is Range-Start or -End, the screen below appears when you select Enter.



Update Range-Start and -End Frame Class Overlay

The update *Range-Start* and *-End* Frame Class overlay contains the following field.

Range Field designates the application ID and field name of an APPX field in a query process that is used by this update process. The Start of Range and End of Range frames execute based on a change in the value of this field.This overlay contains three fields: one to identify the application ID, one to identify the field name, and one to identify the Seq No.

Update Frame Toolbox Option

The toolbox overlay appears on the screen when you invoke the Toolbox option from the update Frames overlay. This toolbox overlay contains a number of features such as Documentation Management and Security Management that will assist you with designing and invoking an update process. The options listed in the Toolbox overlay are described briefly below. See *Process Definition* for a more detailed explanation of the options listed on the Toolbox overlay.

Database Management Option

The Database Management option allows you to add new files or maintain existing ones without leaving update process design.

Process Management Option

The Process Management option allows you to add other types of processes or maintain existing ones without leaving update process design.

Design Transfer Option

The Design Transfer option allows you to copy the attributes from a process that you have already designed and apply it to a new process.

Syntax Check Option

This feature allows you to create the Executable Module for the current update process without actually running it. If the Executable Module for the update process is valid this option is ignored when invoked. Note that this option (Option 97), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

View Audit Info Option

This feature allows you to see who created the currently selected update process and who changed it most recently. It also gives the date of creation and the date it was last changed. Note that this option (Option 98), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

Invoke a Process Option

This feature is available to facilitate testing. It allows you to invoke any process; the currently selected update process using the Test Database defined in system administration is the default. Note that this option (Option 99), like any option with a value of 90 or greater, is available for use from any screen in Application Design without having to go to the Toolbox.

Update Frame Rules Option

Selecting the Rules option accesses the update process frame Event Points For Rules overlay which allows you to select from a variety of options that access the ILF Editor for APPX event points. If statements were defined in the event point, the text on the overlay is highlighted. Upon completion, you are returned to the update Event Points For Rules overlay, which contains the following options:

Start of Process

Start of Process accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the process Event Points overlay.

Start of Frame

Start of Frame accesses the ILF editor for the Start of Frame event point. Upon completion, you are returned to the process Event Points overlay.

End of Process

End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the process Event Points overlay.

PCF Level EPs

PCF Level EPs provides access to the File Level Event Points for the PCF file. This overlay is shown previously. These Event Points are not directly associated with the process but with the PCF file. See the *Rules Option* section of *Files and Fields* for more information on using PCF Level Event Points.

Refer to Using Event Points for more information.

Update Frame Automatic Processes Option

The Automatic Processesoption accesses the Automatic Child Processes specification screen, which allows you to attach a specific process to the update process currently selected so that it invokes automatically when the update process is invoked. See Automatic and Optional Children for more information.

CHAPTER 3-9

Query Processes

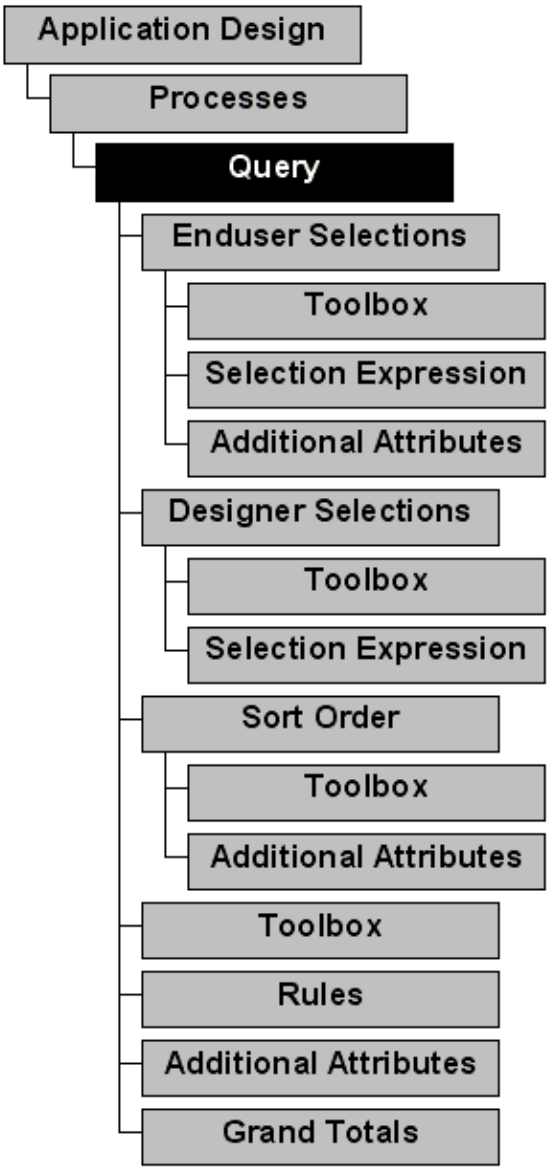
Introduction to Query Processes

Query processes:

Determine the records that are available to a subsequent input, update, or output process.

Establish the order selected records are retrieved in for display or processing.

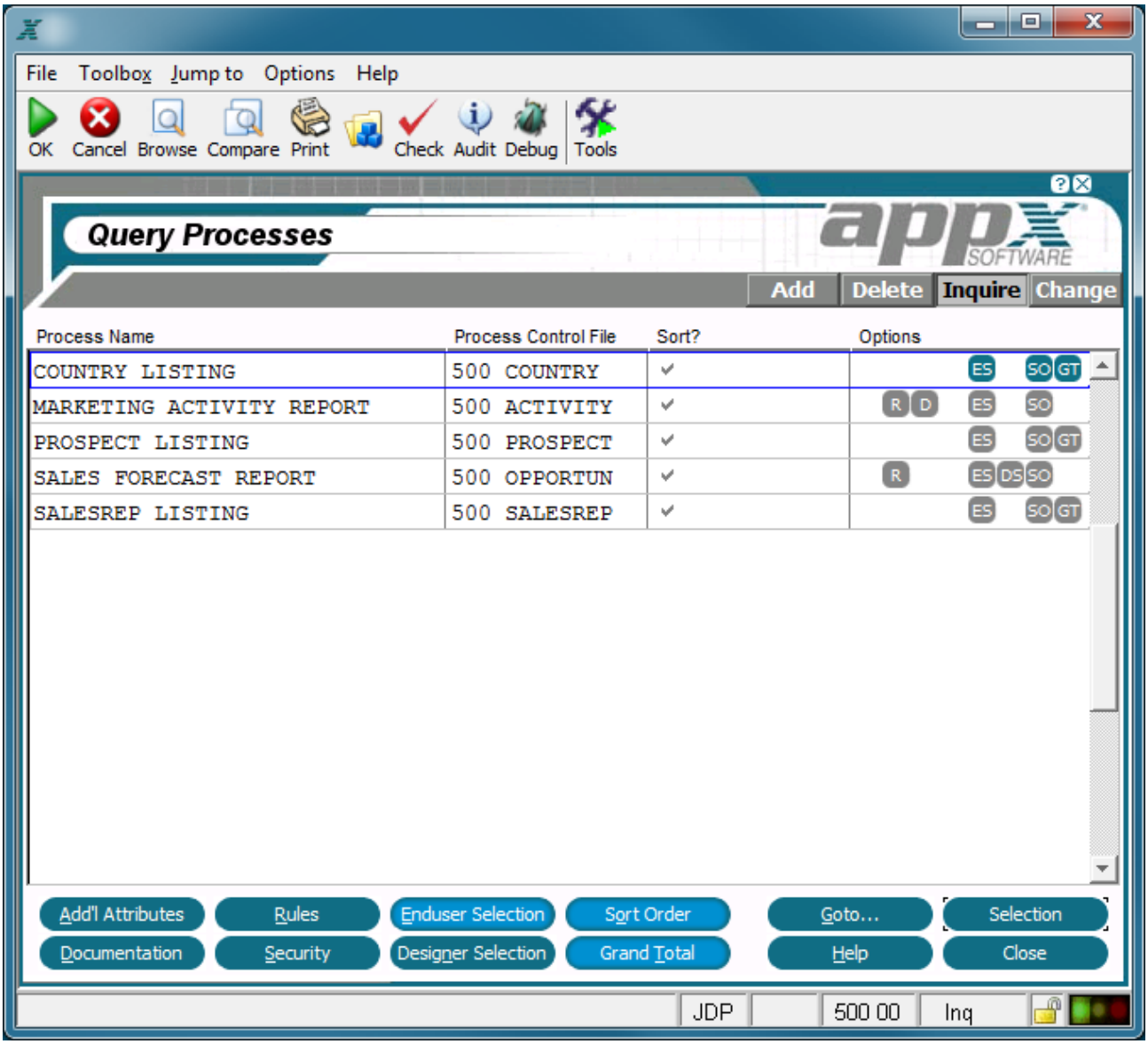
Query processes have special rules with respect to "inheritance" of work fields and temporary work files among APPX processes. See *"Interprocess Communications"* for more information on inheritance). Please see the description under "PROCESS CODE", in (*Predefined Fields and Processes)* for a more detailed explanation of the special inheritance rules with respect to Query processing.



Query Process Definition

Query Process Specifications

Query process specifications establish the general attributes of a query process, including a process control file (PCF), and operational parameters.



Query Processes Screen

The Query Processes screen, shown above, contains the following fields:

Process Name identifies a specific process and consists of 30 uppercase alphanumeric characters that must be unique within type and application.

Process Control File identifies a file by application ID and file name that is to be automatically managed by APPX during the execution of this process. APPX automatically reads the process control file (PCF) during query process execution.

Sort? allows you to explicitly specify whether or not the sort order is displayed to the user. The default is 'yes' ☑.

Options are indicators that are present whenever documentation (T), rules (R), enduser selections (ES), designer selections (DS), sort order (SO), or grand totals (GT) have been defined for this process.

The following options as described in the corresponding sections are available from the Query Processes screen:

Additional Attributes

Rules

Enduser Selections

Sort Order

Documentation

Security

Designer Selections

Grand Totals

Selection - Select the current Process.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu

Jump to - Same as the Process Jump to Pulldown Menu

Query Process Rules Option

Selecting the Rules option accesses the query process frame Event Points For Rules overlay which allows you to select from a variety of options that access the ILF Editor for APPX event points. If statements were defined in the event point, the text on the overlay is highlighted. Upon completion, you are returned to the query Event Points For Rules overlay. The query Event Points overlay contains the following options:

Start of Process (Query Setup)

Start of Process (query setup) accesses the ILF editor for the Start of Process event point. Statements in this event point execute during query setup. Upon completion, you are returned to the query Event Points overlay.

End of Process (Query Setup)

End of Process (query setup) accesses the ILF editor for the End of Process event point. Statements in this event point execute during query setup. Upon completion, you are returned to the process Event Points overlay.

Start of Query Execution

Start of Query Execution accesses the ILF editor for the Start of Query Execution event point. Statements in this event point execute just before the query starts. Upon completion, you are returned to the query Event Points overlay.

Establish PCF Range

This event point provides explicit control for the designer to establish the range (or ranges) of records from the PCF file which are read by the query. This can significantly increase query performance by utilizing available key fields.

Establish PCF Range

This option can be coded by the designer. Otherwise, it will be generated at runtime based on any Record Selection Beg At and End At questions. To explicitly limit customer records to those for a given state, code in the Establish PCF Range event point would consist of a simple BEG AT/END AT loop. These loops can be repeated multiple times to establish multiple ranges for the query to process.

Pre-User Selection

Pre-User Selection accesses the ILF editor for the Pre- User Selection event point. Upon completion, you are returned to the query Event Points overlay.

Post User Selection

Post User Selection accesses the ILF editor for the Post User Selection event point. Upon completion, you are returned to the query Event Points overlay.

End of Query Execution

End of Query Execution accesses the ILF editor for the End of Query Execution event point. Statements in this event point execute when the query is finished. Upon completion, you are returned to the query Event Points overlay.

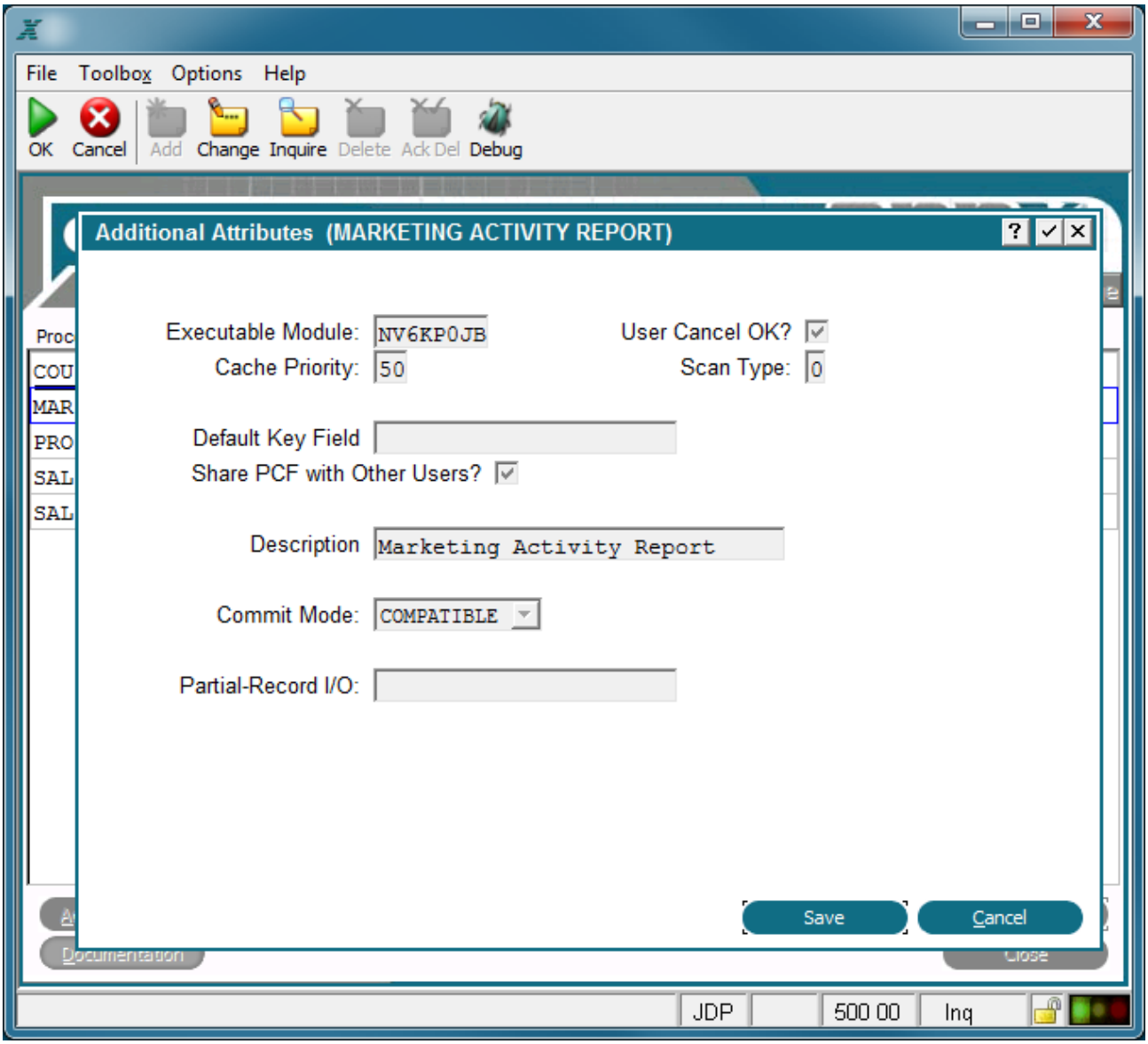
PCF Level EPs

PCF Level EPs provides access to the File Level Event Points for the PCF file. This overlay is shown below. These Event Points are not directly associated with the process but with the PCF file. See the *Rules Option* section of *Files and Fields* for more information on using PCF Level Event Points.

Event Points For Rules Overlay

Query Process Additional Attributes Option

Additional Attributes accesses the query process Additional Attributes overlay from which you can alter the standard EM attributes.



Query Process Additional Attributes Overlay

The query Additional Attributes overlay shown above contains the following fields:

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected query process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name. This field is common to the Additional Attributes overlay for all types of processes.

User Cancel OK? contains either 'yes' ☑ or 'no' ☐ and determines whether or not a user can select the cancel option key to stop the execution of this process. The default is 'yes'. You can conditionally control the user's ability to select the cancel option with statements and the predefined field CANCEL OK. This field is common to the Additional Attributes overlay for all types of processes.

Cache Priority establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is *1*. This field is common to the Additional Attributes overlay for all types of processes.

Scan Type governs whether or not the application user is permitted to scan and further constrain the individual records in the query?s generated pointer file.The *Scan Type* options are***0*** *Do Not Scan* which prohibits the user from scanning and individually constraining records and ***1*** *Scan* which permits the user to scan and constrain records. The default is ***0*** *Do Not Scan*.

Default Key Field designates the specific keypath that is initially presented to a user invoking this process. If blank, the primary key is used. This specification is overridden by the default keypath that is defined for the child process invocation of the process.

Share PCF with Other Users? indicates whether the designated PCF file is available to other users while this process is executing.

Description is incorporated in the message that displays on the screen when the query process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank. The Additional Attributes overlay for all types of processes contain this field.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT*. APPX will commit each modification as it is made.
***This value will be implemented in a future release.**

PCF CYCLE. APPX will commit modifications as each PCF record is processed.

END. APPX will only commit modifications at the end of the process family.

MANUAL. APPX will not automatically commit changes. You must use the COMMIT statement to do so.

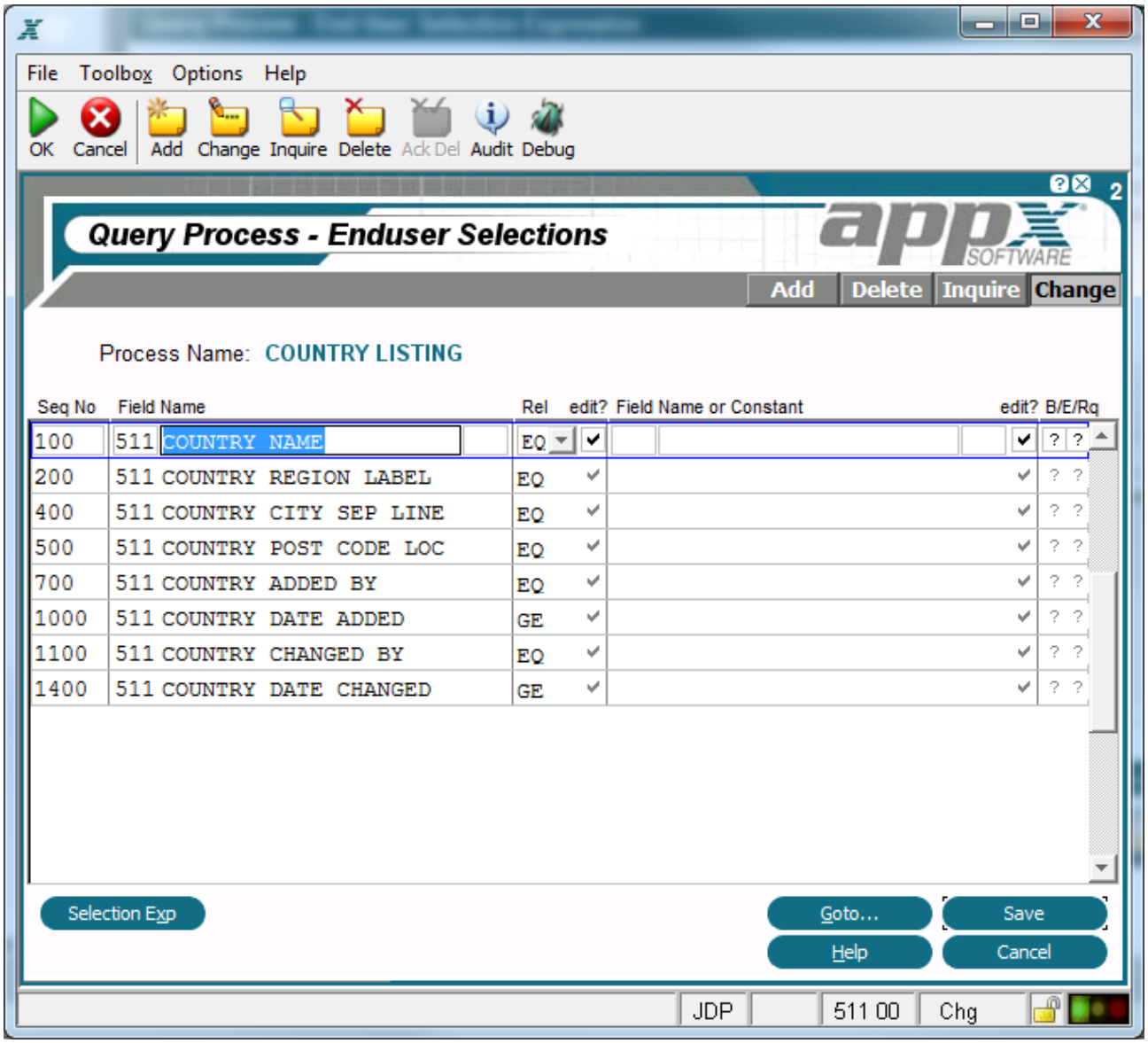
Partial-Record I/O is used to specify a field from the PCF file so that instead of operating on the entire PCF record, APPX operates on the designated field only. If the field is a group header, then I/O will be performed on all members of the group. Utilizing partial-record I/O can greatly improve performance when the PCF is a table in an RDBMS. This is especially true when the table contains many columns, but relatively few are being utilized by the process. The scan option is available for field selection.

See the Establish PCF Range section in Using Event Points for a discussion about the use of *Beg At/End At statement*s to further constrain records in a query process.

Enduser Selections Option

The Enduser Selections option allows quick access to interactive record selections. These are the selections that the operator sees at runtime. *Enduser Selections* specifications define data relationships that you can use to constrain the information that is available to a process. For example, you might define an output function to list information about domestic customers. A related query selects only those records with a domestic value in the country field. If an application user is permitted to see the record selection criteria, the frame is considered *interactive*, which qualifies it as an *Enduser Selection*. This does not imply that the user can modify the criteria. You can establish both *editable* and *non-editable* Enduser selection criteria.

The Enduser Selections overlay, shown below, displays when you select the Enduser Selections option from the Query Processes screen.



Enduser Selections Overlay

The Enduser Selections overlay contains the following fields:

Seq No displays a sequence number that is defaulted by APPX and used to reference the constraint in an *Enduser Selections Expression.* The sequence number controls the order that constraints display to a user. Unless an *Enduser Selections Expression* is entered on the Enduser Selections Expression specification overlay, all constraints are ANDed.

Left' App/Field Name/Occ identifies a field and optional occurrence that is to be compared with another field or constant. During query setup, these fields appear on the left-hand side of the screen.

Relation defines a relationship between the *App/Field Name/Occ* entered previously and the *App/Field Name or Constant/Occ* entered below. This field may contain up to two alphanumeric characters. The *Relation* options are:

EQ (equal to)

NE (not equal to)

GT (greater than)

LT (less than)

GE (greater than or equal to)

LE (less than or equal to)

IN(includes)

Right' App/Field Name or Constant/Occ indicates the field or constant that serves as the object of the relation. For field entries other than from the PCF, the field must be explicitly made available with statements. The designer can also specify a NULL constant by entering " " (that's double-quote, space, double-quote) for alpha, numeric, date, and (effective with APPX 4.1.a) token fields.

AA is an indicator that is present when additional attributes have been defined for these enduser selections.

Rq To help prevent users from accidentally running large reports, you can now designate certain End User Selections as 'Required' on a Query.

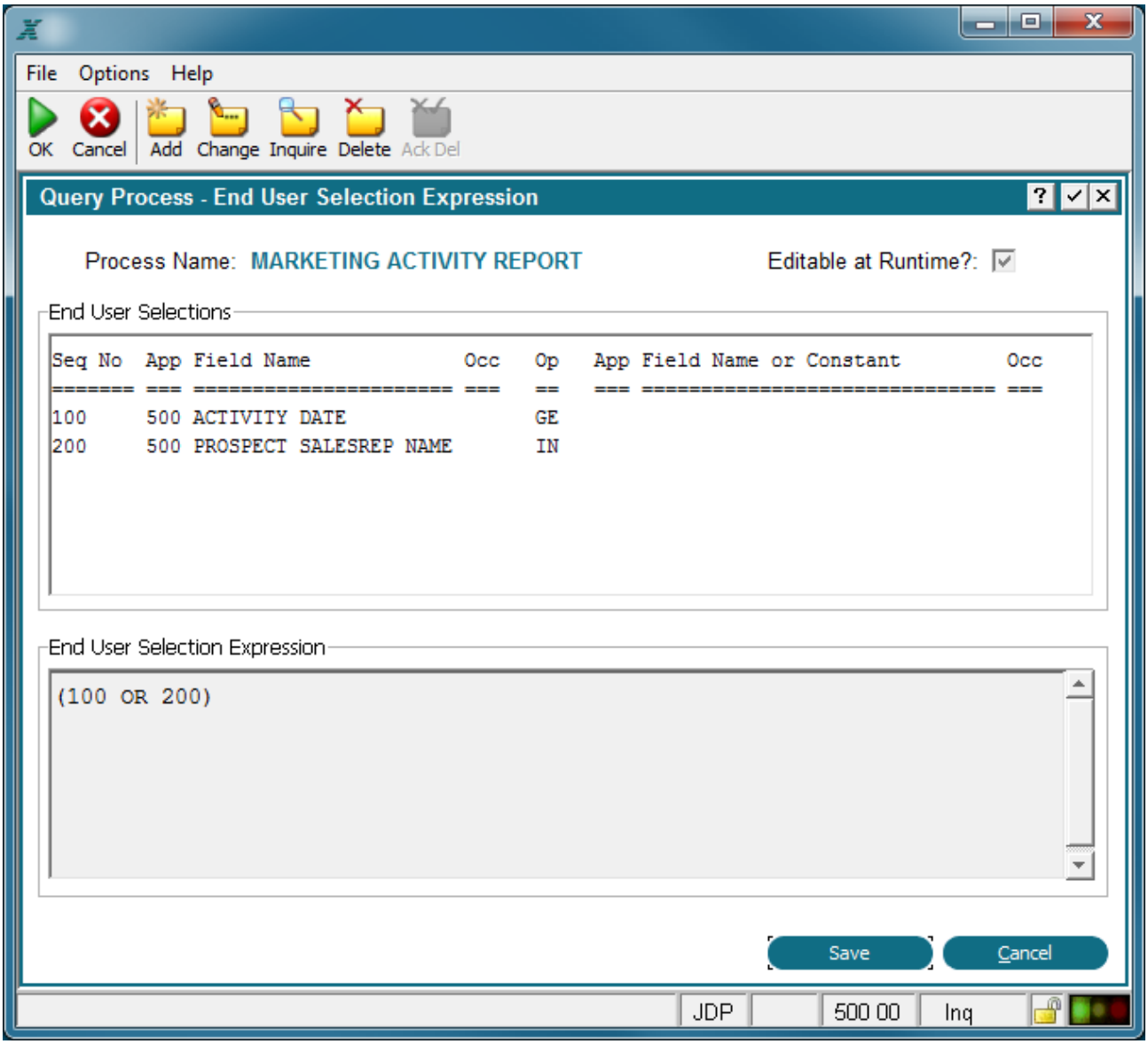
On the 'End User Selections' screen, to the right of the 'Beg At/End At' flags is a 'Rq' check box. If you want to ensure the user enters some criteria on this field, check this box. At runtime, if the user leaves the field blank, they will receive a 'Blank Not Allowed' error.

Other options are available on the Enduser Selections overlay and are described in the following sections:

Selection Exp

Enduser Selections Expression Option

The enduser selections expression option accesses the Enduser Selections Expression overlay, shown below. Enduser Selections Expression specifications establish complex logical relationships between record selection criteria by using ANDs, ORs, and parentheses. You define separate selections expressions for Enduser and Designer record selections. APPX ANDs these two selections expressions.



Enduser Selections Expression Overlay

The Enduser Selections Expression overlay contains two fields.

Enduser Selections Expression defines a logical expression that joins record selection constraints established in the Enduser Selections overlay. Constraints are identified by their sequence number.They can then be combined with other constraints by using ANDs, ORs, and parentheses. Valid entries in a selections expression are ***any sequence number*** that a constraint is defined for, AND, OR, and ( ).

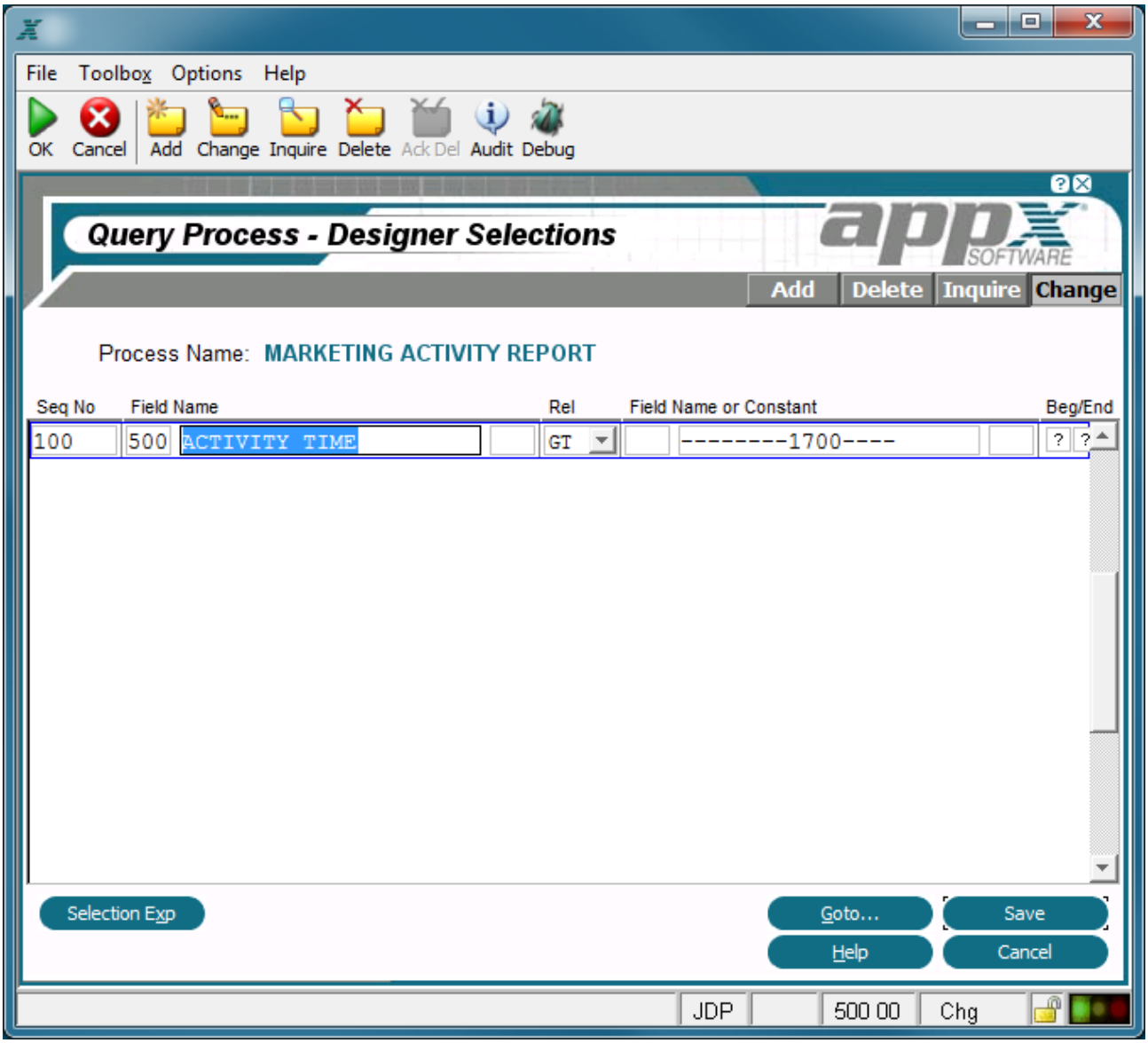
If *Enduser Selections Expression* is blank, all record selection constraints are ANDed. If either the *Relation* or the *App/Field Name or Constant/Occ* selections specification is blank, the relation is ignored (considered to be true). Any selections specification that is not explicitly referenced by a sequence number in a selections expression must be true for the selections expression to be true. A selections expression using all of the various *Selections Expression* entries might look something like the following:

((200 OR 300) AND 1000) OR (400 - 700)

Editable at Runtime? indicates whether or not a user can change the selections expression during query setup. The default is 'yes' ☑ but can be toggled to 'no' ☐ by clicking the checkbox.

Designer Selections Option

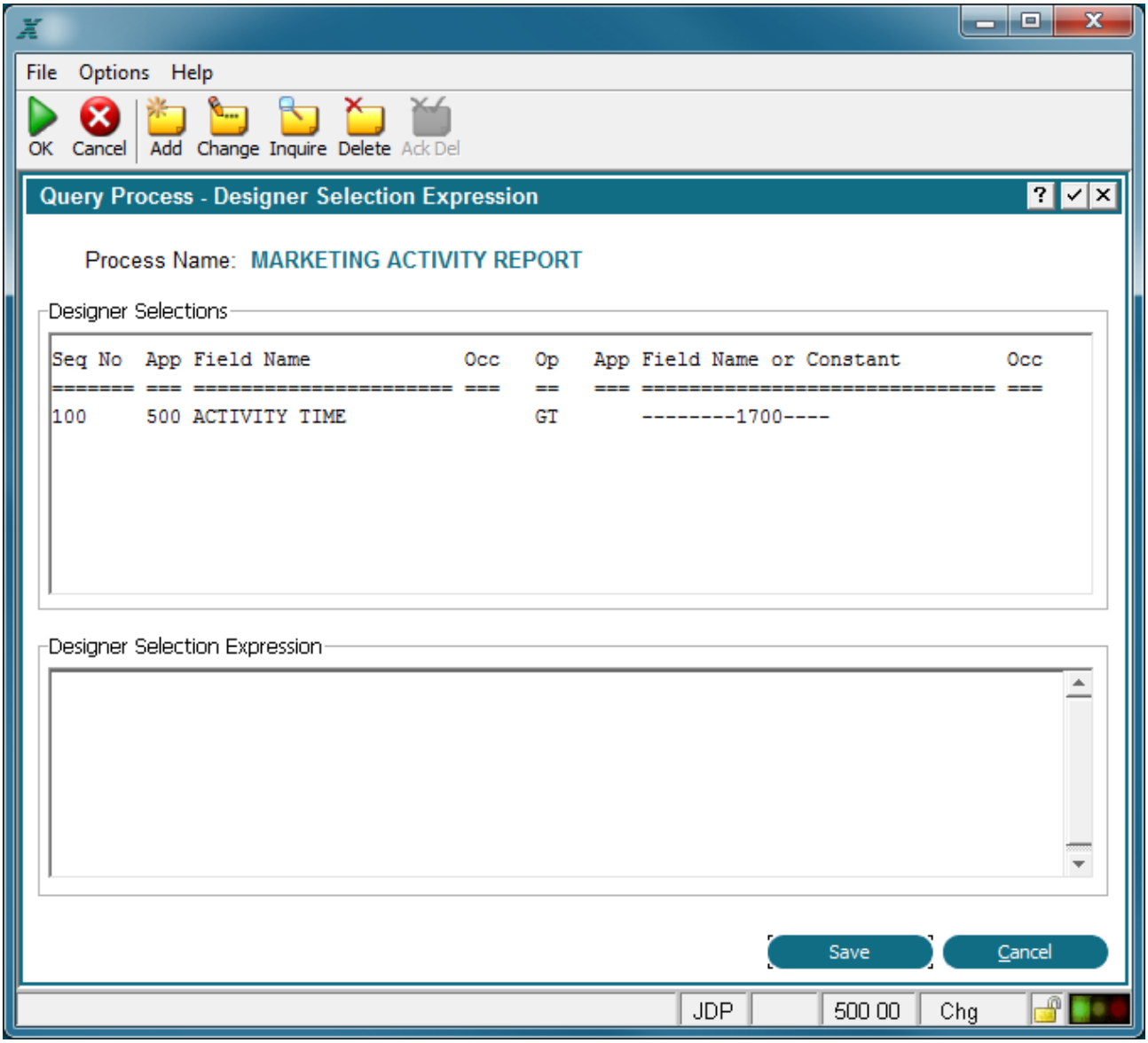
The Designer Selections option allows you to access non-interactive record selections. These function in exactly the same way as enduser selections, except that the operator never sees the runtime screens and, hence, cannot modify the operators. The Designer Selections overlay is shown below:



Designer Selections Overlay

Designer Selections Expression Option

The Designer Selections Expression option accesses the Designer Selections Expression overlay, shown below. Designer Selections Expression specifications allow you to access non-interactive record selections. These function in exactly the same way as enduser selections, except that the operator never sees the runtime screens and, hence, cannot modify the operators.



Designer Selections Expression Overlay

The Designer Selections Expression overlay contains the following field.

Designer Selections Expression defines a logical expression that joins record selection constraints established in the Designer Selections overlay. Constraints are identified by their sequence number.They can then be combined with other constraints by using ANDs, ORs, and parentheses. Valid entries in a selections expression are ***any sequence number*** that a constraint is defined for, AND, OR, and ( ).

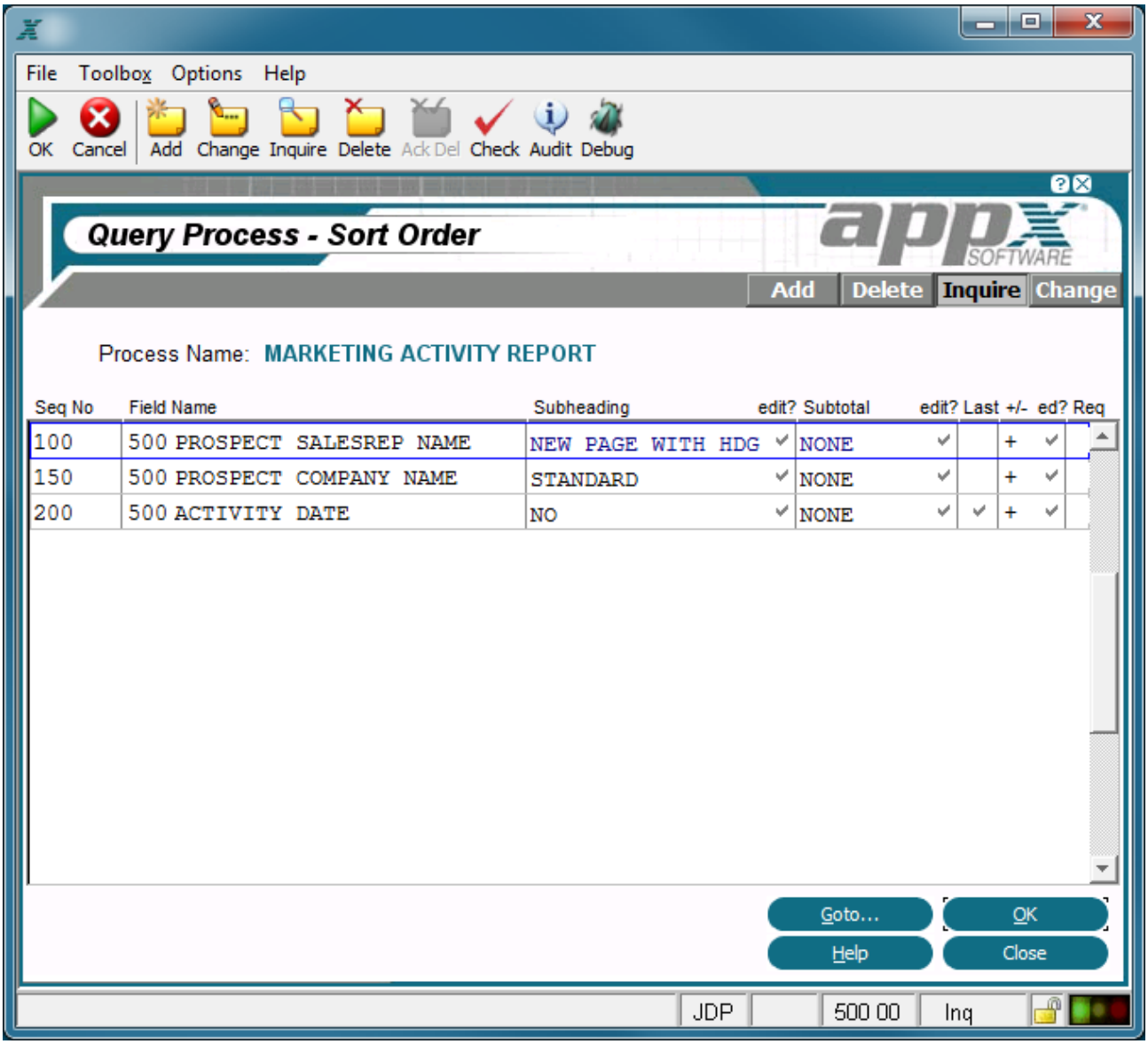
If Designer Selections Expression is blank, all record selection constraints are ANDed. If either the *Relation* or the *App/Field Name or Constant/Occ* selections specification is blank, the relation is ignored (considered to be true). Any selections specification that is not explicitly referenced by a sequence number in a selections expression must be true for the selections expression to be true. A selections expression using all of the various *Selections Expression* entries might look something like the following:

((200 OR 300) AND 1000) OR (400 - 700)

> Note that the Additional Attributes option does not appear on the *Designer Selections* overlay like it does on the *Enduser Selections* overlay because it is not necessary to include the field ***Editable at Runtime?*** since the user is not allowed to modify these fields.

Sort Order Option

The Sort Order option provides quick access to the query process Sort Order overlay, shown below. The Sort Order overlay also displays if you select Enter, and then End from the Query Processes screen. Sort order specifications determine the order in which records are presented. You can establish a virtually unlimited number of sort items, with a maximum of 255 active at any one time. Active sort items display first by sequence number order, in their order of precedence. Non-active sort items can be activated by a user during query setup. Sort fields that are identified on the Sort Order overlay are related to range fields in *Start of Range* and *End of Range* frames in output, inquiry, and update processes.



Query Processes Sort Order Overlay

The query Sort Order overlay contains the following fields.

Seq No defines the field's position within the sort order that is used to generate the report.

App/Field Name/Occ identifies a specific field on which to sort. This field must be maintained in the PCF or made available with statements.

Range-Start/Subheading allows you to choose whether or not to execute any *Range-Start* frames in a subsequent output or update process, for example, to print a subheading. The *Range-Start/Subheading* options are:

NO. Any *Range-Start* frame should be ignored.

STANDARD. A *Range-Start* frame will execute immediately after the previous *Record* or *Range-Start* frame.

NEW PAGE. The report will skip to a new page before printing this *Range-Start* frame.

NEW PAGE WITH MSG. The report will skip to a new page before printing this *Range-Start* frame, and will append a continuation message to it.

The default is *NO*.

Rng-End/SubTotal indicates whether or not to execute the *End of Range* frames, if any, for this sort field. The *Range-End/SubTotal* options are:

NO. Any *Range-End* frame should be ignored.

STANDARD. A *Range-End* frame will execute immediately after the previous *Record* or *Range-End* frame.

NEW PAGE. The report will skip to a new page before printing this *Range-End* frame.

The default is *NO*.

Lst Lvl? A 'yes' ☑ in this checkbox designates the last field in the sort order. This may not necessarily be the last field defined since not all fields may be included in the sort. The default is 'no' ☐.

Sort Order determines whether values are sorted in *ascending* (from lowest to highest value in the sort field), or *descending* (from highest to lowest value in the sort field) order. The default is + (ascending).

T and **AA** are indicators that are present whenever documentation (T) or additional attributes (AA) have been defined for this process.

The following two options are available on the query Sort Order overlay:

Additional Attributes Option

The Sort Order Additional Attributes overlay contains the following fields:

Sort on This Field Required? Select 'yes' ☑ or 'no' ☐ to control whether or not this field is required for sorting. The designer may force a user to sort on this field by selecting 'yes'. A user running the query may change the sort order, but a sort on this field is required. The default is 'no'

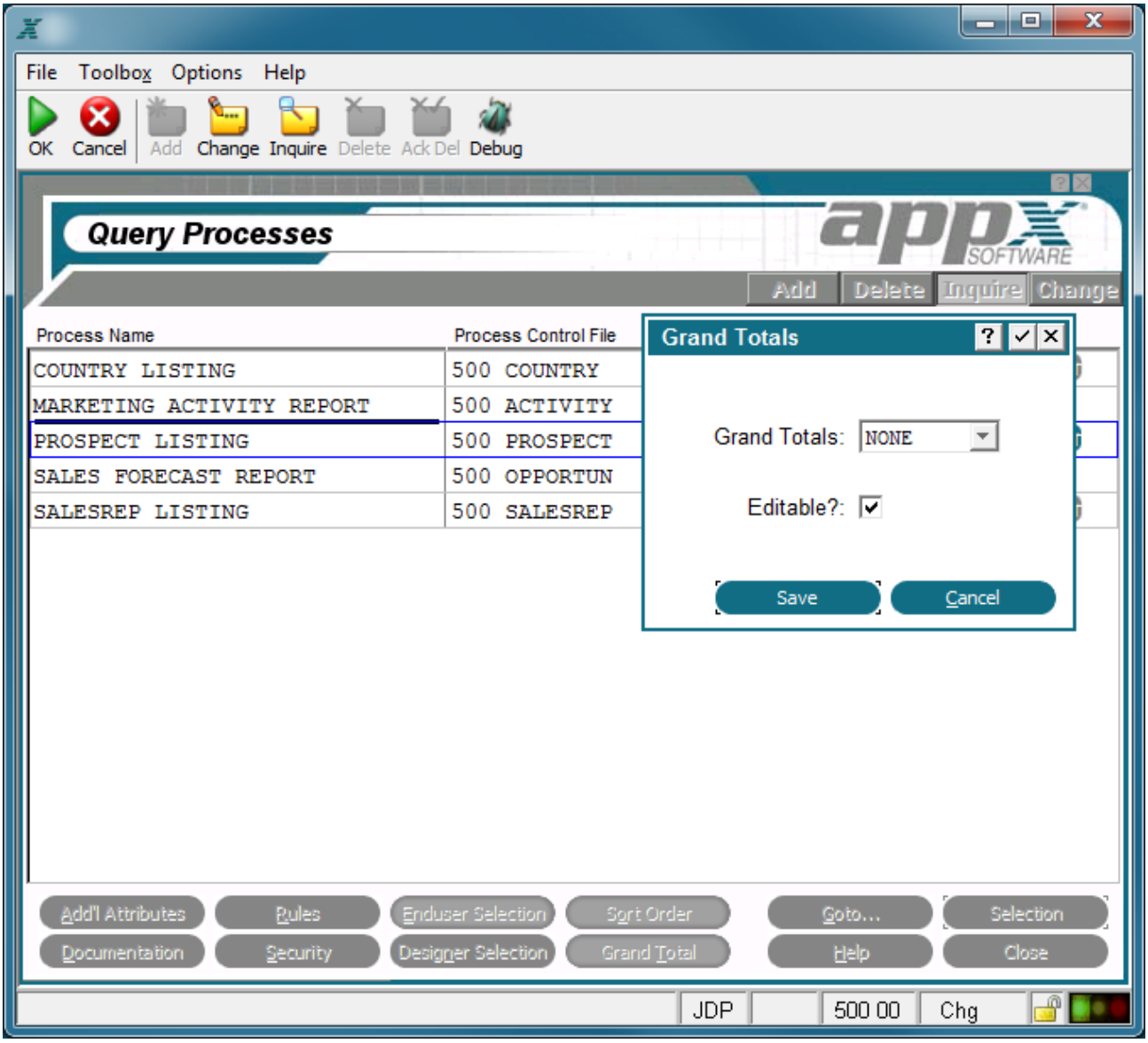
Subheading NO Edit? allows you to specify whether a user can modify the subheading when the query is run. The default is ☑.

Subtotal NO Edit? allows you to specify whether a user can modify the subtotal when the query is run. The default is ☑

Sort Order + Edit? allows you to specify whether a user can modify the sort order when the query is run. The default is ☑.

Grand Totals Option

Grand Totals allows you to edit certain parameters that are related only to report grand totals. The Grand Totals overlay is shown below.



Query Process Grand Totals Overlay

The query process Grand Totals overlay contains the following fields.

Grand Totals allows you to specify that a subsequent output process prints grand totals. The *Grand Totals* options are:

NONE. There will be no grand totals.

STANDARD. The grand totals will print directly following the last *Record* or *Range-End* image.

NEW PAGE. The report will skip to a new page before printing grand totals.

The default is STANDARD.

Editable? field allows you to explicitly choose whether or not a user can modify this parameter when the query is run.

Populating Query Files

QPARM, QSLCT, and *QSORT* are temporary files that are established during query setup. They store the sort and record selection criteria that are established for this query execution. As a result, the records that generate into the pointer file during execution are directly determined by the content of these files.

The temporary files are initially populated with the sort and record selection criteria that are established in application design (in the query process? source files). When an application user modifies the defaults on sort and record selection displays, the modifications are made directly to these files.

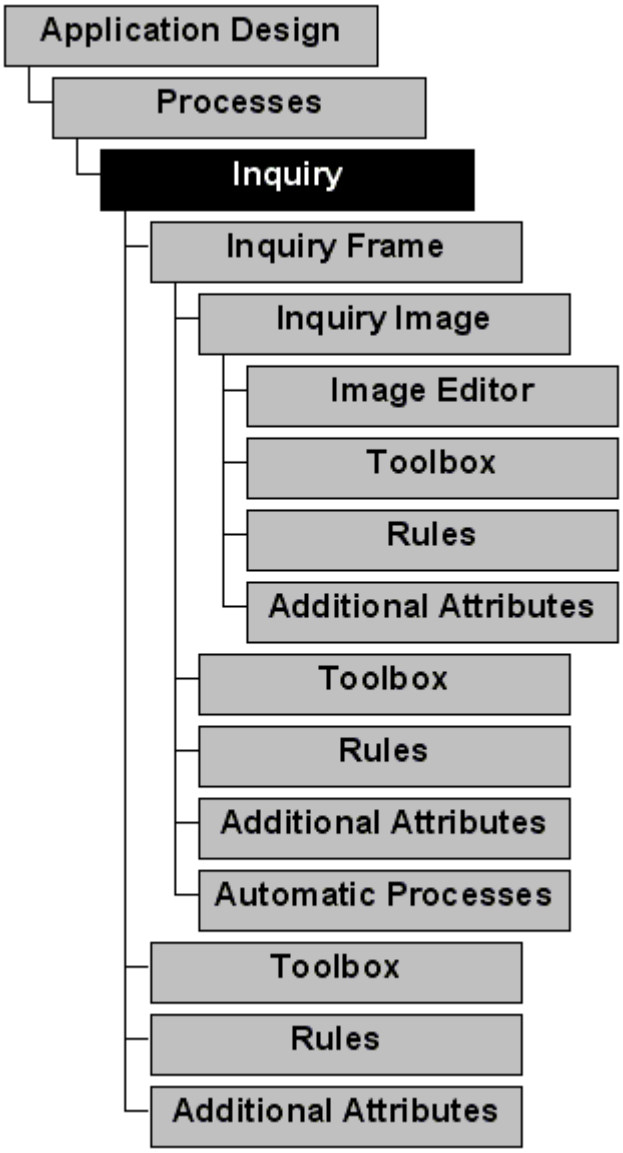
If the query is active, the temporary files are already populated. If, within the confines of a subprocess or related process family, you execute another sort setup for this query, the contents of these existing files *can* be reused. Whether or not they are used, and how they are used, depends upon the mode the query process was invoked in and the *Query Update Type.* In Automatic and Optional Children, refer to Child Additional Attributes Option for information about *Override Default Mode*. Also, see Child Use Query Option for a discussion of *Query Update Type*.

CHAPTER 3-10

Inquiry Processes

Introduction to Inquiry Processes

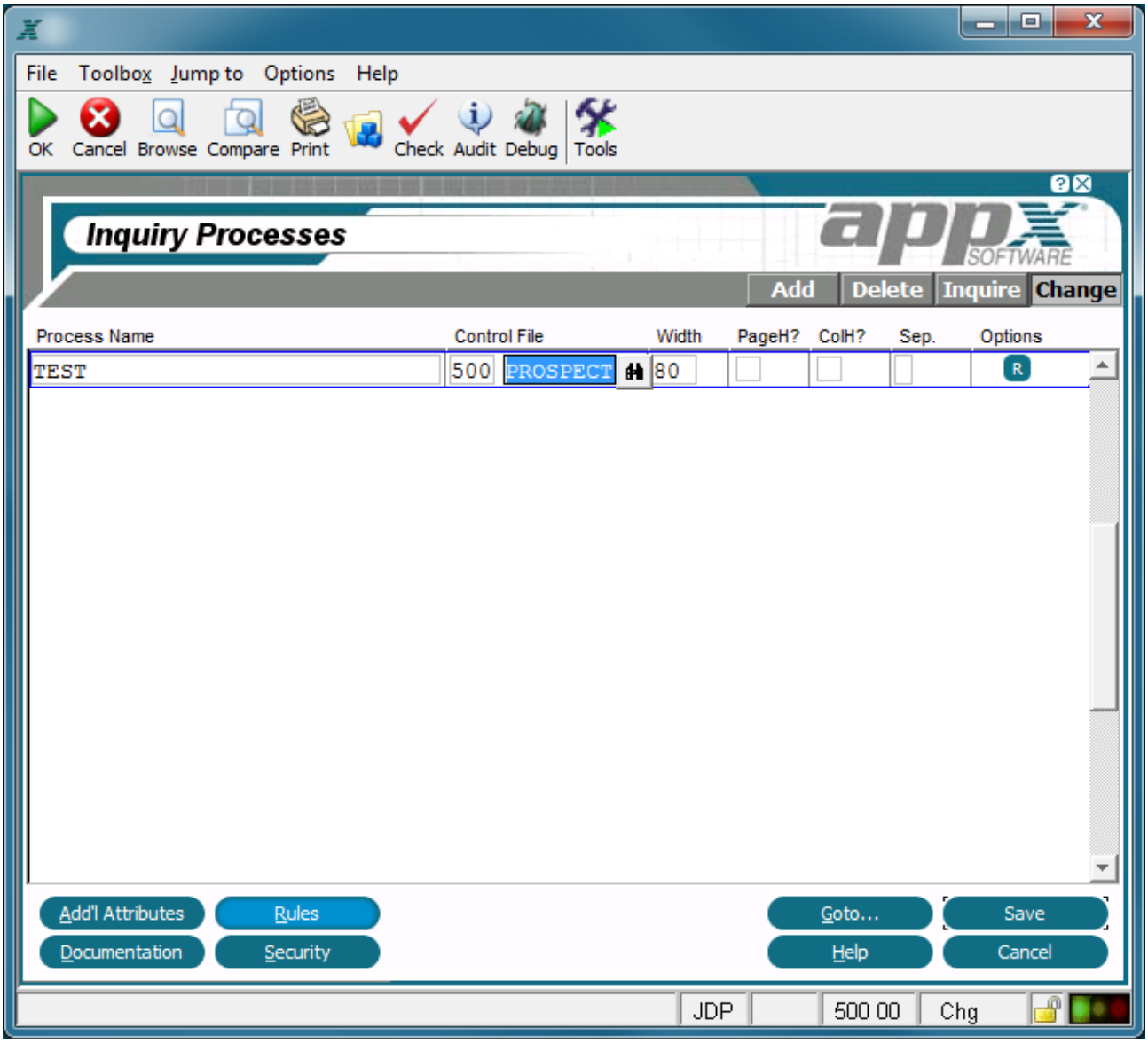
Inquiry Processes convey information from the database, usually to the screen, although the hard copy is available. The format is designer-defined. Customer Transactions and account balance information are examples of inquiry processes. Inquiry processes share many of the features of output processes, with one exception.: An inquiry process automatically generates a Key Entry frame, which allows the user to enter the key to the desired record. APPX assumes that an inquiry process is a means to quickly access a specific record, or set of records, rather than to sift the database for a range of records.



Inquiry Process Definition

Inquiry Process Specifications

Inquiry process specifications establish the general attributes of an inquiry process. They include such specifications as the inquiry print file, if any, the process control file, the name of the inquiry, and format characteristics. The Inquiry Processes screen is shown below.



Inquiry Processes Screen

The Inquiry Processes screen contains the following inquiry-specific fields.

Process Name identifies a specific process that is unique within type and application.

Control File identifies a file by application ID and file name that is to be automatically managed by APPX during the execution of this process. APPX automatically reads the process control file (PCF) during inquiry process execution.

Width indicates the maximum number of characters across, or in other words the number of columns, to allocate for each row in the report format. APPX uses the value you enter here to produce standard images of the proper width. If blank, the default width of the form that the report prints on defaults to the form width which is defined in system administration. If the form is narrower than the width of the formatted report, APPX truncates the inquiry. If the form is wider than the width of the report, however, APPX uses the larger width for standard images, but does not expand the format of the report itself. The default is *80.*

PageH determines whether or not APPX automatically prints a page heading standard image. If 'yes' ☑, this image prints before any *Start of Page* frames for the report. Be careful not to also explicitly define a *Start of Page* frame with a page heading standard image, which could cause the standard image to print twice at the top of each page in the report. If 'no' ☐, you can explicitly define a *Start of Page* frame with a page heading standard image or, alternatively, define your own page heading using a *Start of Page* frame. The default is 'yes'.

ColH determines whether or not APPX automatically prints a *Start of Page* frame with a column heading standard image. APPX generates column headings based upon specifications in the data dictionary for each item included in the inquiry image. If 'yes' ☑, this image prints after any *Start of Page* frames for the report. Be careful not to also explicitly define a *Start of Page* frame with a column heading standard image, which would cause the standard image to print twice for each page in the report. If 'no' ☐, you can explicitly define a *Start of Page* frame with a column heading standard image or, alternatively, define your own column headings using a *Start of Page* frame. The default is 'yes'. Refer to Standard Column Heading Image for additional information.

Sep (Separator) identifies one alphanumeric character that prints continuously across the report to separate standard page headings,page frames, and standard column headings from the body of the report. If blank, APPX does not print a heading separator. The default is =.

Options are indicators that are present whenever documentation (T), rules (R), or additional attributes (AA) have been defined for this process.

The following options as described in the corresponding sections are available on the Inquiry Processes screen:

Additional Attributes

Rules

Documentation

Security

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Inquiry Process Rules Option

Selecting the Rules option accesses the inquiry process Event Points For Rules overlay which allows you to select from options that access the ILF Editor for APPX event points. The inquiry process Event Points overlay contains the following options:

Start of Process

Start of Process, which is common to all types of processes, accesses the ILF editor for the *Start of Process* event point. Upon completion, you are returned to the process Event Points overlay.

Post PCF Read

Post PCF read accesses the ILF editor for the *Post PCF Read* event point. Upon completion, you are returned to the process Event Points overlay.

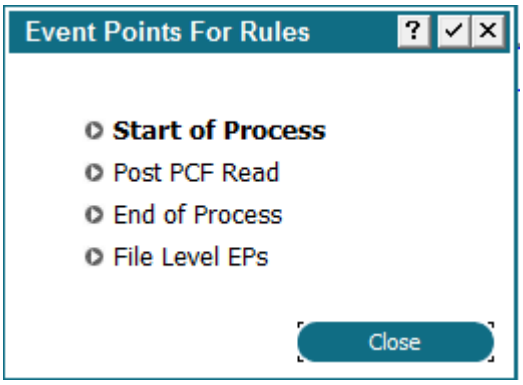
End of Process

End of Process, which is common to all types of processes,accesses the ILF editor for the *End of Process* event point. Upon completion, you are returned to the process Event Points overlay.

PCF Level EPs

PCF Level EPs provides access to the File Level Event Points for the PCF file. This overlay is shown below. These Event Points are not directly associated with the process but with the PCF file. See the *Rules Option* section of Files and Fields for more information on using PCF Level Event Points.

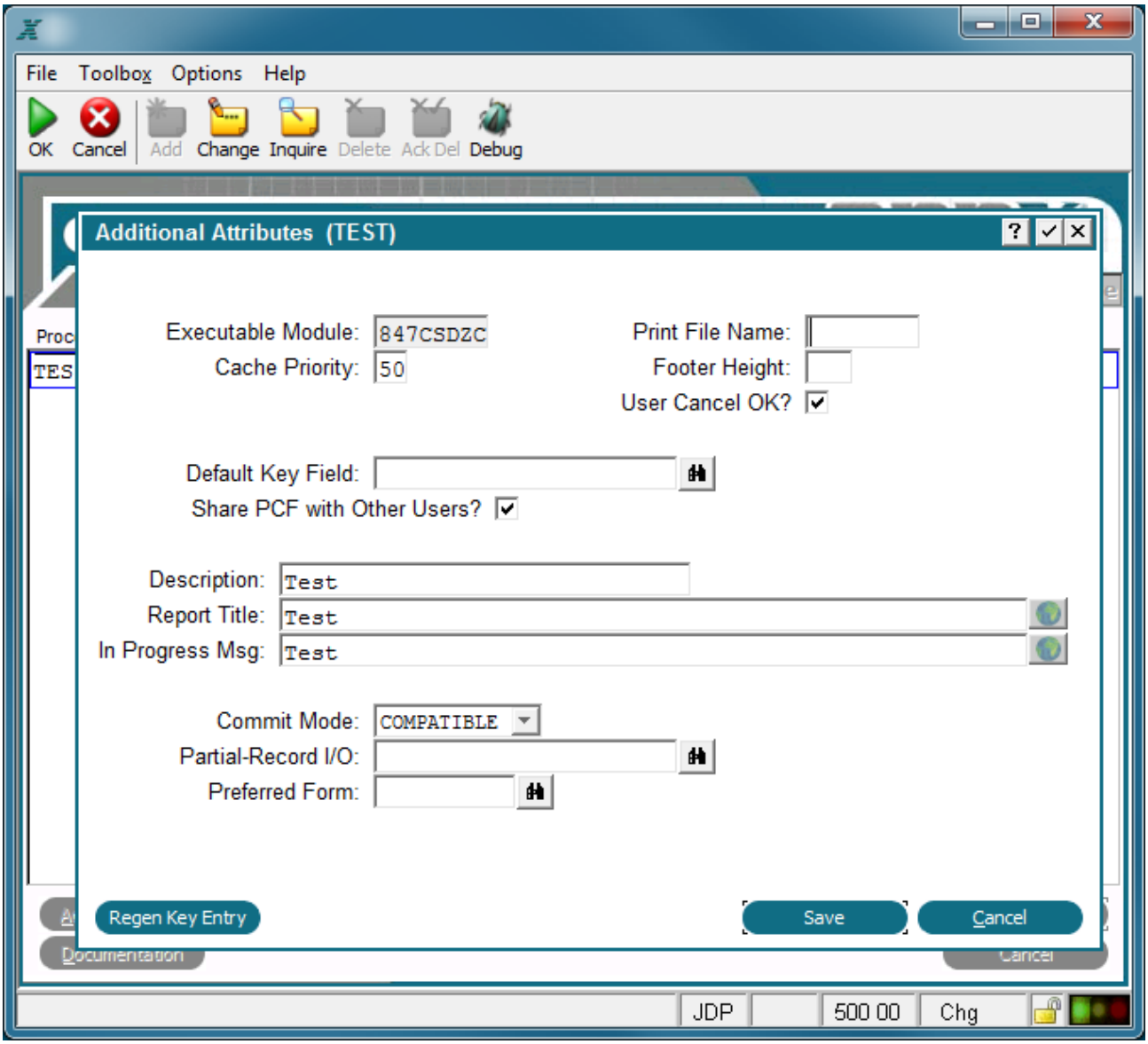
Refer to Using Event Points for more information.



File Level Event Points for Rules Overlay

Inquiry Process Additional Attributes Option

The Additional Attributesoption accesses the Inquiry Process Additional Attributes overlay, shown below, from which you can alter the standard EM attributes.



Inquiry Process Additional Attributes Overlay

The Additional Attributes overlay for Inquiry processes contain the following fields.

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected inquiry process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name. This field is common to the Additional Attributes overlay for all types of processes. See *Process Definition*, for more information.

Print File Name establishes the name of the file that is used to store the contents of the printed inquiry. If necessary to guarantee uniqueness, APPX may append one or more characters to the value you enter here, or replace one or more of the ending characters. If two or more output/inquiry processes in the

same subprocess family are defined with identical *Print File* values, the processes share a common print file. They print as a single report, with continuous page numbers. If this specification is blank, APPX uses the last *Print File* that is active within the subprocess family.

Cache Priority establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is *50.* This field is common to the Additional Attributes overlay for all types of processes. See *Process Definitio*n, for more information.

Footer Height indicates the amount of space, in number of rows, to reserve on each page for printing the page footer. APPX uses this value to determine placement of *End of Page* frames. If blank, APPX does not reserve space for a page footer.

User Cancel OK? contains either 'yes' ☑ or 'no' ☐ and determines whether or not a user can select the cancel option key to stop the execution of this process. The default is 'yes'. You can conditionally control the user's ability to select the cancel option with statements and the predefined field CANCEL OK. This field is common to the Additional Attributes overlay for all types of processes.

Default Key Field designates the specific keypath to the PCF that is used in executing the defined inquiry. If blank, the primary key is used. A default keypath that is defined for the invocation of a child process overrides this specification.

Share PCF with Other Users? indicates whether other users can access the designated PCF file when this process is executing. Default is 'yes' ☑ but can be toggled to 'no' ☐ by clicking the checkbox.

Description is incorporated in the message that displays on the screen when the inquiry process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank. The Additional Attributes overlay for all types of processes contain this field. See *Process Definitio*n, for more information.

Report Title defines the text that is used to name the report. This text automatically displays in the standard image for a *Start of Page* frame which is printed at the top of each page of the inquiry.

In Progress Msg provides text for the message that displays to the screen while the report is executing in the foreground.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT*. APPX will commit each modification as it is made.
*This value will be implemented in a future release.

PCF CYCLE. APPX will commit modifications as each PCF record is processed.

END. APPX will only commit modifications at the end of the process family.

MANUAL. APPX will not automatically commit changes. You must use the COMMIT statement to do so.

Partial-Record I/O is used to specify a field from the PCF file so that instead of operating on the entire PCF record, APPX operates on the designated field only. If the field is a group header, then I/O will be performed on all members of the group. Utilizing partial-record I/O can greatly improve performance when the PCF is a table in an RDBMS. This is especially true when the table contains many columns, but relatively few are being utilized by the process. The scan option is available for field selection.

Preferred Form When designing for PDF output, a preferred form can be specified for output and inquiry processes. If specified, it will be used to help tune the image editor session to match the form specifications.

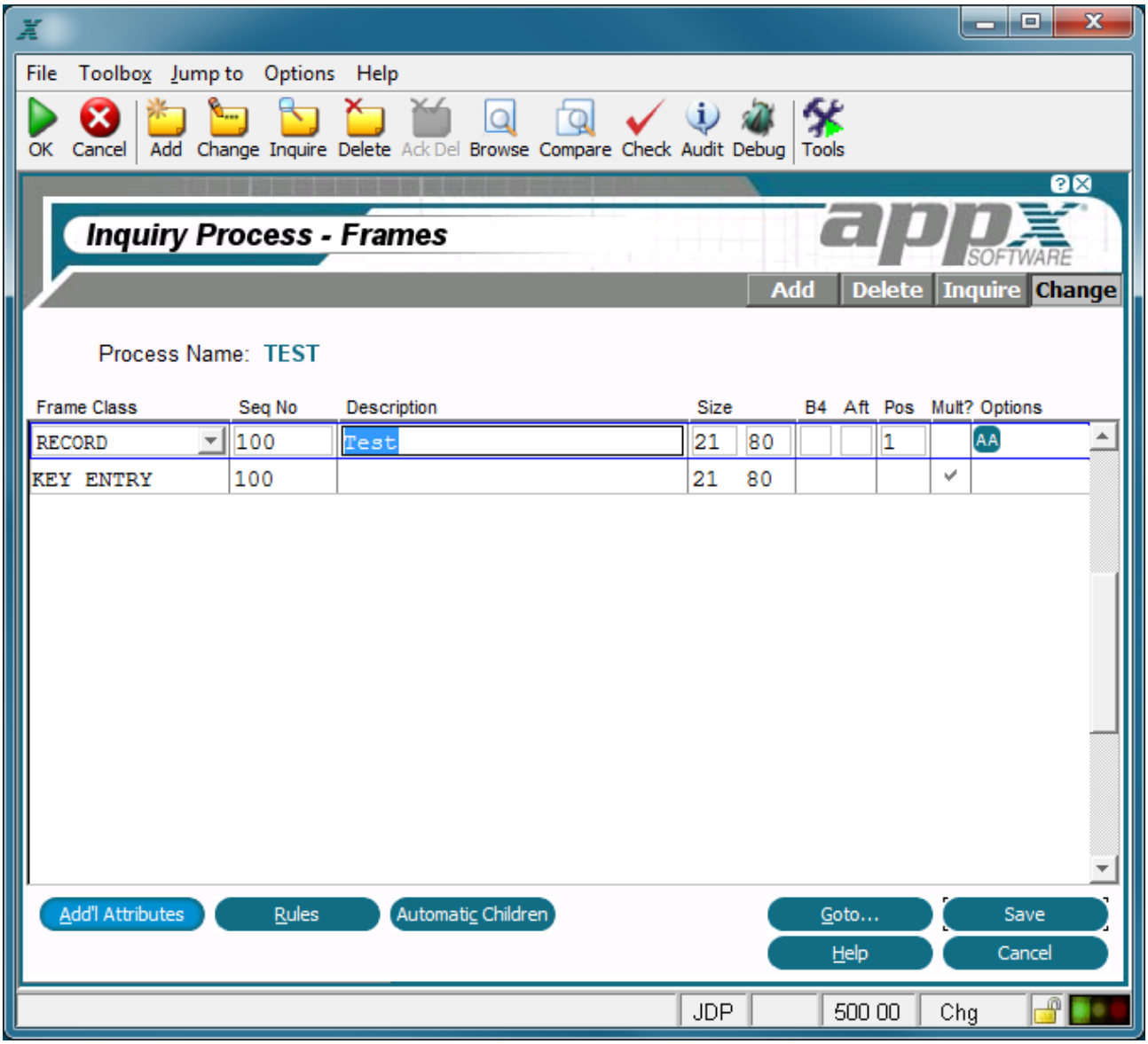
The following option is available on the inquiry Additional Attributes overlay.

Regenerate Key Entry Frame Option

The regenerate key entry frame option allows you to re-create the automatically generated, but modifiable, *Key Entry* frame that makes inquiry unique and different from output. If you have modified the *Key Entry* frame for any reason and wish to return to the standard frame, select this option.

Inquiry Frame Specifications

Inquiry frame specifications define attributes and statements unique to frames that manipulate the keys from each record in a PCF. The inquiry frames overlay, shown below, is automatically generated after you select Enter ☑ from the Inquiry Processes screen.



Inquiry Frames Overlay

The inquiry process Frames overlay contains the following fields.

Frame Class defines the type of frame with which you are working. Valid options are:

Report-Start frames print once at the beginning of a report. To print on a separate page, the designer should set *New Page After?* in Inquiry Frame Additional Attributes for the last *Report-Start* frame.

Page-Start frames print once at the beginning of each page of a report. They are primarily used for page headings and column headings. Standard images for both of these are optionally available. Refer to Standard Column Heading Image for additional information.

Range-Start frames print immediately before the first record for which the value in a specific sort field (the range field) changes. They are primarily used for subheadings and lower-level column headings. Standard images for both of these are optionally available. Refer to Standard Column Heading Image for additional information.

Record frames manipulate and print information read from the process control file. They comprise the body of a report. *Record* frames can be defined to scroll.

Range-End frames print immediately after the last record in a series of records that have the same value in a specific sort field (the range field). They are primarily used for subtotals, and a standard subtotal image is optionally available.

Page-End frames print once at the conclusion of each page of a report.

Report-End frames print once at the conclusion of a report. To print on a separate page, the designer should set *New Page Before?* in Inquiry Frame Additional Attributes for the first *Report-End* frame.

Key-Entry frames manipulate the keys from each record in a PCF.

Seq No displays a sequence number that is defaulted by APPX and used to identify the frame. This default sequence number can be overridden, but must be unique within the frame class for the process. Sequence numbers determine the order of the frames in the process structure and may contain up to seven numeric characters. The first frame that is defined in add mode is assigned sequence number *100*, and additional frames are assigned a number equal to the highest existing sequence number, plus *100*.

Description identifies this frame.The description is used for documentation purposes only.

Size? Row/Col designates the number of rows and columns that compose the frame. The default is *21*, *80*.

B4, displayed for all Inquiry frame classes except Key Entry, indicates the number of blank lines to be printed before executing this frame. For optional or repeating frames, it may be more appropriate to specify lines to skip at the image level in Inquiry Image Additional Attributes. The default is *0*.

Af, displayed for all Inquiry frame classes except Key Entry,indicates the number of blank lines to print subsequent to executing this frame.. For optional or repeating frames, it may be more appropriate to specify lines to skip at the image level in Inquiry Image Additional Attributes. The default is 0.

Pos designates how many columns over from the left side of the image that the report will print. See Frame/Image Positioning in *Getting Started* for more information.

Mult? This field indicates that this output frame contains more than one image if checked 'yes' ☑. If 'no' ☐ is entered, you will be unable to add more than one entry at the image level. The default is 'no'.

Options are indicators that are present whenever documentation (T), rules (R), additional attributes (AA), or automatic processes (AP) have been defined for this process.

The following options as described in the corresponding sections are available on the inquiry Frames overlay:

Additional Attributes

Rules

Automatic Children

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Inquiry Frame Rules Option

Selecting the Rules option accesses the inquiry frame Event Points For Rules overlay which allows you to select from options that access the ILF Editor for APPX event points. If statements were defined in the event point, the text on the screen is highlighted. Refer to Using Event Points for more information.

The Inquiry Frames Event Points overlay contains the following options:

Start of Process

Start of Process, which is common to all types of processes, accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the process Event Points overlay.

Post PCF Read

Post PCF Read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the process Event Points overlay.

Select Image

Select Image accesses the ILF editor for the Select Image event point. Upon completion, you are returned to the inquiry frame Event Points overlay.

Global EP's For Images

Global EPs for images overlayallows you to access three additional event points which are described below.

Start of frame accesses the ILF editor for the Start of Frame event point. Upon completion, you are returned to the inquiry frame Event Points overlay.

Global Pre-Display accesses the ILF editor for the Global Pre-Display event point. Upon completion, you are returned to the inquiry frame Event Points overlay.

End of Frame accesses the ILF editor for the End of Frame event point. Upon completion, you are returned to the inquiry frame Event Points overlay.

End of Process

End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the process Event Points overlay.

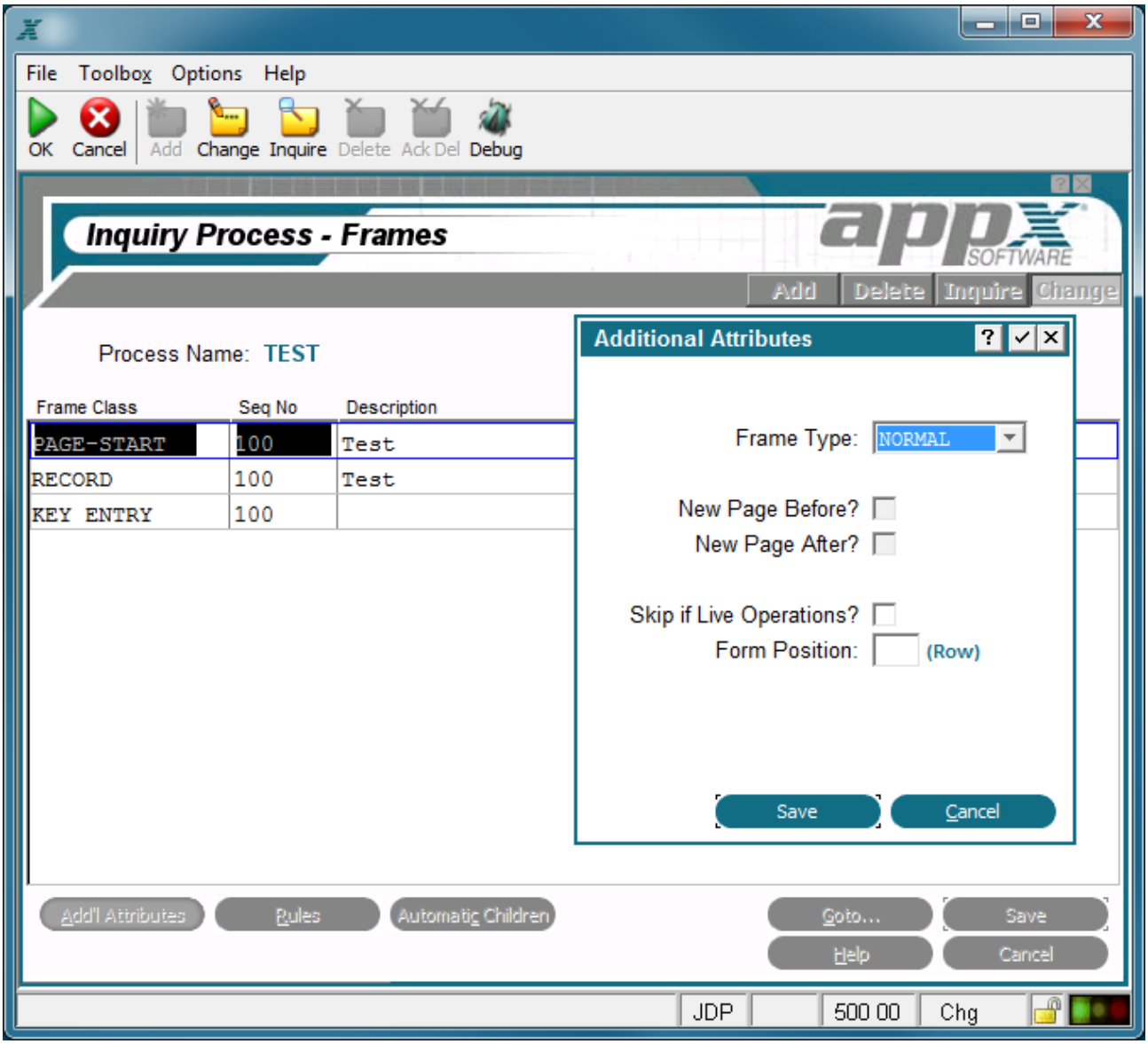
File Level EPs

PCF Level EPs provides access to the File Level Event Points for the PCF file. These Event Points are not directly associated with the process but with the PCF file. See the *Rules Option* section of *Files and Fields* for more information on using PCF Level Event Points.

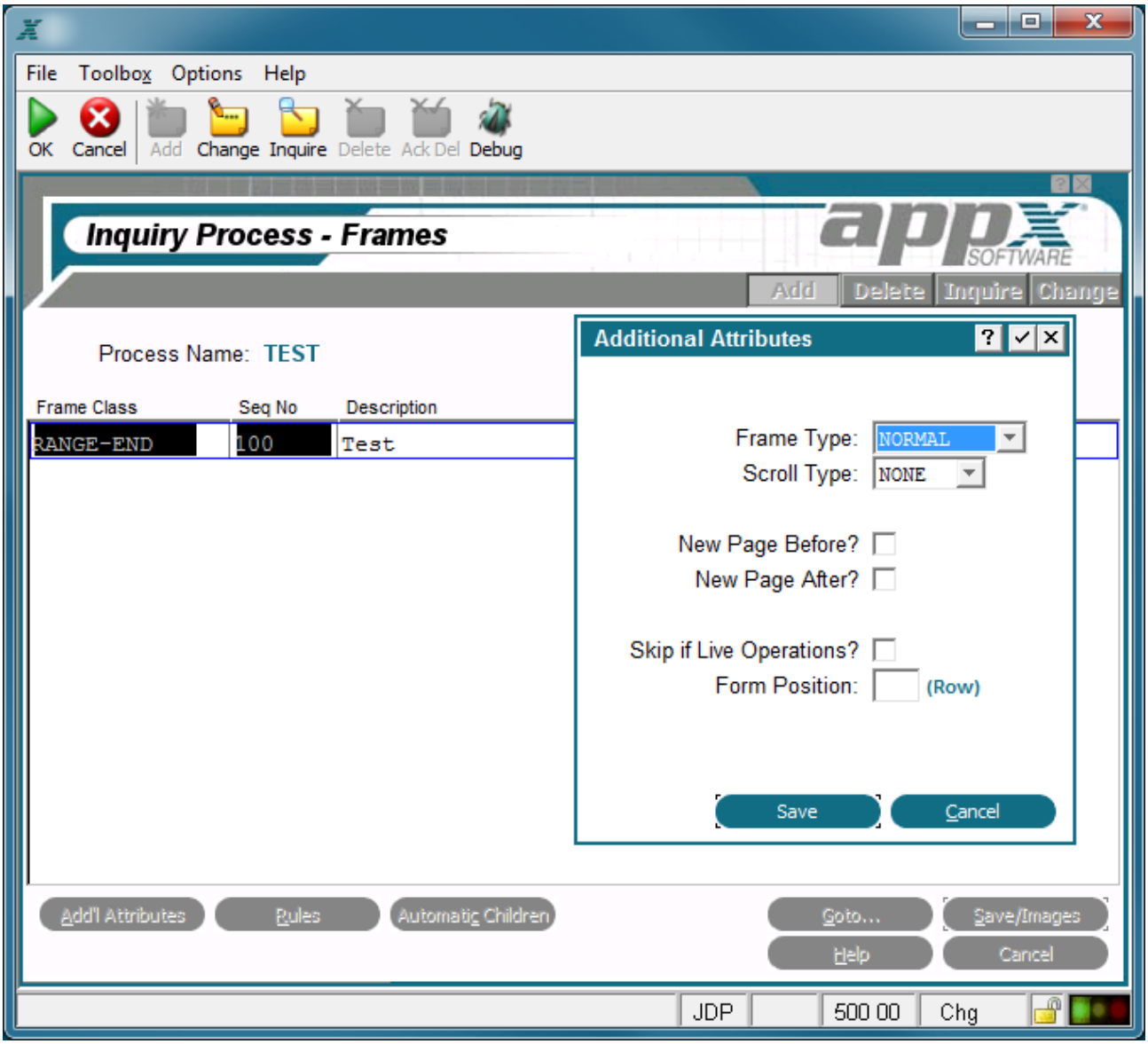
Refer to Using Event Points for more information.

Inquiry Frame Additional Attributes Option

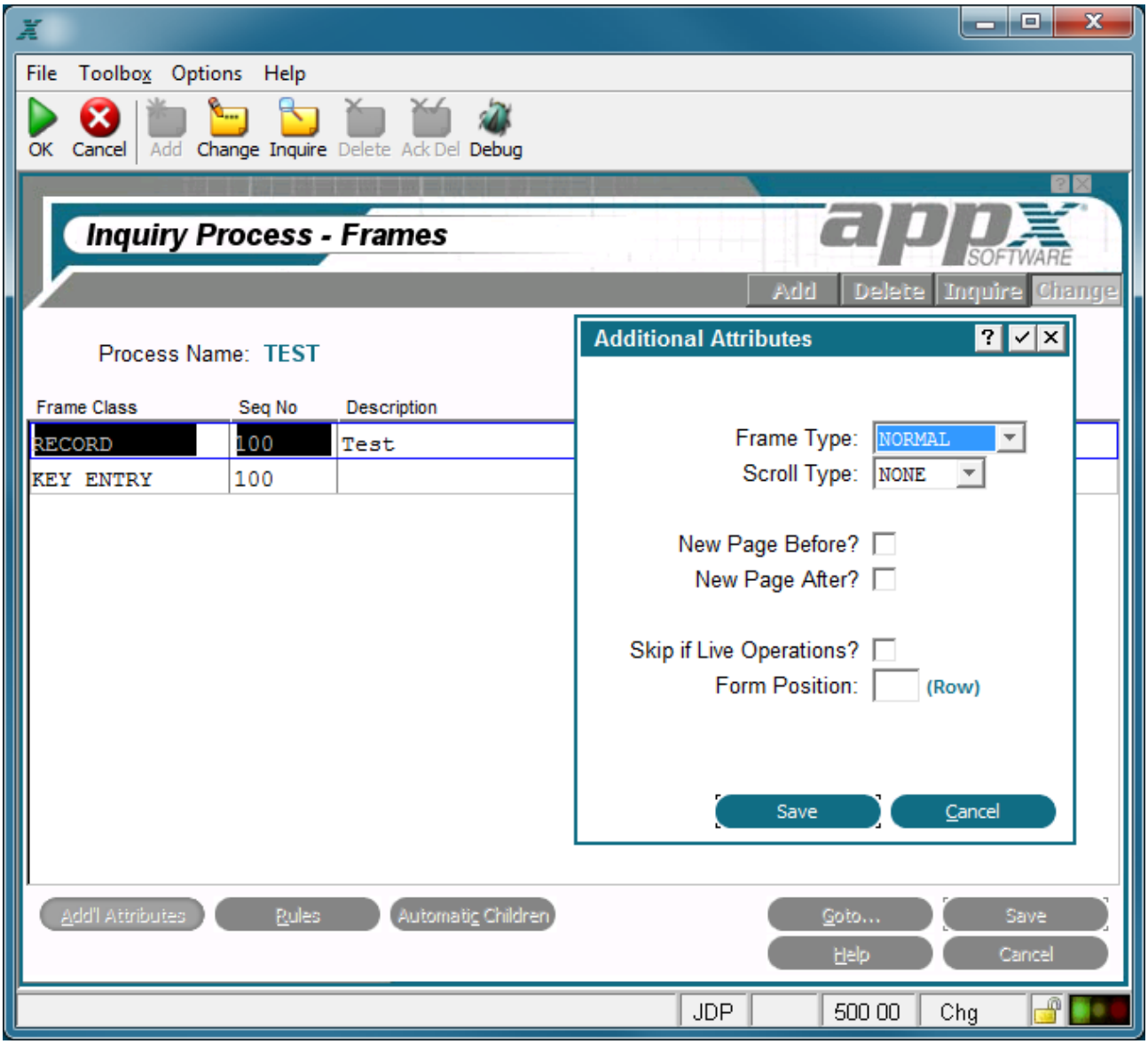
The Additional Attributes option accesses the inquiry frame Additional Attributes overlay, which varies between frames with different Frame Classes.



Inquiry Report and Page-Start and -End Frames Additional Attributes Overlay



Inquiry Range-Start and -End Frames Additional Attributes Overlay



Inquiry Record Frame Additional Attributes Overlay

The following fields are available on the inquiry frame Additional Attributes overlay for all frame classes except Key Entry.

Frame Type governs the execution of an image (or images) for the frame. The *Frame Type* options are:

NORMAL. Executes the first (lowest-numbered) alternate image unless another image was explicitly selected with statements and the predefined field ALTERNATE IMAGE NUMBER.

OPTIONAL. Executes the image that is identified by the *Normal Frame Type* above, with the following exception: If the value in the predefined field ALTERNATE IMAGE NUMBER is *0*, do not execute an image.

REPEATING. Executes the image repeatedly until the value in the ALTERNATE IMAGE NUMBER is set to *0* by statements.

The default is *NORMAL*.

New Page Before? determines whether or not to begin a new page before executing this frame. If the report is between pages before this frame executes, 'yes' ☑ does not cause a blank page to print. The default is 'no' ☐.

New Page After? determines whether or not to begin a new page subsequent to executing this frame. If the report is between pages after this frame executes, 'yes' ☑ does not cause a blank page to print.The default is'no' ☐.

Skip If Live Operations? determines whether or not the frame is exclusive to the initial setup and recovery processing phases of operation. If 'yes' ☑ , the frame does not execute during the live operations phase. If 'no' ☐, the frame executes during all phases of operation. The default is'no' ☐.

Form Position? Row designates the placement of the frame on the display. When implemented, the row is defined relative to the top of the display. This field may contain up to three numeric characters. See Frame/Image Positioning in *Getting Started* for more information.

The Record and Range-Start and -End frames Additional Attributes overlay contains the following unique field:

Scroll Type indicates whether or not the images on the frame scroll and, if so, the type of scrolling to be performed. The *Scroll Type* options are:

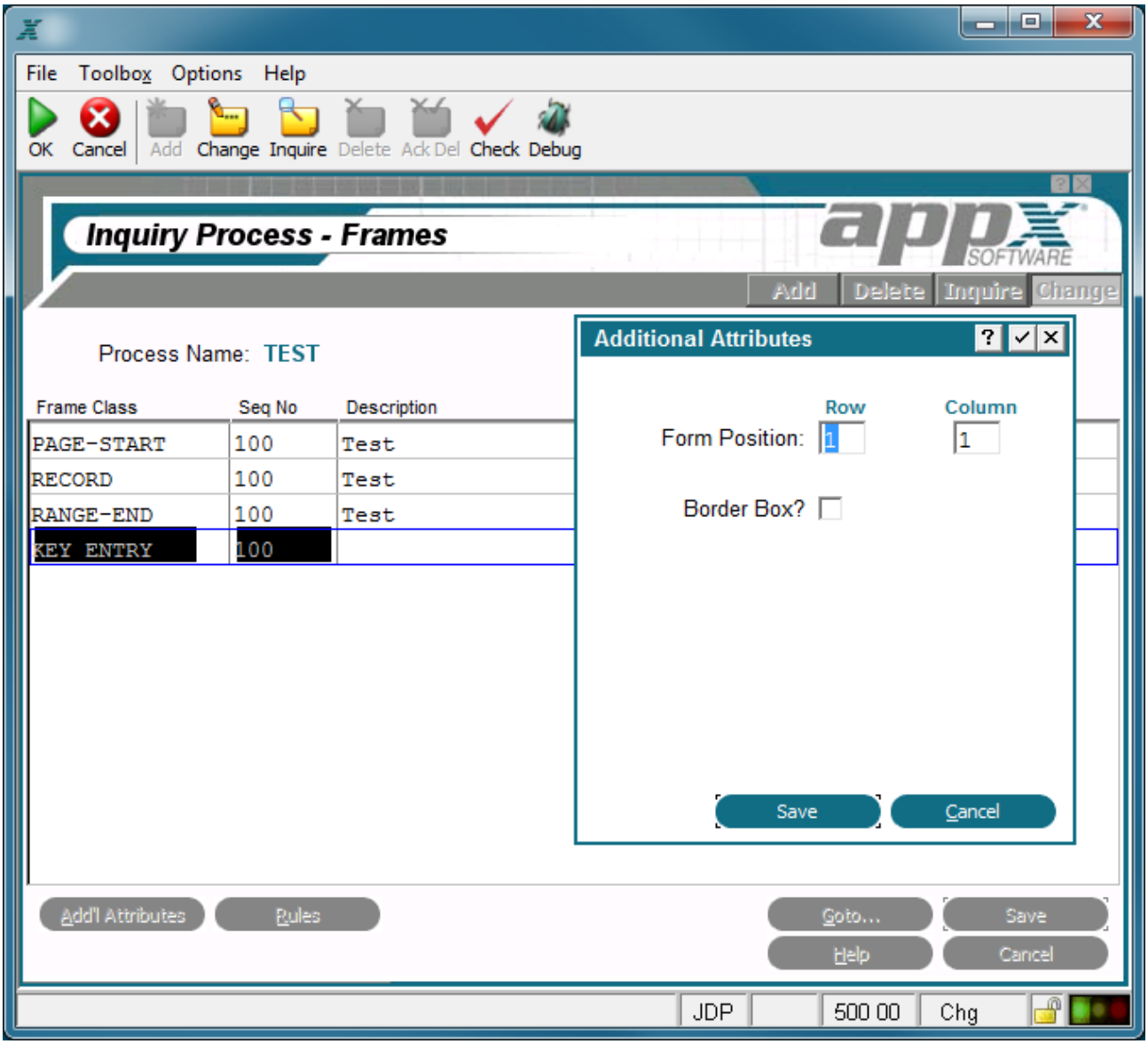
NONE. The image on the frame does not scroll.

DOWN. APPX divides the frame into a grid of equal-sized regions, based upon a calculated composite image size. The first image is placed into the upper left region in the frame. Succeeding images are placed in the region below the previous image until the column is complete. As each column is completed, the next image is placed at the top of the column immediately to the right of the completed column.

ACROSS. APPX divides the frame into a grid of equal-sized regions, based upon a calculated composite image size. The first image is placed into the upper left region in the frame. Succeeding images are placed in the region to the right of the previous image until the row is complete. As each row is completed, the next image is placed in the far left-hand position of the row immediately below the completed row.

The default is blank.

The inquiry *Key Entry* frame Additional Attributes overlay is shown below:



Inquiry Key Entry Frame Additional Attributes Overlay

The following fields are available on the inquiry *Key Entry* frame Additional Attributes overlay:

Form Position? Row/Col determines the placement of the frame on the display. Row entries designate positioning relative to the top of the display and column entries define the positioning relative to the far left-hand position on the display. The default is *1,1*.

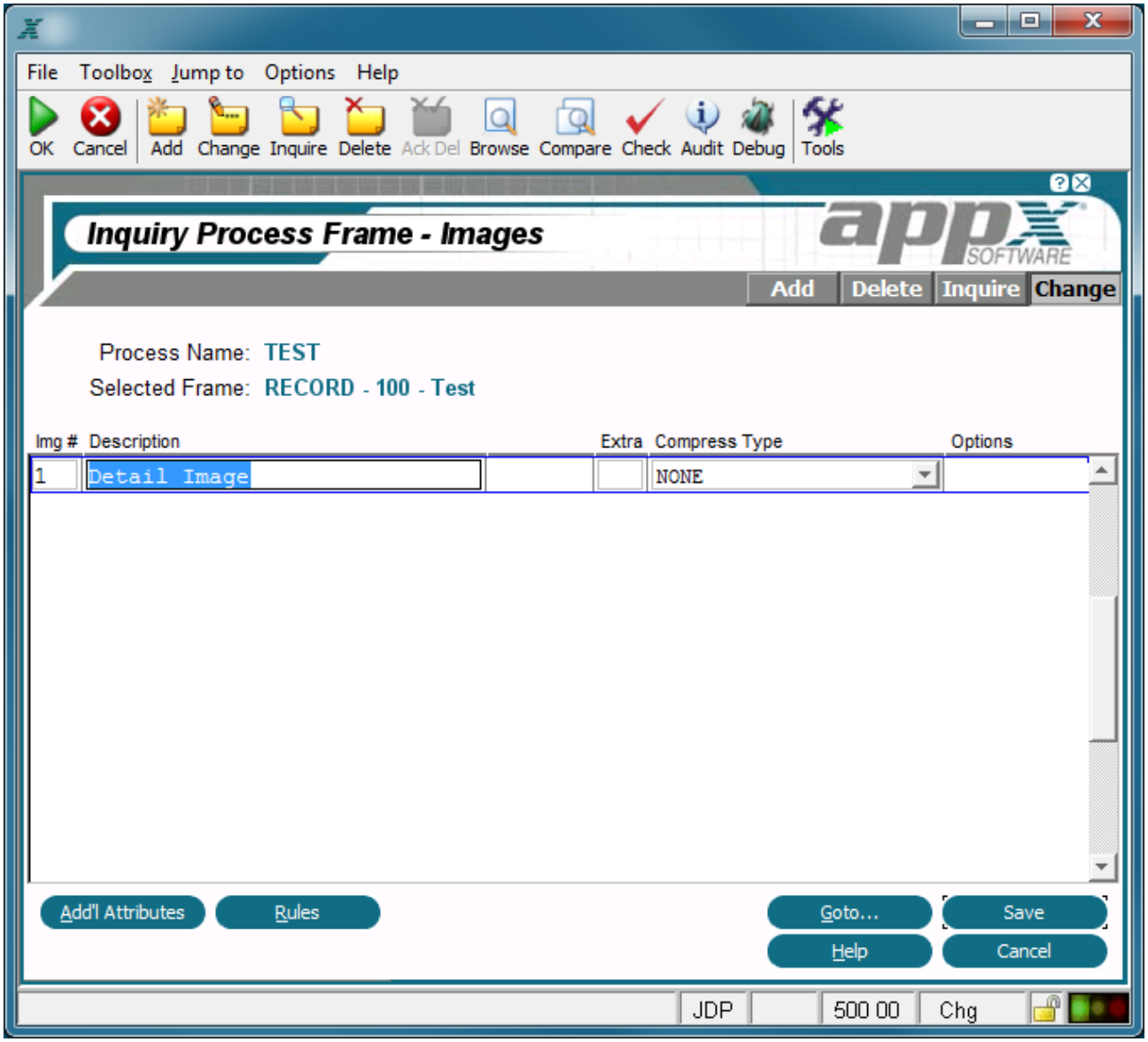
Border Box? indicates whether or not APPX draws a box around this frame before it displays to a user. The border does not consume rows or columns within the space that is defined for the frame, but does consume space on the screen. The default is 'no' ☐.

Inquiry Frame Automatic Processes Option

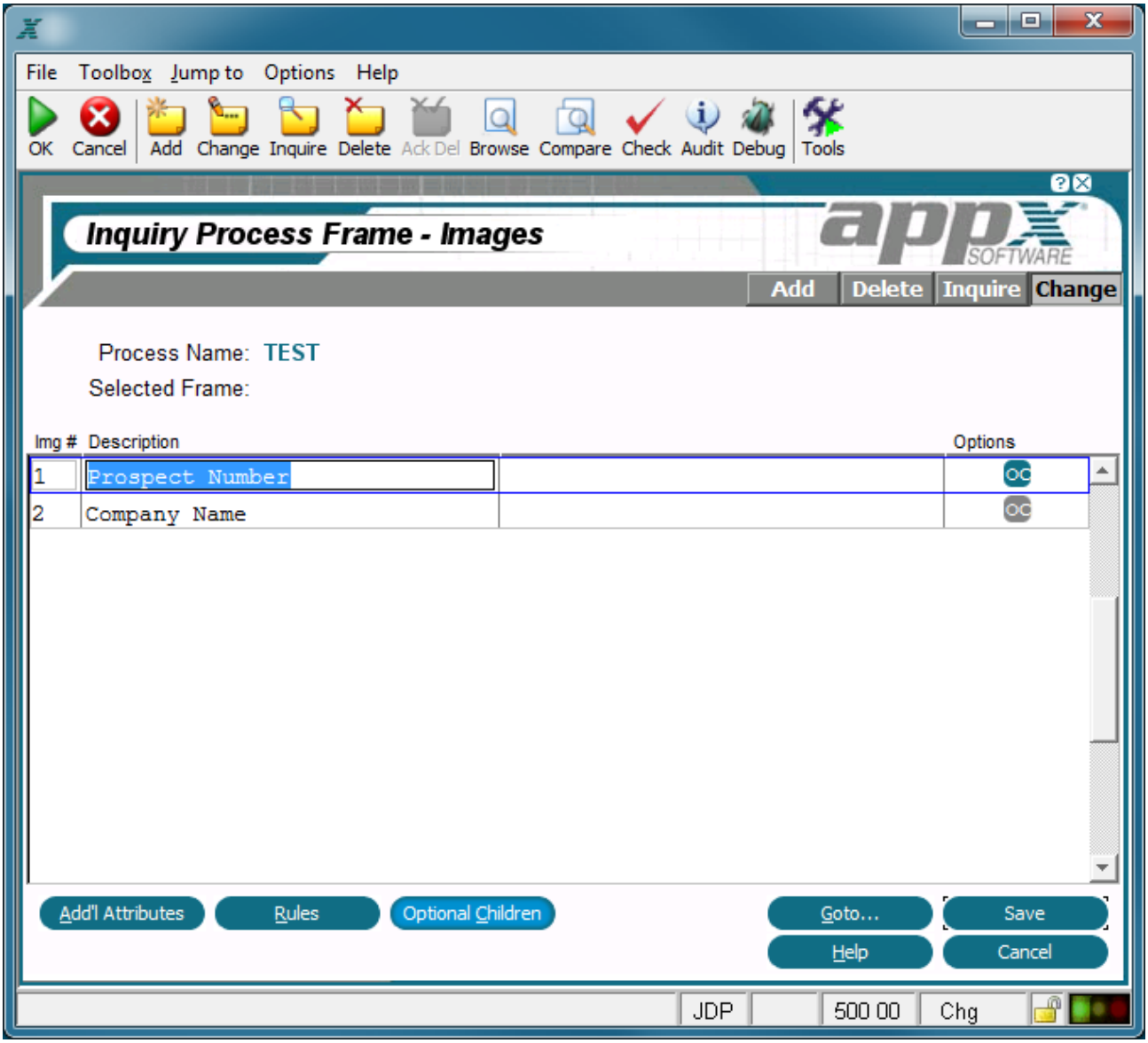
The automatic processes option, available on the Inquiry Frame overlay for all frame-classes except Key Entry, accesses the Automatic Child Process overlay. This allows you to attach a specific process to the inquiry process currently selected so that it invokes automatically when the inquiry process is invoked. Refer to Automatic and Optional Children for more information.

Inquiry Image Specifications

Inquiry image specifications define the visual and operational attributes of the image. The Images overlay automatically displays after you select Enter ☑ from the inquiry Frames overlay..



Inquiry Images Overlay for Report-Start and -End, Page-Start and -End, Range-Start and -End and Record type Frame Classes



Inquiry Images Overlay for Key Entry type Frame Classes

Both inquiry Images overlays contain the following fields:

Img No displays a sequence number that is defaulted by APPX. The image number uniquely identifies each possible image for the frame and is referenced when determining which image, if any, is to display. The first image that is defined in add mode is assigned alternate number *1*, and additional frames are assigned a number equal to the highest existing image number, plus *1*. This default alternate number can be overridden, but must be unique within the frame. Refer to *Images,* for a discussion of alternate images in APPX.

Description identifies this alternate image. This field is used for documentation purposes only.

Options are indicators that are present whenever documentation (T), rules (R), additional attributes (AA), or optional processes (OP--for key entry images only) have been defined for this process.

The inquiry Images overlays for *Report-Start* and *-End*, *Page-Start* and *-End*, *Range-Start* and *-End* and *Record* type Frame Classes also contain the following fields:

Extra (Lines) indicates a number of additional rows to add to the size of the image. This field may contain up to three numeric characters. For non-scrolling frames only, this entry defines the additional number of rows to reserve on the page when determining page breaks. For example, you can use this specification to ensure sufficient room to print at least one record frame beneath a subheading.

Compress Type indicates whether or not to suppress blank lines in an image and, if so, the type of lines to compress. The *Compress Type* options are:

NONE. Do not compress.

EMBEDDED BLANK LINES. Compress embedded blank lines. (Image still occupies the full number of rows.)

TRAILING BLANK LINES. Compress trailing blank lines.

EMBEDDED/TRAILING. Compress embedded and trailing blank lines.

The default is NONE.

The following options as described in the corresponding sections are available on the inquiry Image overlays:

Additional Attributes

Rules

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Inquiry Image Rules Option

Selecting the Rules option accesses the inquiry image Event Points For Rules overlay which allows you to select from options that access the ILF Editor for APPX event points. If statements were defined in the event point, the text on the screen is highlighted. Refer to Using Event Points for more information. The inquiry Event Points overlay contains the following options:

Start of Process

Start of Process, which is common to all types of processes, accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the process Event Points overlay.

Post PCF Read

Post PCF Read accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the process Event Points overlay.

Select Image

Select Image accesses the ILF editor for the Select Image event point. Upon completion, you are returned to the inquiry frame Event Points overlay.

Global EP's For Images

Global EPs for images overlayallows you to access four additional event points.

Pre-Display

Pre-Display accesses the ILF editor for the Pre-Display event point. Upon completion, you are returned to the inquiry image Event Points overlay.

Pre-Display/Verify

Pre-Display/Verify, available only for images with key entry type frame-class, accesses the ILF editor for the Pre-Display/Verify event point. Upon completion, you return to the inquiry frame Event Points overlay.

Option Intercept

Option Intercept, available only for images with key entry type frame-class, accesses the ILF editor for the Option Intercept event point. Upon completion, you return to the inquiry frame Event Points overlay.

Verify

Verify, available only for images with key entry type frame-class, accesses the ILF editor for the Verify event point. Upon completion, you are returned to the inquiry frame Event Points overlay.

End of Process

End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the process Event Points overlay.

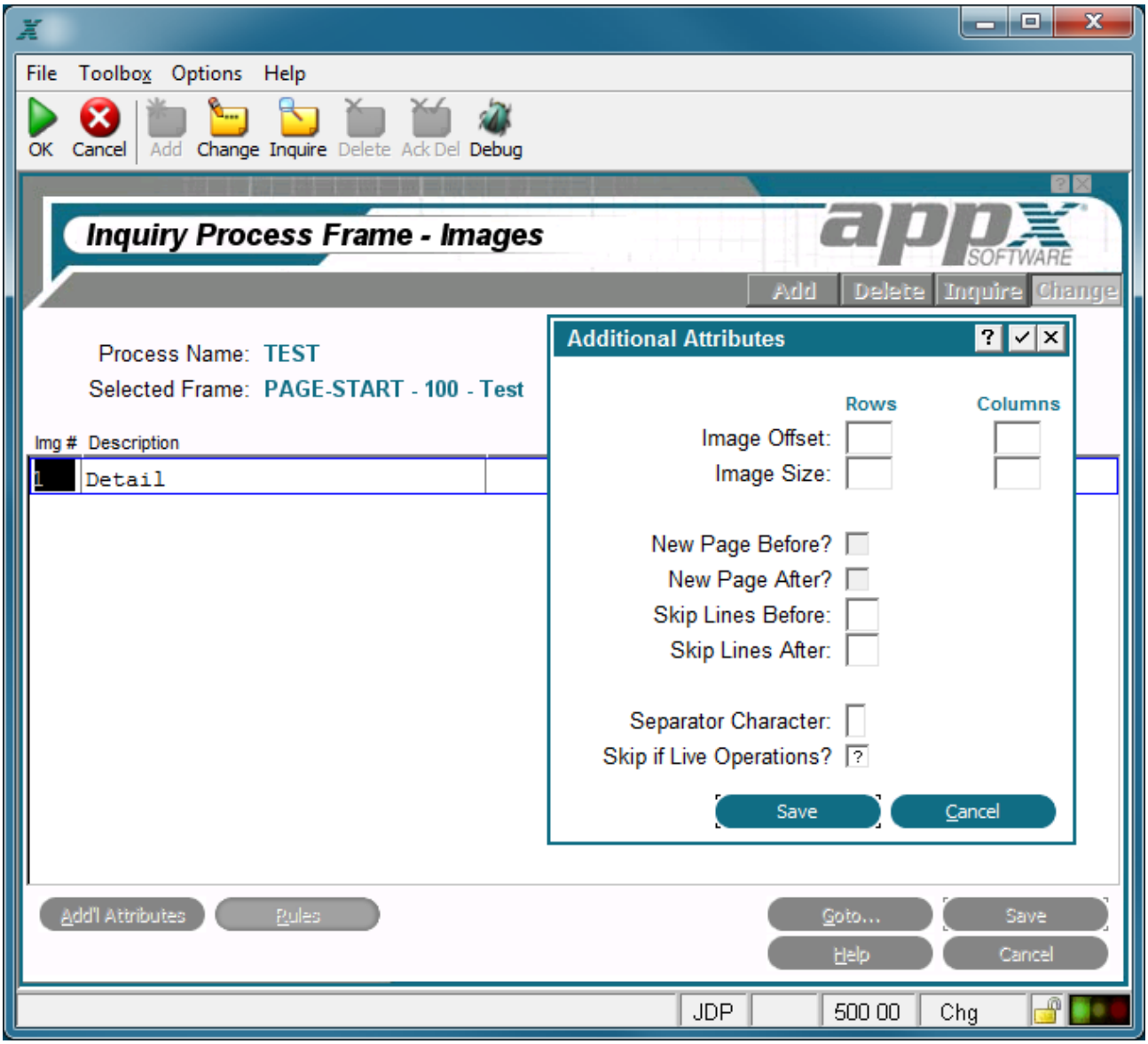
File Level EPs

PCF Level EPs provides access to the File Level Event Points for the PCF file. These Event Points are not directly associated with the process but with the PCF file. See the Rules Option section for more information on using PCF Level Event Points.

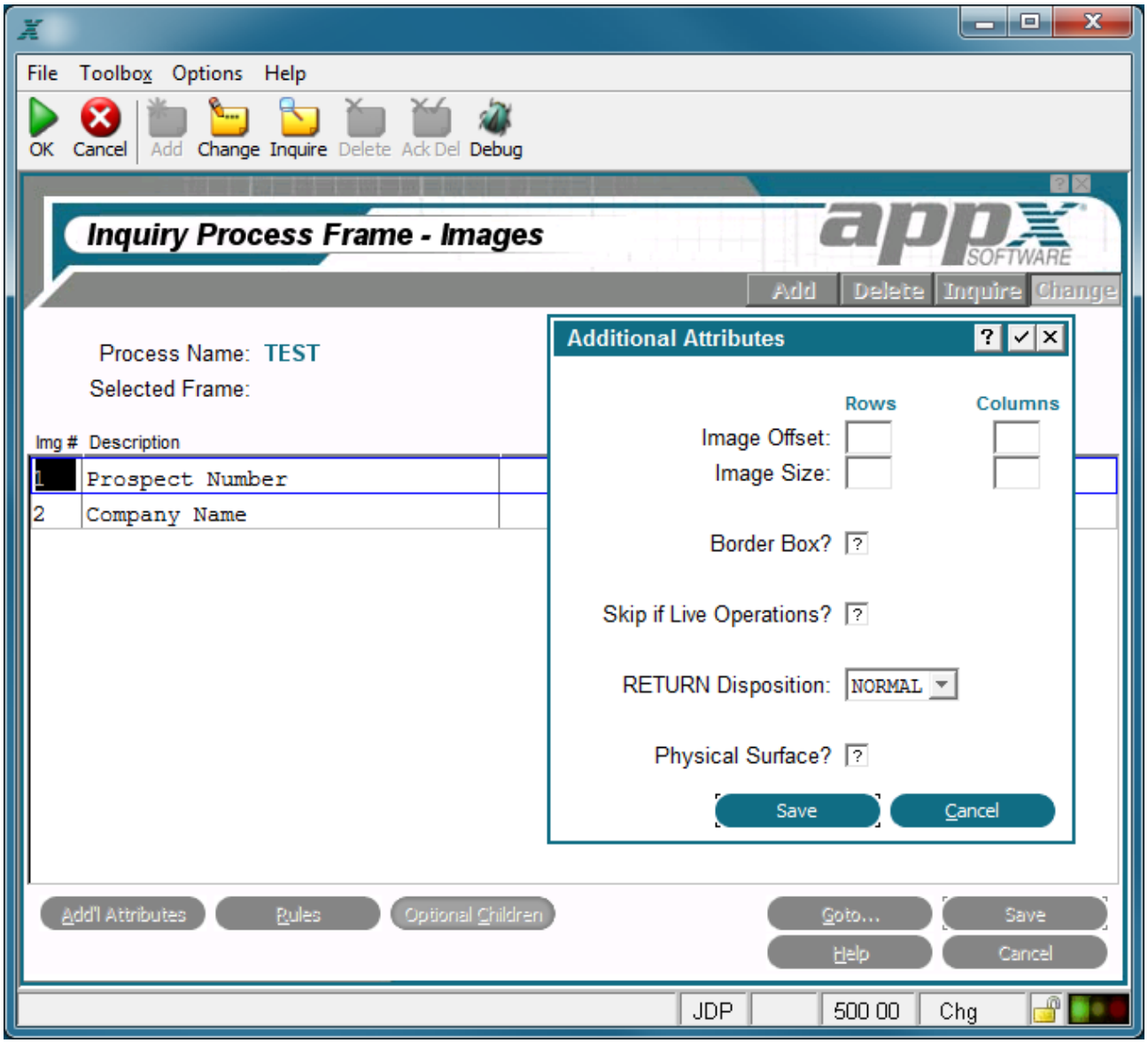
Refer to Using Event Points for more information.

Inquiry Image Additional Attributes Option

The Additional Attributesoption accesses the inquiry process image Additional Attributes overlay. This overlay may vary depending on the type of frame to which the image belongs.



Inquiry Images Additional Attributes Overlay for Report-Start and -End, Page-Start and -End, Range-Start and -End and Record type Frame Classes



Inquiry Key Entry Image Additional Attributes Overlay

The following fields are available on Inquiry Images Additional Attributes Overlay for *Report-Start* and *-End*, *Page-Start* and *-End*, *Range-Start* and *-End* and *Record*-type Frame Classes:

Image Offset? Row/Columns determines the placement of the rows and columns of this image, relative to the frame. Row entries designate positioning relative to the top of the frame. Column entries designate positioning relative to the left of the frame. If blank, the APPX defaults to same row/column position as the frame. The default is blank. See Frame/Image Positioning for more information.

Image Size? Rows/Columns designates the number of rows and columns that comprise the displayed image. The image cannot be larger than the frame it belongs to. If blank, the size of the image defaults to the size of the frame. The default is blank.

New Page Before? determines whether or not to begin a new page before executing this image in a nonscrolling frame. If the report is between pages before this image executes, 'yes' ☑ (Y using Character Mode) does not cause a blank page to print. The default is 'no' ☐ (N using Character Mode).

New Page After? determines whether or not to begin a new page subsequent to executing this image in a nonscrolling frame. If the report is between pages after this image executes, 'yes' ☑ (Y using Character Mode) does not cause a blank page to print.The default is'no' ☐ (N using Character Mode).

Skip Lines Before indicates the number of blank lines to be printed before executing this image. If Print Beside is in effect, APPX only skips lines for the columns that are occupied by the image. The default is *0*.

Skip Lines After indicates the number of blank lines to print subsequent to executing this image. If Print Beside is in effect, APPX only skips lines for the columns that are occupied by the image. The default is *0*.

Separator Character determines the character that prints continuously across the entire image to separate it from the rest of the report. If blank, APPX does not print a heading separator. The default is blank.

Skip If Live Operations? determines whether or not the image is exclusive to the initial setup and recovery processing phases of operation. If 'yes' ☑ (Y using Character Mode), the image is not executed during the live operations phase. The default is 'unknown' ? (blank using Character Mode).

The following fields are available on the inquiry *Key Entry* image Additional Attributes overlay.

Image Offset? Row/Columns determines the placement of the rows and columns of this image, relative to the frame. Row entries designate positioning, relative to the top of the frame. Column entries designate positioning relative to the left of the frame. If blank, the APPX defaults to same row/column position as the frame. The default is blank. See Frame/Image Positioning for more information.

Image Size? Rows/Columns designates the number of rows and columns that comprise the displayed image. The image cannot be larger than the frame it belongs to. If blank, the size of the image defaults to the size of the frame. The default is blank.

Border Box? indicates whether or not APPX draws a box around this image before it displays to a user. The border does not consume rows or columns within the space that is defined for the image, but does consume space on the screen. If the box specification is combined with an overline, an underline, or both, APPX replaces the top and/or bottom of the box with the overline and/or underline. This minimizes the space that is consumed by the border. The physical space on the screen that is consumed by the box is system-specific.

Skip If Live Operations? determines whether or not the image is exclusive to the initial setup and recovery processing phases of operation. If 'yes' ☑ (Y using Character Mode), the image is not executed during the live operations phase.

Return Disposition option designates the effect on the image displayed for this frame of a user selecting Enter ☑. There are three *RETURN Disposition* options.

HOLD. Causes APPX to automatically control the disposition of the frame. The image for the frame displays until the process cycle completes (until all frames execute for one PCF record), at which time the image is removed.

CLEAR. Causes the contents of the frame to clear, but the image for the frame still exists and still obscures the contents of any prior images that it overlays on the screen.

REMOVE. Causes the frame itself to be removed, and will no longer obscure the contents of any prior frames that it overlays on the screen.

The default is HOLD.

Physical Surface? controls whether or not this image is 'attached' to the physical surface. Click the checkbox to toggle between values of 'yes' ☑, 'no' ☐, or 'unknown' ? (Y, N or blank using Character Mode). 'Yes' indicates that the image will always display in front of images that are not attached to the physical surface and that panning options do not apply. The image will always be ?seen? by the user even if the logical surface is panned far to the right or other images not attached to the physical surface are executed.

Inquiry Image Optional Processes Option

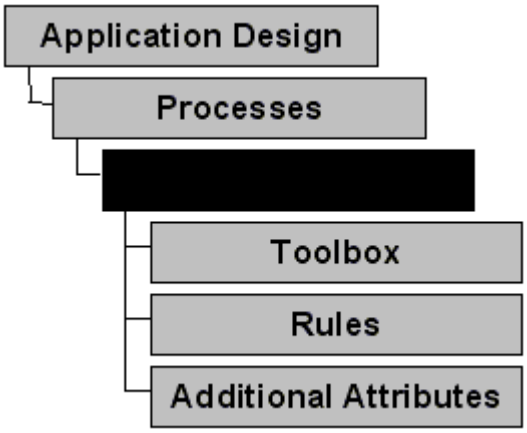
The optional processes option, which is available from the Inquiry Images Additional Attributes Overlay for only *Key Entr*y-type Frame Classes, accesses the inquiry image Optional Child Processes specification screens that define attributes to govern the discretionary invocation of another APPX process from an image in an inquiry process. These specifications include the name of the child process, the invocation type, and whether or not various activities at the child level affect the parent process. Upon completion, you are returned to the inquiry Images overlay. See Automatic and Optional Children for detailed information about defining optional child processes.

CHAPTER 3-11

Status Processes

Introduction to Status Processes

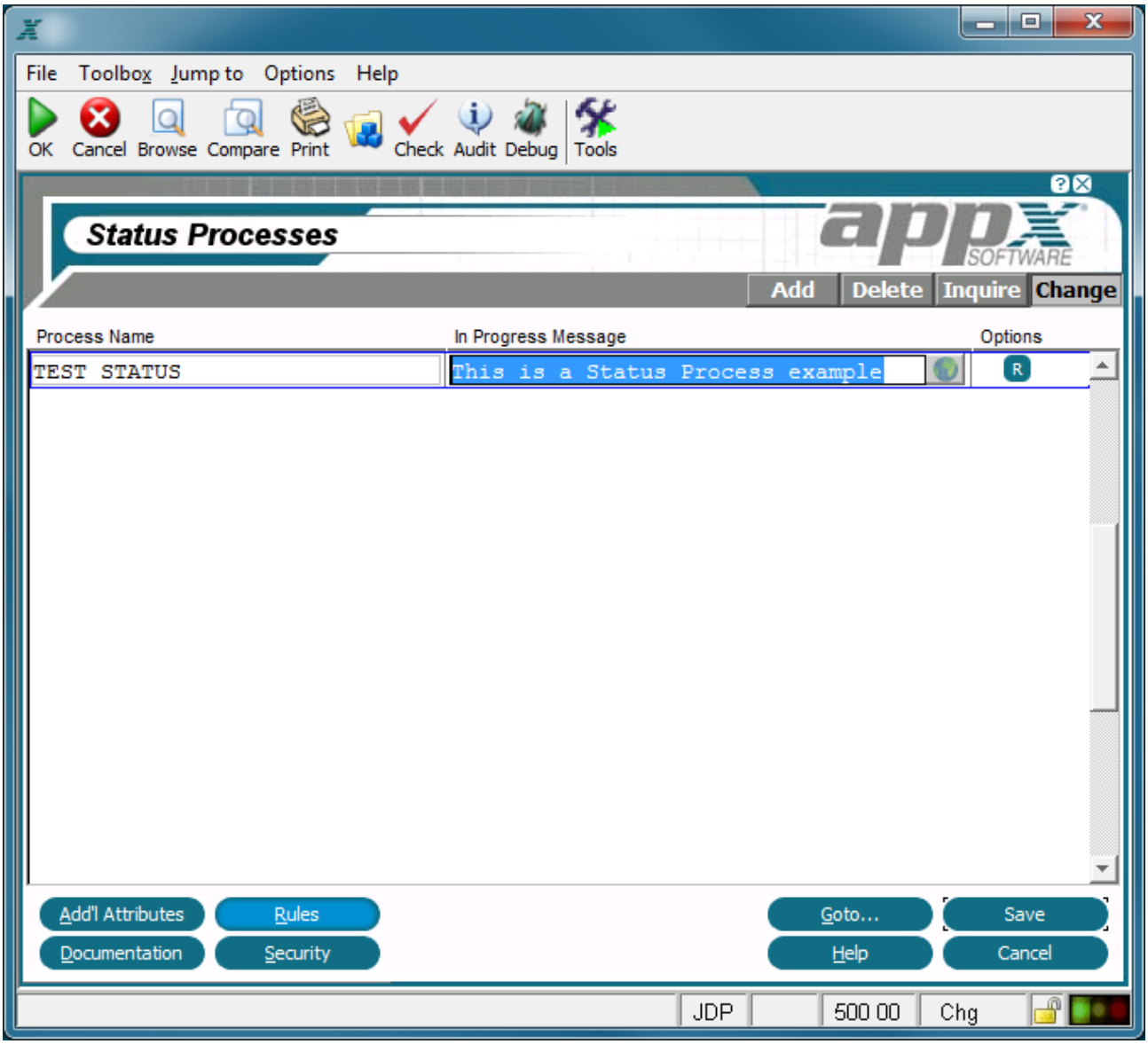
Status processes are used to provide various error reporting options.



Status Process Definition

Status Process Specifications

Status process specifications establish the general attributes of a status process. The Status Processes screen is shown below.



Status Processes Screen

The Status Processes screen, shown above, contains the following fields:

Process Name identifies a specific process that must be unique within type and application.

In Progress Message is the message that is displayed to the user while this process is running.

Opts are indicators that are present whenever documentation (T), rules (R), or additional attributes (AA) have been defined for this process.

The Status Processes screen contains the following options as described in the corresponding sections:

Additional Attributes

Rules

Documentation

Security

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

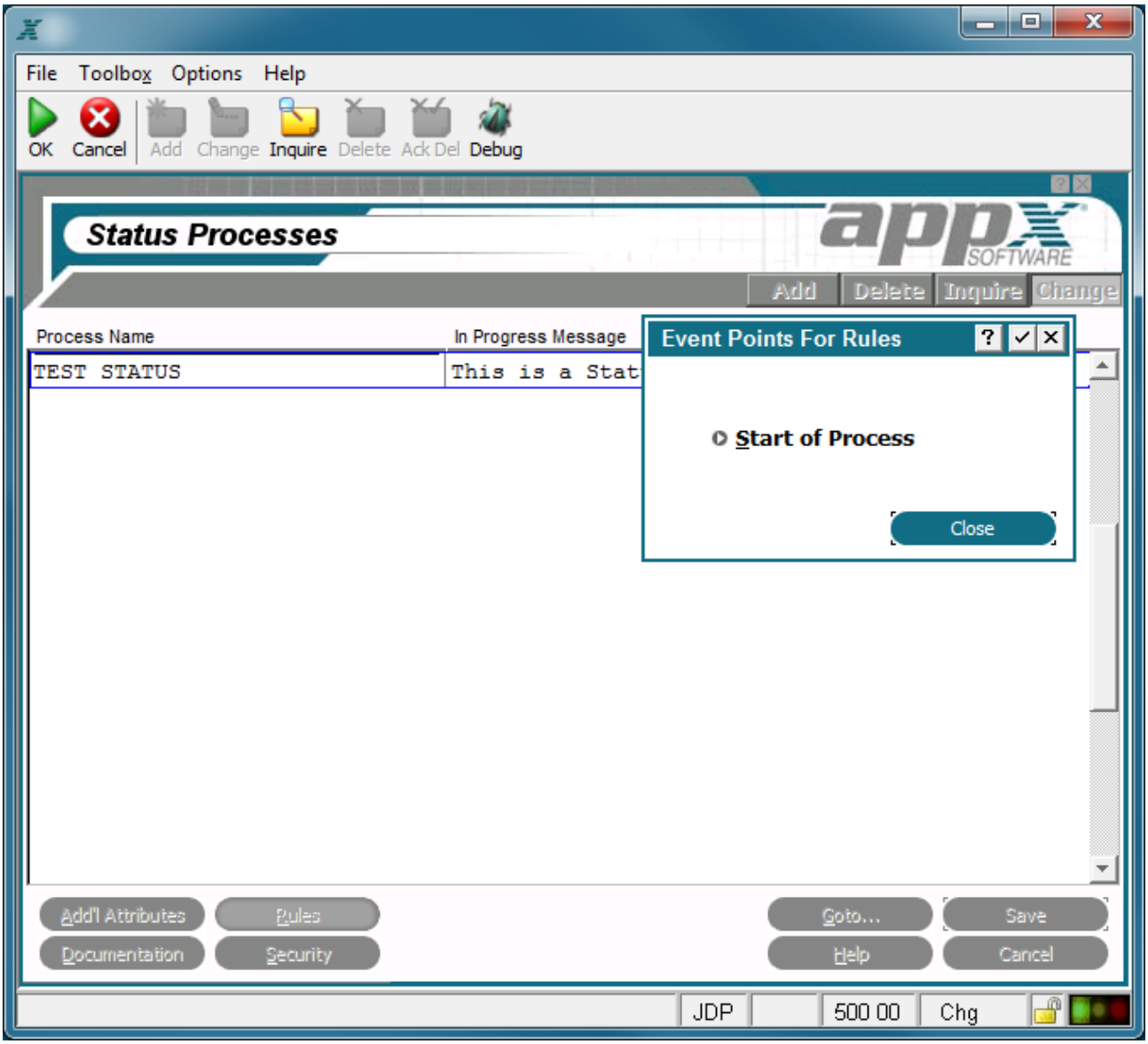
Status Process Rules Option

Selecting the Rules option accesses the status process Event Points For Rules overlay, shown below, which allows you to enter the ILF Editor and finish the status process. The status Event Points overlay contains the following option:

Start of Process

Start of Process, which is common to all types of processes, accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the process Event Points overlay.

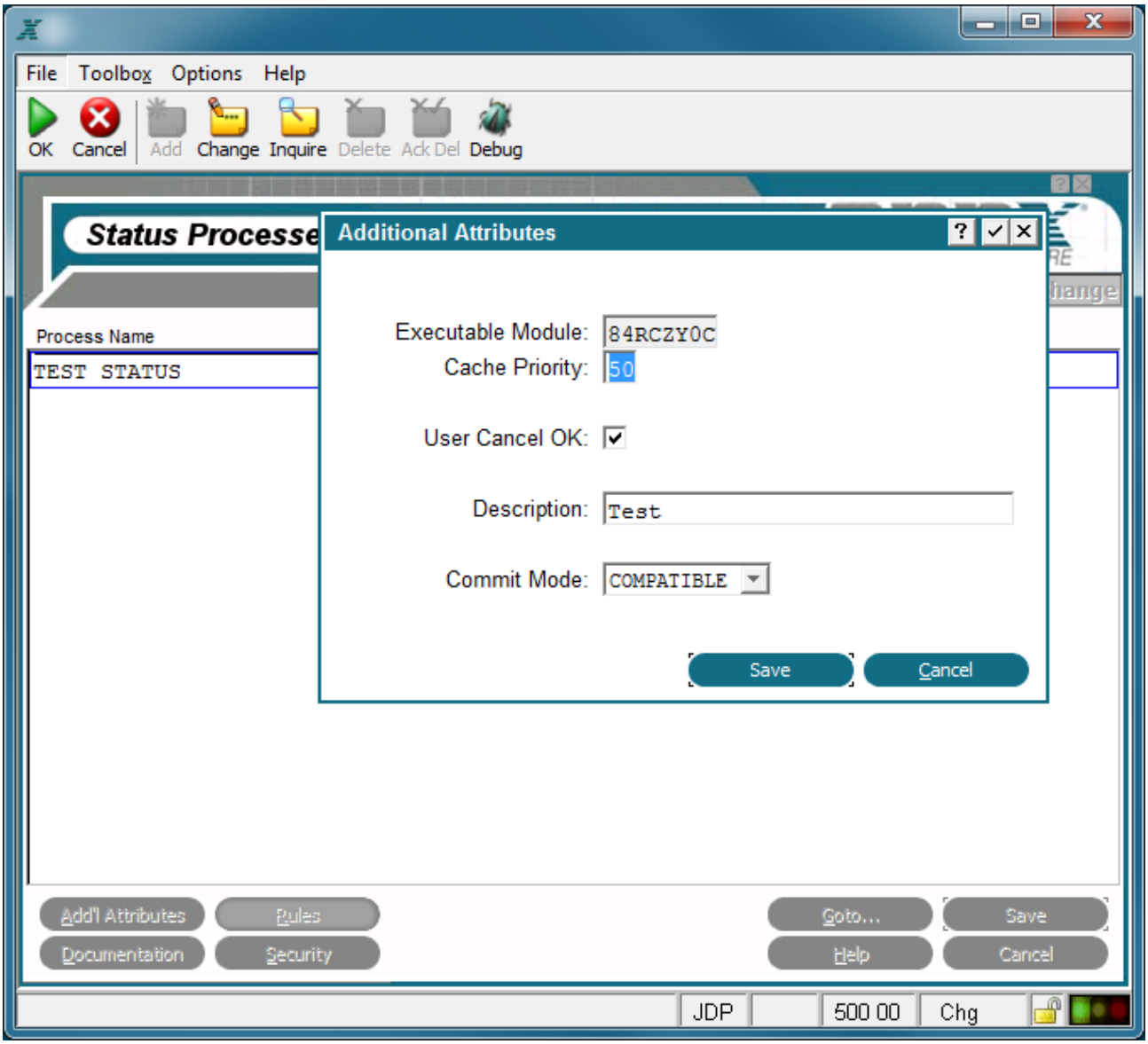
Refer to Using Event Points for more information.



Event Points For Rules Overlay

Status Process Additional Attributes Option

The Additional Attributes overlay for Status processes is shown below:



Status Process Additional Attributes Overlay

The Additional Attributes overlay for Status processes contains the following fields:

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected status process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name.

Cache Priority establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is *50*.

User Cancel OK? determines whether or not a user can select the Cancel option to stop the execution of this process. The default is 'yes' ☑. You can conditionally control the user's ability to select the Cancel option with statements and the predefined field CANCEL OK. This field is common to the Additional Attributes overlay for all types of processes.

Description is incorporated in the message that displays on the screen when the status process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank. The Additional Attributes overlay for all types of processes contain this field.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT*. APPX will commit each modification as it is made.

PCF CYCLE. APPX will commit modifications as each PCF record is processed.

END. APPX will only commit modifications at the end of the process family.

MANUAL. APPX will not automatically commit changes. You must use the COMMIT statement to do so.

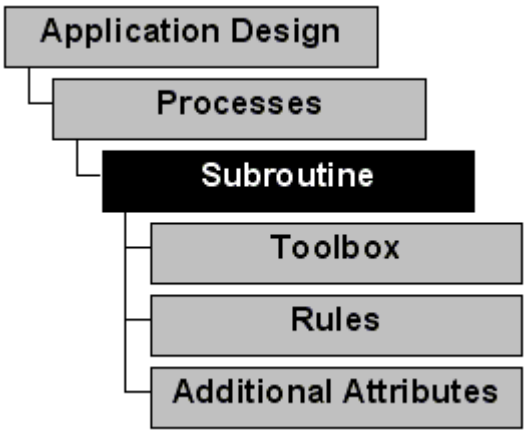
CHAPTER 3-12

Subroutine Processes

Introduction to Subroutine Processes

Subroutine processes are reusable procedural programs that can be executed from other APPX processes. A program that converts one unit of measure to another, for example, can be created as a subroutine.

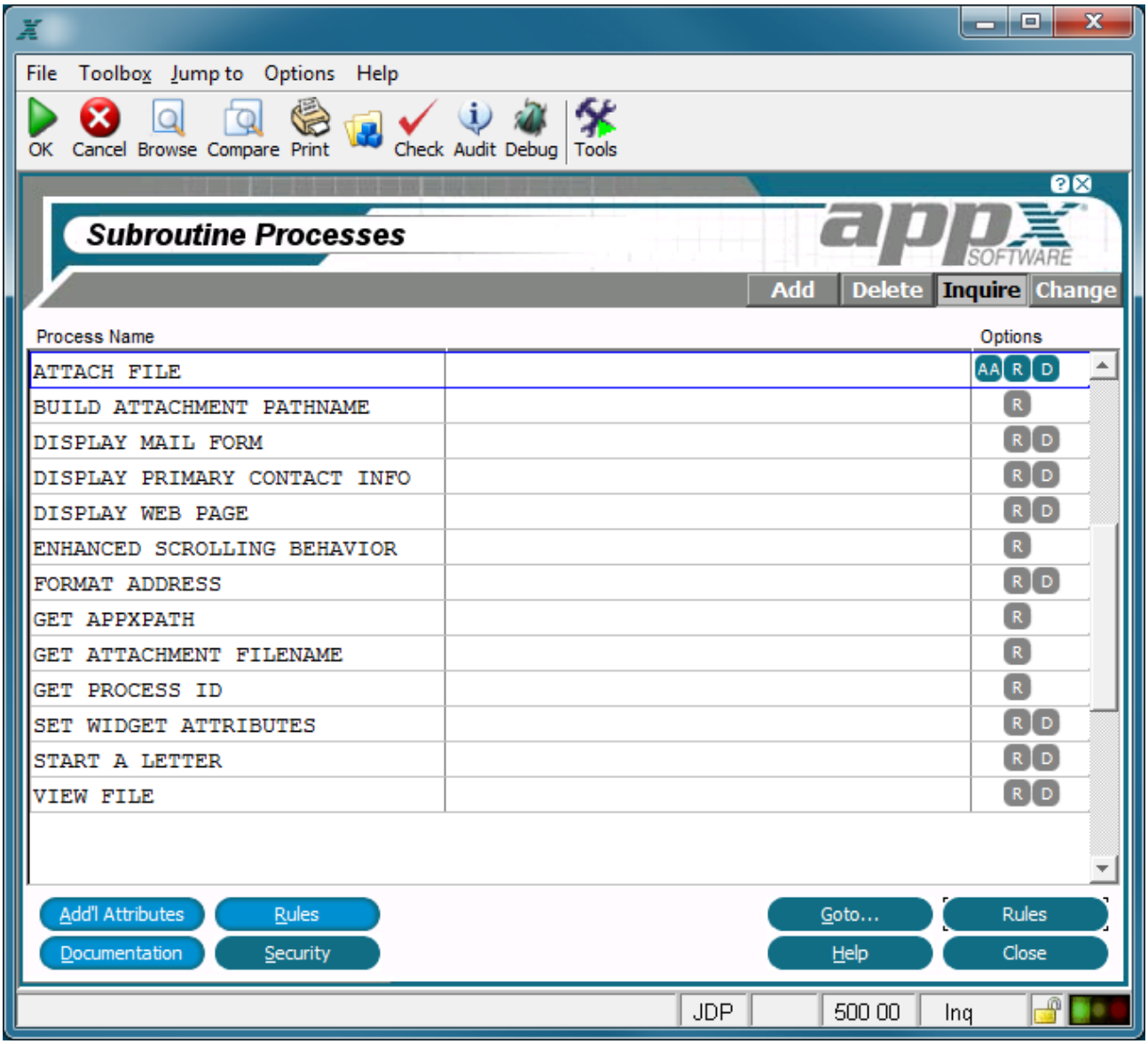
A subroutine process does not have frames, images, or automatic or optional children. After completing the specifications on the Processes screen to identify the subroutine process, you are automatically taken to the statement editor to define or modify ILF statements for the *Subroutine* event point.



Subroutine Process Definition

Subroutine Process Specifications

The Subroutine Processes screen accesses the APPX statement editor for the *Subroutine* event point. This screen automatically displays after you select the Subroutine option from the Processes overlay. The Subroutine Processes screen is shown below.



Subroutine Process Screen

The Subroutine Processes screen contains the following field.

Process Name identifies a specific process that is unique within type and application.

Opts are indicators that are present whenever documentation (T), rules (R), or additional attributes (AA) have been defined for this process.

The Subroutine Processes screen contains the following options as described in the corresponding sections:

Additional Attributes

Rules

Documentation

Security

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Rules - Open the ILF editor for entry and modification of subroutine coding.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

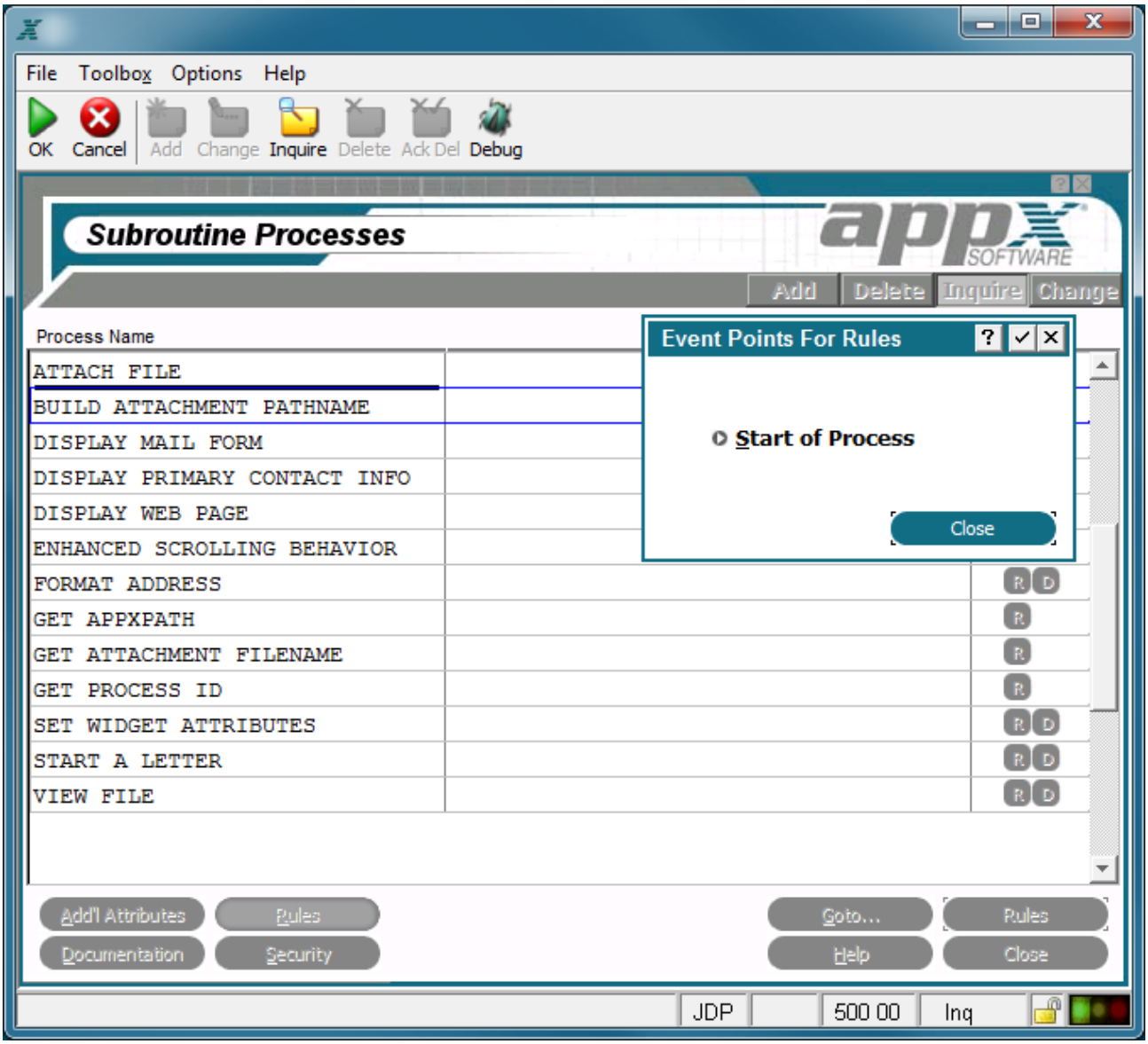
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Subroutine Process Rules Option

Selecting the Rules option accesses the subroutine process Event Points For Rules overlay, shown below, which allows you to enter the ILF Editor and finish the subroutine



Event Points For Rules Overlay For Subroutine Processes

The subroutine Event Points overlay contains the following option:

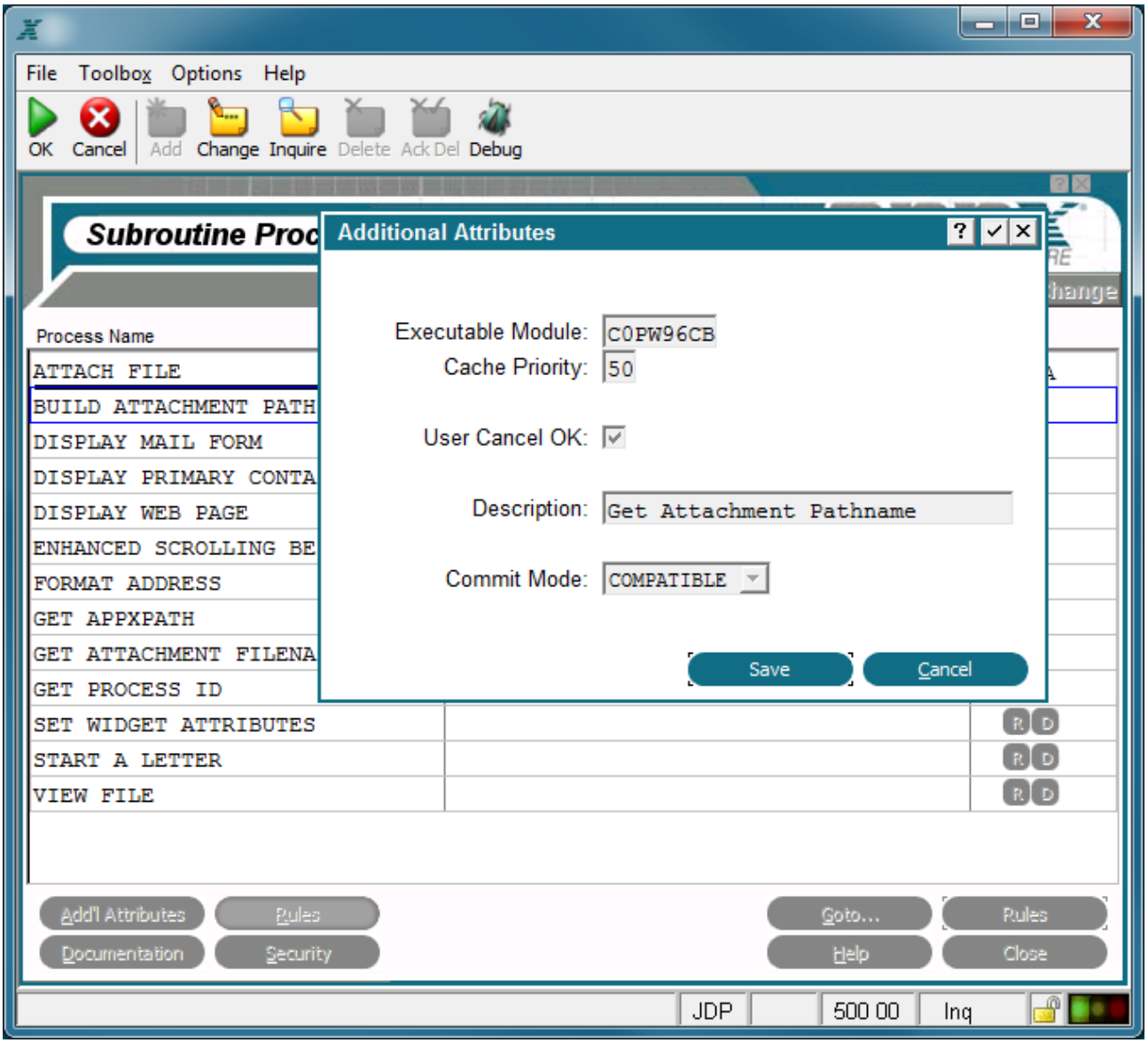
Start of Process

Start of Process, which is common to all types of processes, accesses the ILF editor for the Start of Process event point. Upon completion, you are returned to the process Event Points overlay.

Refer to Using Event Points for more information.

Subroutine Process Additional Attributes Option

The Additional Attributes option accesses the Subroutine Process Additional Attributes overlay from which you can alter the standard EM attributes. The Additional Attributes overlay for Subroutine processes is below:



Subroutine Process Additional Attributes Overlay

The Additional Attributes overlay for Subroutine processes contains the following fields:

Executable Module displays the name of the executable module (EM) that is automatically generated by APPX. APPX derives the file name from the date and time the currently selected subroutine process was added. The name consists of a unique string of eight alphanumeric characters and cannot be changed. If APPX finds it necessary to recreate the EM, the new EM retains the same file name. This field is common to the Additional Attributes overlay for all types of processes.

Cache Priority establishes the likelihood that the process will remain in memory after execution, relative to other processes that the user has also completed executing. A process with a cache priority of *99* is most likely to remain in memory. A process with a cache priority of *1* is least likely to remain in memory. A cache priority of *0* indicates that the process is never cached. The default is *50.* This field is common to the Additional Attributes overlay for all types of processes.

User Cancel OK? contains either 'yes' ☑ or 'no' ☐ and determines whether or not a user can select the option key to stop the execution of this process. The default is 'yes'. You can conditionally control the user's ability to select the Cancel option with statements and the predefined field CANCEL OK. This field is common to the Additional Attributes overlay for all types of processes.

Description is incorporated in the message that displays on the screen when the subroutine process is compiling. It is used to communicate with users since it provides a more descriptive and easily understood alternative to *Process Name*, which is the default if this field is left blank.

Commit Mode controls the commit mode for a process and can be selected from a drop-down list of available options. *Commit Mode* determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it has no effect with APPXIO. Also, not all File Managers support this feature. Although initially set here for the process, it can be added or overridden by use of predefined field COMMIT MODE. The following options are available:

COMPATIBLE. Changes are committed as soon as all locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables.

AUTOCOMMIT*. APPX will commit each modification as it is made.

PCF CYCLE. APPX will commit modifications as each PCF record is processed.

END. APPX will only commit modifications at the end of the process family.

MANUAL. APPX will not automatically commit changes. You must use the COMMIT statement to do so.

CHAPTER 3-13

Table Processes

Table Overview

The Table Widget allows the designer to present information to the user in a scrollable table. The user can rearrange the columns, sort the columns (ascending/descending), change the width and select single or multiple rows.

The designer controls what records and columns appear in the table, and can have some rows pre-selected. The designer also controls what action should be taken when the user clicks or double clicks a row.

The data in the table can come from a temporary file (memory or disk based) or a permanent file. More than one Table Widget can be present on an Image.

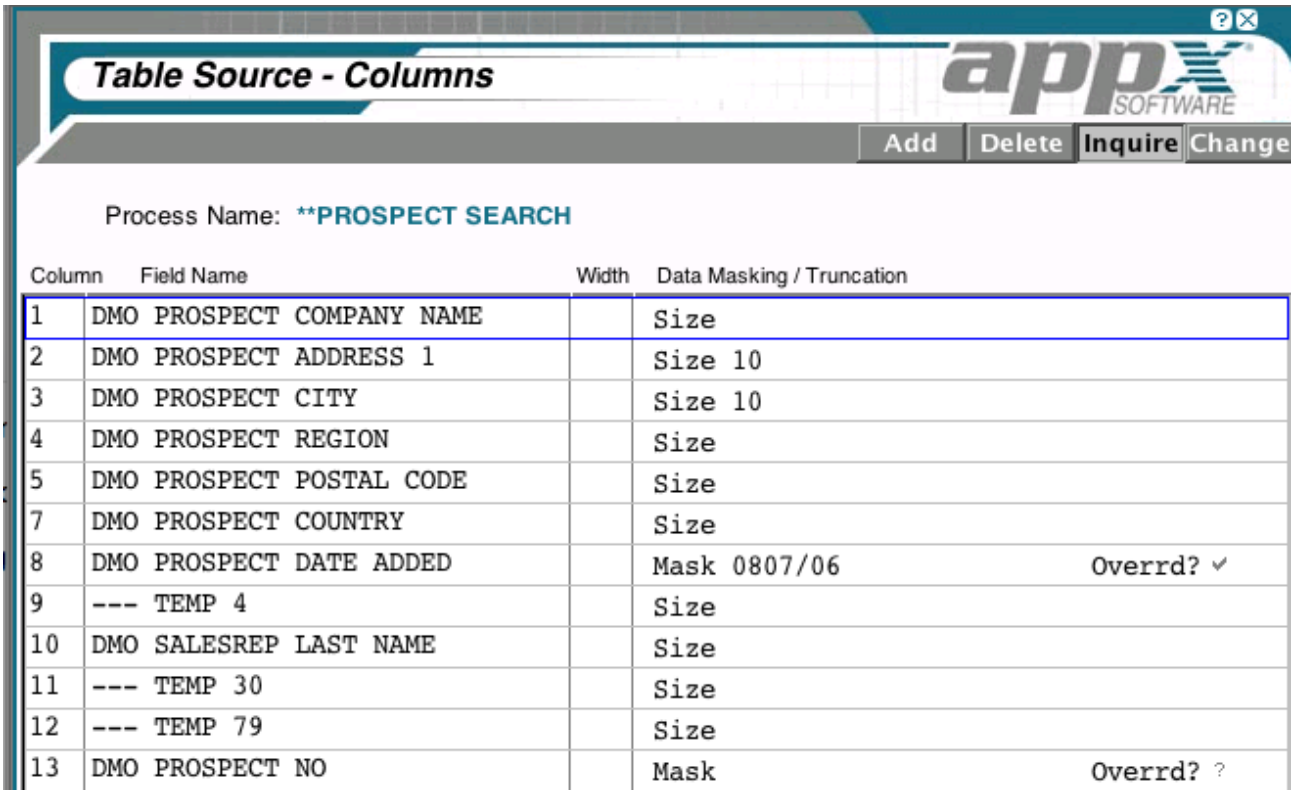
Editting the data in the table is not supported at this time.

To support the Table Widget, a new process type has been added - Table Sources.

Creating a Table

The first step in using a Table Widget in your input process is to define a 'Table Source' (look under Processing Objects/Status Checks or under the 'Specifications' pull down menu on the Specifications Tab of Application Design). The Table Source is like a simplified input process that identifies the PCF file to use and which fields to include. For each field you can specify a mask (date and numeric fields) or a size (alpha fields). Via ILF code, you can decide which records to include in the table and pre-select certain records.

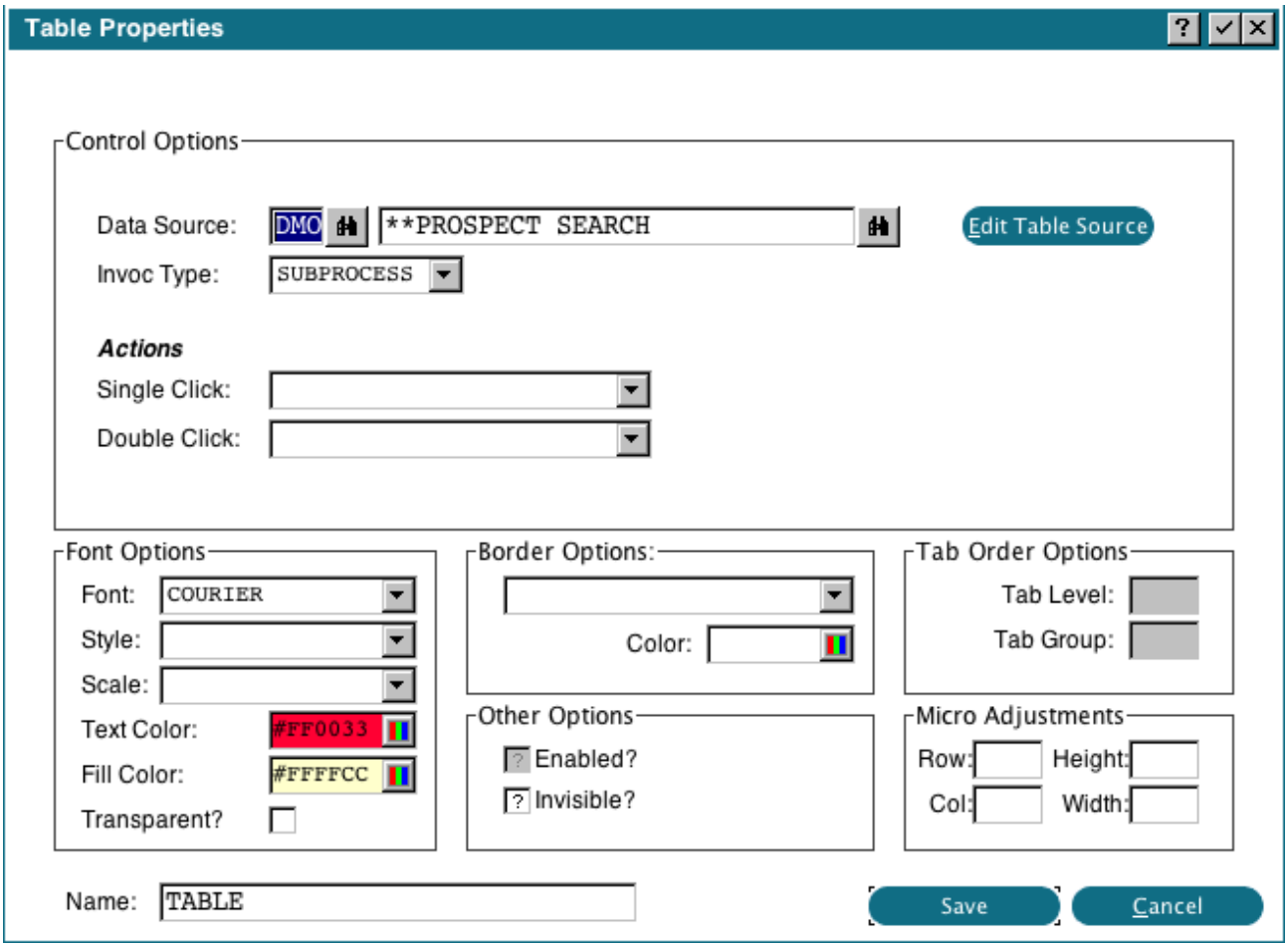
Add a new Table Source, identifying the PCF file to use. On the next screen you can list the fields you want included in the table. The order you list them here is the order they will initially be presented to the user. The 'Column' number controls the order of the columns, arrange this however prefer. For each field on the list, you can set either the size or mask, depending on the field type.



Column	Field Name	Width	Data Masking / Truncation
1	DMO PROSPECT COMPANY NAME		Size
2	DMO PROSPECT ADDRESS 1		Size 10
3	DMO PROSPECT CITY		Size 10
4	DMO PROSPECT REGION		Size
5	DMO PROSPECT POSTAL CODE		Size
7	DMO PROSPECT COUNTRY		Size
8	DMO PROSPECT DATE ADDED		Mask 0807/06 Overrd? ✓
9	--- TEMP 4		Size
10	DMO SALESREP LAST NAME		Size
11	--- TEMP 30		Size
12	--- TEMP 79		Size
13	DMO PROSPECT NO		Mask Overrd? ?

There are 4 Event Points associated with the Table Source Process, Start of Process, Post PCF Read, End of Process and File Level Event Points. The Start of Process Event Point executes when the table widget is loaded and the End of Proces Event Point executes when all records have been read. This occurs during the Pre-Display Event Point of the Input process, and may occur more than once depending on how you handle single and double click events (see below). The Post PCF Read event point executes for each record read in the PCF. You can use this to look up data from related fields, exclude records or pre-select records. To exclude a record, set --- INCLUDE RECORD to N. To pre-select a record, set --- SELECT RECORD to Y.

Once you have the Table Source process defined, you are ready to add a Table Widget to an input process. In the Image Editor toolbar, there is a new icon called 'Paint a Table'. Use this tool to draw a rectangle on the image. When you release the mouse, a 'Table Properties' dialog box will appear. This is where you specify the Data Source (the Table Resource process you defined earlier), the invocation type and what options to fire when the user single or double clicks a row (if any). You can also give this widget a name. This will make it easier to tell Table Widgets apart if you are going to have more than one Table Widget on the image.



Once you fill in these details and press Return, the Table Widget will be displayed. The columns and rows will be filled with dummy data to give you a representation of the widget and to help you distinguish the Table Widget from other Widgets on the image.

The Table Widget at Runtime

When the Input process executes, after the Pre-Display event point runs, the Table Widget(s) will be loaded. Each Table Widget will execute the Event Points in the Table Source process as described above. You can prevent a Table Widget from loading by setting --- WIDGET RELOAD DATASOURCE to "N" in the Pre-Display event point. You might want to do this if the PCF for the Table Source contains a large number of records, and you don't want the table loaded until the user has a chance to enter some filter criteria.

If you have specified an Option for either the Single click or Double Click actions, then those Options will fire when the user clicks a row. This is no different than the user clicking a button that fires an Option, so the Option Intercept event point will execute first. If --- OPTION still contains the USER XX value after the Option Intercept event point ends, then Appx will continue it's normal processing, i.e., it will attempt to run the specified Optional Child, then re-execute the normal event points for the image,

including Pre-Display. This means your Table Widget will be re-executed as well, and the data reloaded (unless you have turned off the --- WIDGET RELOAD DATASOURCE spec). If you do not want this to happen, you should set --- OPTION to blank in the Option Intercept Event Point. Conversely, if you want the Table Widget to reload, but do not want all the other Event Points in the Input process to fire, you can use the --- .WIDGET RELOAD DATASRC subroutine, then set --- OPTION to blank. Since --- OPTION is blank, no other event points will execute, and since --- WIDGET RELOAD DATASRC was run, the Table Widget will re-execute.

> Note that if you do not set an Option to fire when the user selects a row or rows, you will need some other method for the user to signal that they are done selecting rows. For example, you could put another button on the image that they click. You can test for that Option, and if true, examine the --- SLCTKEYS memory file to see which keys were selected.

The --- SLCTKEYS memory file contains one record for every row the user selected (including any rows you pre-selected via --- SELECT RECORD). This file is keyed on the Parent Type of the Table Widget (which will always be WIDGET), the row and column position of the Table Widget and a unique sequence number for each row selected. The --- SLCTKEYS PCF KEY VAL field contains the Primary key to the PCF record. You do not have to include the primary key of the PCF file in the Table Widget, Appx will supply that value regardless.

If you have more than one Table Widget on the image, you can use the row and column position to differentiate them. Or, if you gave your Table Widget a name, you can use that to read the --- WIDGET file, then use --- WIDGET KEY in a BEG AT/END AT loop on --- SLCTKEYS to only read records for that Table Widget. For Example:

```
      SET      --- WIDGET NAME                =      <widgetname>
      READ     --- WIDGET                 HOLD 0 FT 0 BY WIDGET NAME
T     BEG AT   --- SLCTKEYS IN --- WIDGET KEY
T     END AT   --- SLCTKEYS IN --- WIDGET KEY
T     BEG READ --- SLCTKEYS               HOLD 0 KEY IS  SLCTKEYS KEY
```

The --- SLCTKEYS PCF KEY VAL field is an alpha field that may contain binary characters if the PCF Primary key is a numeric field. In this case, you cannot simply move the --- SLCTKEYS PCF KEY VAL field to the numeric field, you need to have a group field that contains the numeric field and move --- SLCTKEYS PCF KEY VAL to that field.

The user can click a column heading to sort the data in ascending or descending order, and they can drag the columns to re-arrange them. These changes will remain until the process is restarted, at which point the widget will revert to the designer's specifications.
Modify via ILF

You can also create or modify the Table Widget via ILF code. The fields unique to the Table Widget are:

WIDGET WIDGET TYPE - must be TABLE
WIDGET D SRC AP - The Application ID of the Table Resource
WIDGET D SRC NAME - The process name of the Table Resource
WIDGET D SRC INV TYPE - The invocation type of the Table Resource process
WIDGET OPTION - The option to fire on a single click
WIDGET OPTION 2 - The option to fire on a double click

Using HTML

You can embed HTML in a Table Widget column. The Table Widget control will check your HTML for valid syntax (ie, matching opening and closing tags) and if no problems are found, it will attempt to display it. If the HTML is not syntactically valid, it will be 'cleaned', ie, incorrect HTML will be removed. This is done so that the Table Widget will still display, otherwise invalid HTML would prevent the Table widget from displaying. If you are not getting the results you expect from your HTML code, check to make sure your HTML is valid and not getting truncated.

CHAPTER 3-14

Automatic and Optional Children

Introduction to Automatic and Optional Children

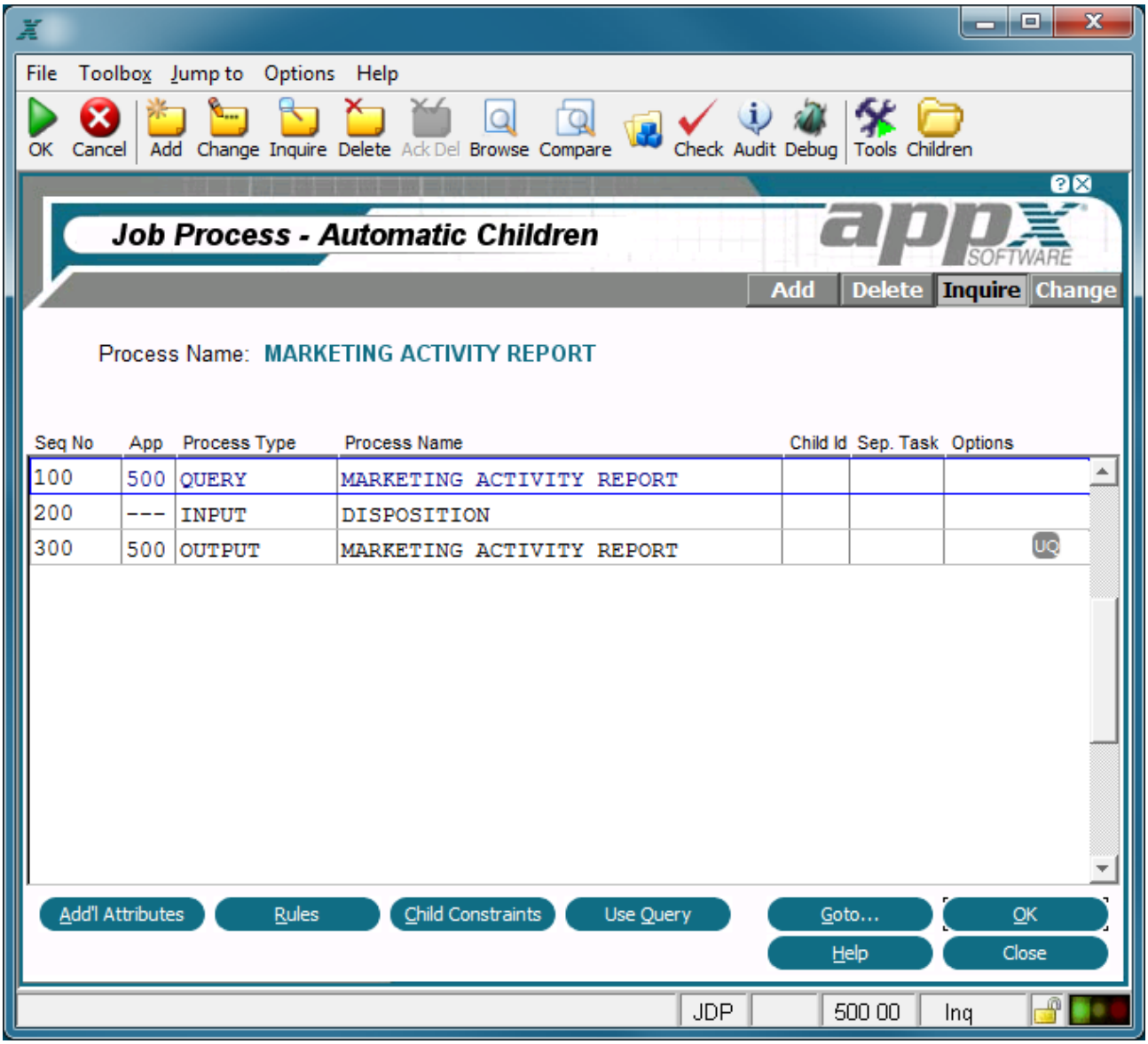
Children are simply processes that are invoked from another process (the *parent* process). If they are invoked as a result of an option selection by the user, they are optional children. If they are invoked by APPX without user intervention, they are automatic children.

APPX does, however, impose certain restrictions on the types of processes that can invoke children. Optional children can only be invoked from interactive images in menu and input processes. Automatic children can be invoked from frames in job, input, output, update, and inquiry processes. See the Automatic and Optional Child Invocations Overview of APPX Processes for more on invocation.

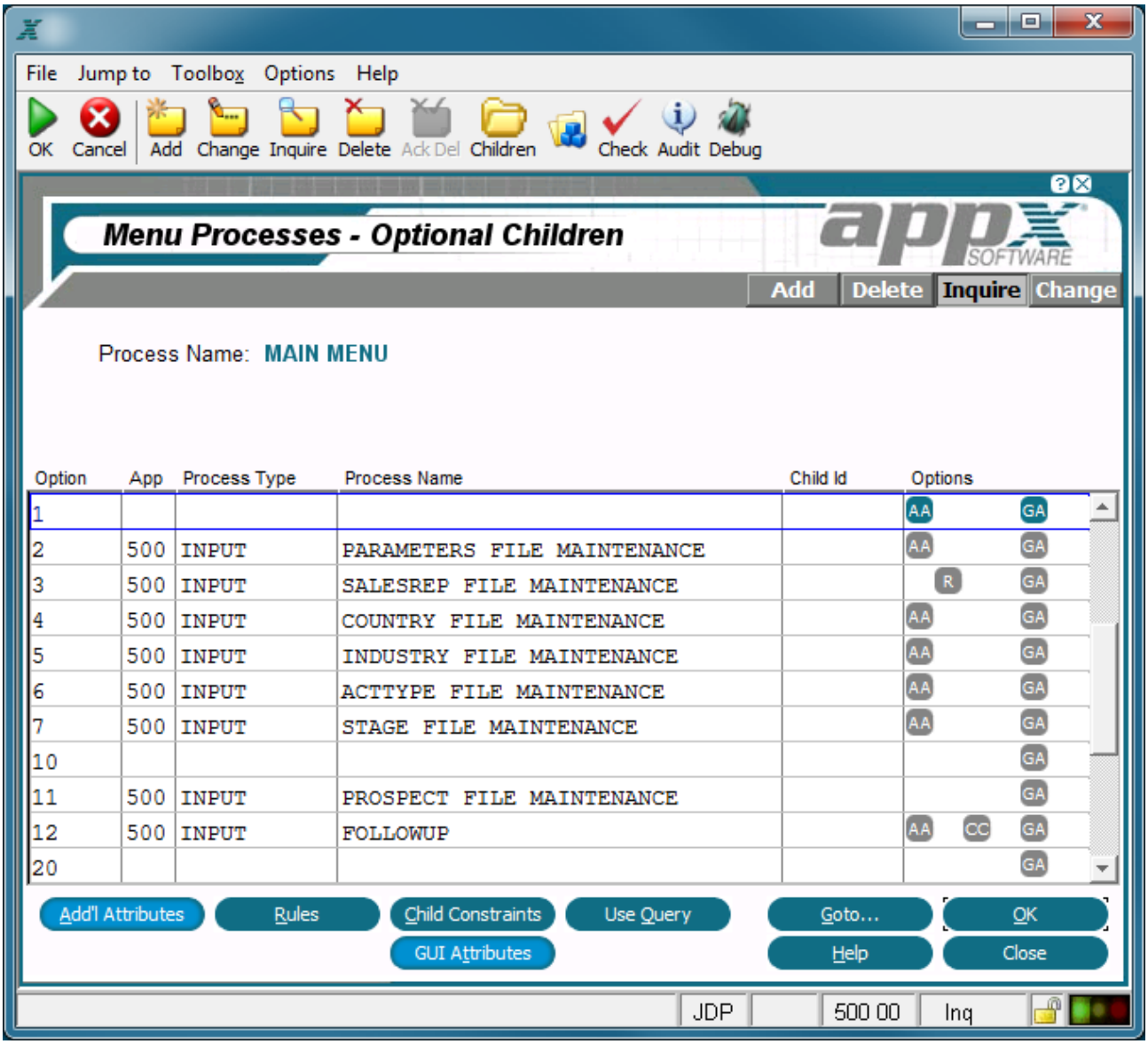
Child Specifications

The Child specification screen is a scrolling display that identifies APPX processes to be invoked either automatically or optionally from another APPX process. The specifications that follow are a composite of those you see when defining automatic and optional children. If a specification only displays for a specific type of child, the definition indicates so.

You access the Automatic Child Processes specification screen, shown in below, by selecting Automatic processes from the Frames specification screen for input, output, update, and inquiry processes, or by selecting Steps from a job processes screen. You access the Optional Child Processes specification screen, shown in the second figure below, by selecting Optional Processes from the Images specifications screen for input processes, or by selecting Optional Processes from the Menu Processes screen.



Automatic Child Processes Screen



Optional Child Processes Screen

The child screens display one of the following two fields, depending upon whether the child process is automatic or optional.

Seq No for an automatic child, establishes the order in which this child is invoked for this frame. You can explicitly alter this default execution sequence with statements and the *Child ID* specification. The first automatic child that is defined in add mode is assigned sequence number *100*, and additional fields are assigned a number equal to the highest existing sequence number, plus *100*. This default sequence number can be overridden, but must be unique for each automatic child that is invoked from the same parent process frame.

Option for optional children, represents the number of the option that a user must select to invoke this optional child process from a menu or an input image. The number must be unique for each optional child that is invoked from the same parent process image. There is no sequential relationship that is established between any two or more optional children.

The following specifications uniquely identify a process to be invoked as an automatic or optional child.

Process Type identifies the type assigned to the process that is to be invoked as an automatic or optional child. The *Process Type* options are Menu, Job, Input, Output, Update, Query, Inquiry, Status, and Subroutine. See *Overview of Appx Processes* for an explanation of the different process types.

App identifies the application that contains the process to be invoked as an automatic or optional child.

Process Name designates the process that is to be invoked as an automatic or optional child. To invoke the startup menu for a selected database, define the process type as *MENU*, and leave the application ID and process name blank. To invoke the startup menu for a particular application, fill in the application ID and leave the process name blank.

Child ID can be used to control execution sequence for automatic children. For both automatic and optional children (that do not execute in any predetermined sequence), the field can also be used to pass four characters of information to the child process with the CHILD ID predefined field. If the automatic children are to invoke in *Seq No* order, leave this specification blank. If the automatic children can be invoked in other than *Seq No* order, the *Child ID* functions as a label. You use this specification in conjunction with statements and the predefined field NEXT CHILD ID to modify the execution sequence. Refer to Using Event Points for additional information.

Separate Task? For automatic child processes, select 'yes' ☑ if you want the child process to be run as a separate task in background. A *task* is defined as a single APPX session. If 'no' ☐, the process cannot start a separate task. If 'yes', the process will start a separate task if the operating system supports background processing and if the operator selected the *Background* option from a disposition screen. This task is independent of, and runs concurrently with, any subsequent child processes. If you want to run several processes within a single background session, you must create another job, and define the processes in that job as NOT being separate tasks. You must then invoke that job as a child process with *Separate Task?* ☑ in place of the originally invoked child processes. The default is 'no'.

Options are indicators that are present whenever documentation (T), rules (R), additional attributes (AA), child constraints (CC), use query (UQ), or GUI attributes (GA) have been defined for this child.

The following options as described in the corresponding sections are available on one or both of the child screens:

Additional Attributes

Rules

Child Constraints

Use Query

GUI Attributes

Goto... - Allows you to identify and retrieve another record by optionally entering a full or partial key.

Help - Allows you to view online help text for a selected item.

Close or **Cancel** - In Inquire mode, Close allows you to end the current process. Otherwise, cancel allows you to end the current process without saving changes, if any, to the current record.

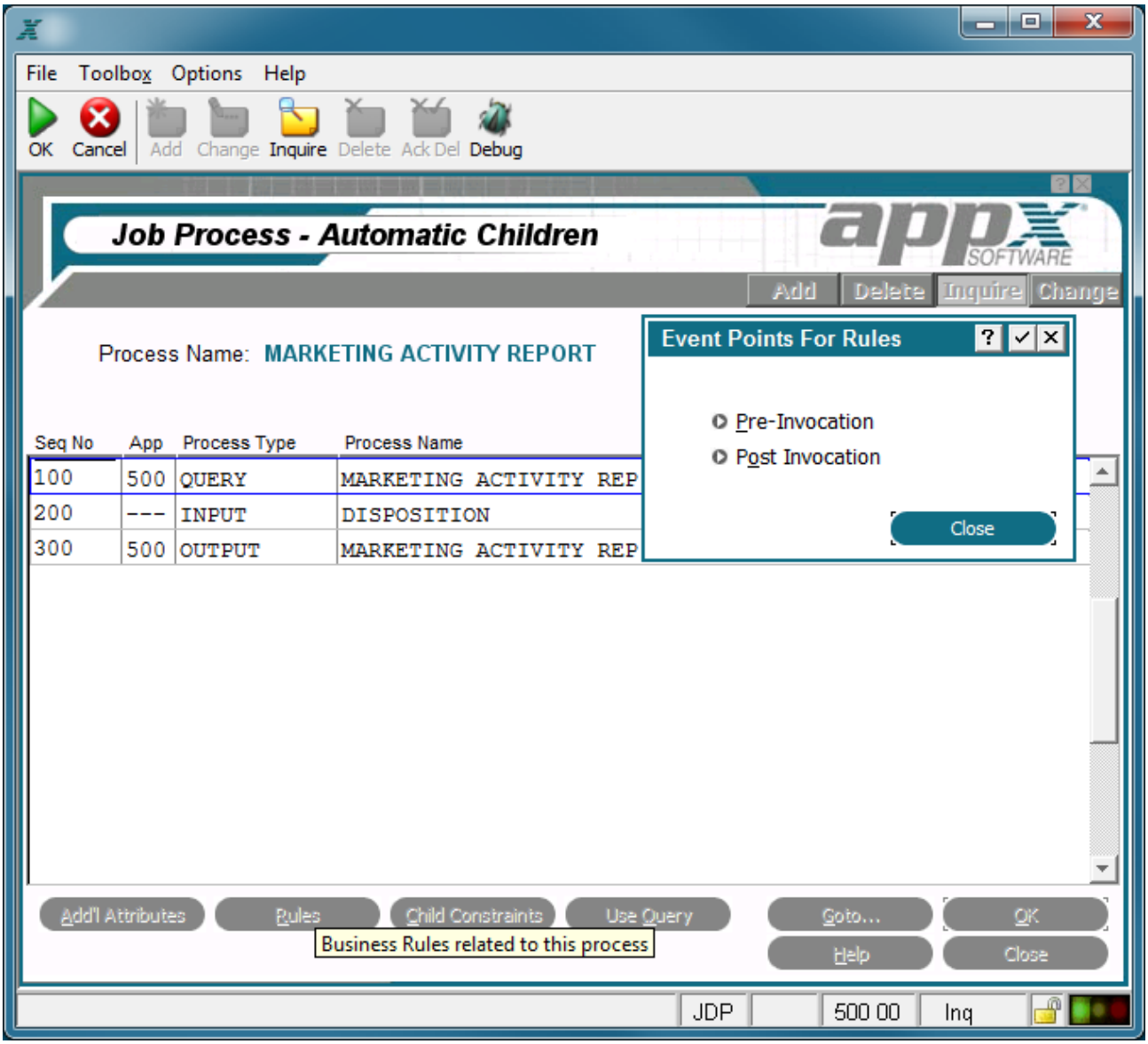
In addition, the menu bar provides the following pulldown menus:

Toolbox - Same as the Process Toolbox Pulldown Menu.

Jump to - Same as the Process Jump to Pulldown Menu.

Child Rules Option

Rules accesses the Event Points For Rules overlay, shown below. If statements were defined in the event point for the option that is currently active on the screen, the event point text is highlighted.



Child Event Points For Rules Overlay

The child Event Points For Rules overlay contains the following options:

Pre-Invocation

Pre-invocation accesses the ILF editor screen for the Pre-Invocation event point. Upon completion, you are returned to the child Event Points overlay.

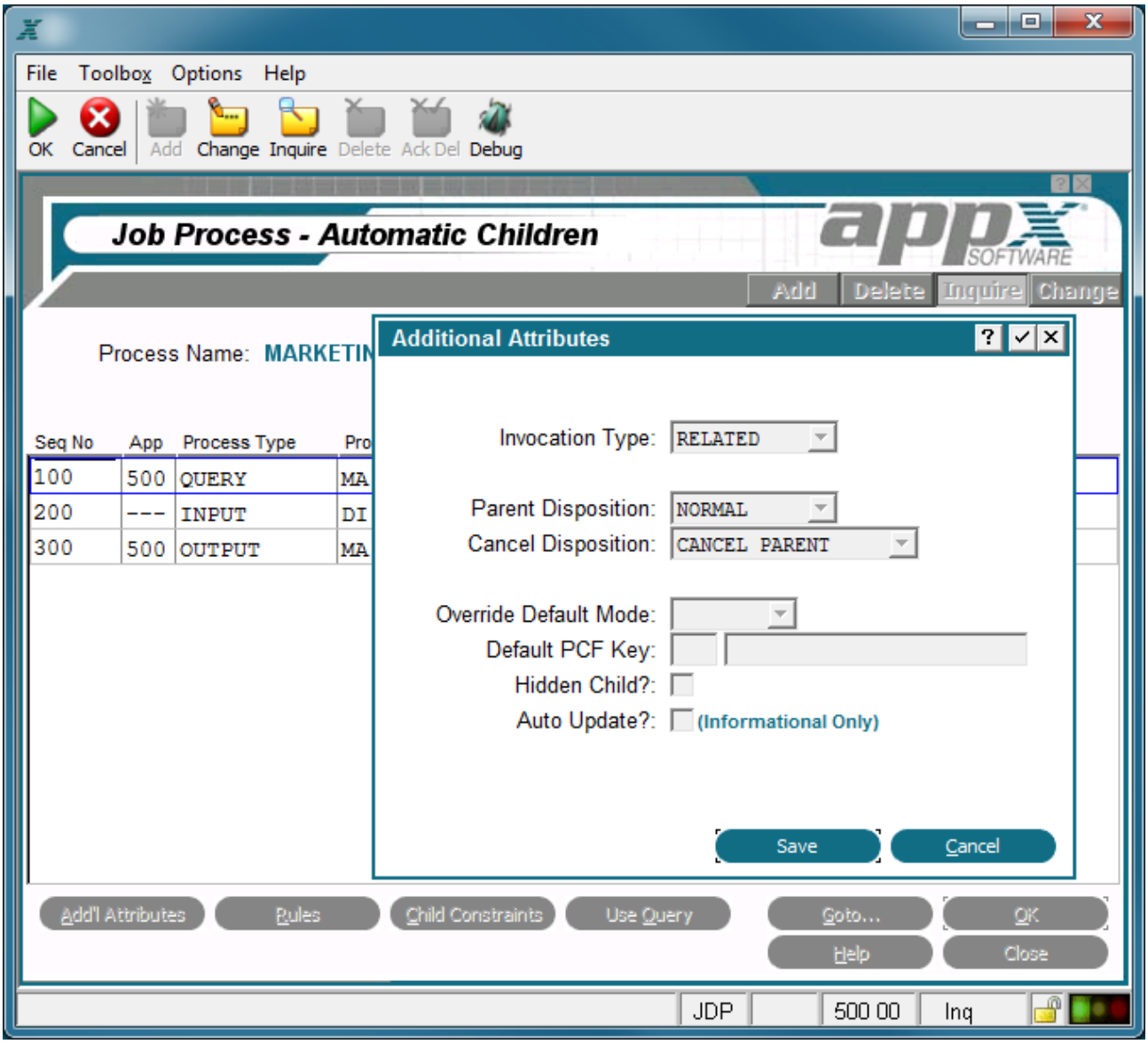
Post Invocation

Post Invocation accesses the ILF editor screen for the Post Invocation event point. Upon completion, you are returned to the child Event Points overlay.

Refer to *Using Event Points,* for additional information.

Child Additional Attributes Option

Additional Attributes allows entry of invocation type, parent, and cancel dispositions. The child Additional Attributes overlay is shown below.



Child Additional Attributes Overlay

The child Additional Attributes overlay contains the following fields:

Invocation Type defines the boundaries of shared information between the parent and child process, or how tightly coupled the child is to the parent. It determines the types of information (such as a record area, a file position or the contents of a temporary file) that the parent process can pass to and share with the child process it invokes. Whether or not a specific item of information is passed or shared depends upon *Pass* and *Share* specifications that were entered in the data dictionary, or defined

explicitly with statements. The options (ranked from most to least tightly coupled) are *SUBPROCESS, RELATED, DETACHED*.If you enter a partial value, APPX selects the option with the next highest value. For example, an entry of *REL* or *R* is equivalent to entering *RELATED*. See *Interprocess Communication* for more information about Interprocess Communication.

Parent Disposition determines what happens to the parent process when a child process is invoked. The Parent Disposition options are:

NORMAL. The parent process resumes after the child process completes. For example, after a line item entry process (the child) completes, the user returns to the order header entry process (the parent) to enter the next order.

END BEFORE. The parent process completes immediately before the child process invokes. The parent's End of Process event point executes and the parent process ends before the child is invoked. After the child process completes, the user is positioned wherever they would have gone if the parent process had ended normally.

END AFTER. The parent process completes immediately after the child process ends. After the child's End of Process event point executes, the parent's *End of Process* event point executes and the parent process ends.

The default is NORMAL.

Cancel Disposition governs the effect of a user electing to terminate the child process with the APPX cancel option. The *Cancel Disposition* options are:

DISABLE. The user is not permitted to cancel the child process.

RETURN TO PARENT. The parent process resumes after the user cancels the child process.

END PARENT. The parent process is ended if the user cancels the child process.

CANCEL PARENT. The parent process is also cancelled if the user cancels the child process.

The default is *Return to Parent* for optional children and *Cancel Parent* for automatic children.

Override Default Mode. A child process automatically defaults to the same mode as the parent process unless you enter a specific mode here. In the case of query child processes, note that this specification can affect how a query is processed. Usually, mode is left blank or specified as ADD for a query. However, if you intend to reuse existing query temporary files while repeating query setup, enter CHANGE here in order to preserve any runtime modifications to the initial query setup. See Populating Query Files and Child Use Query Option for more information.

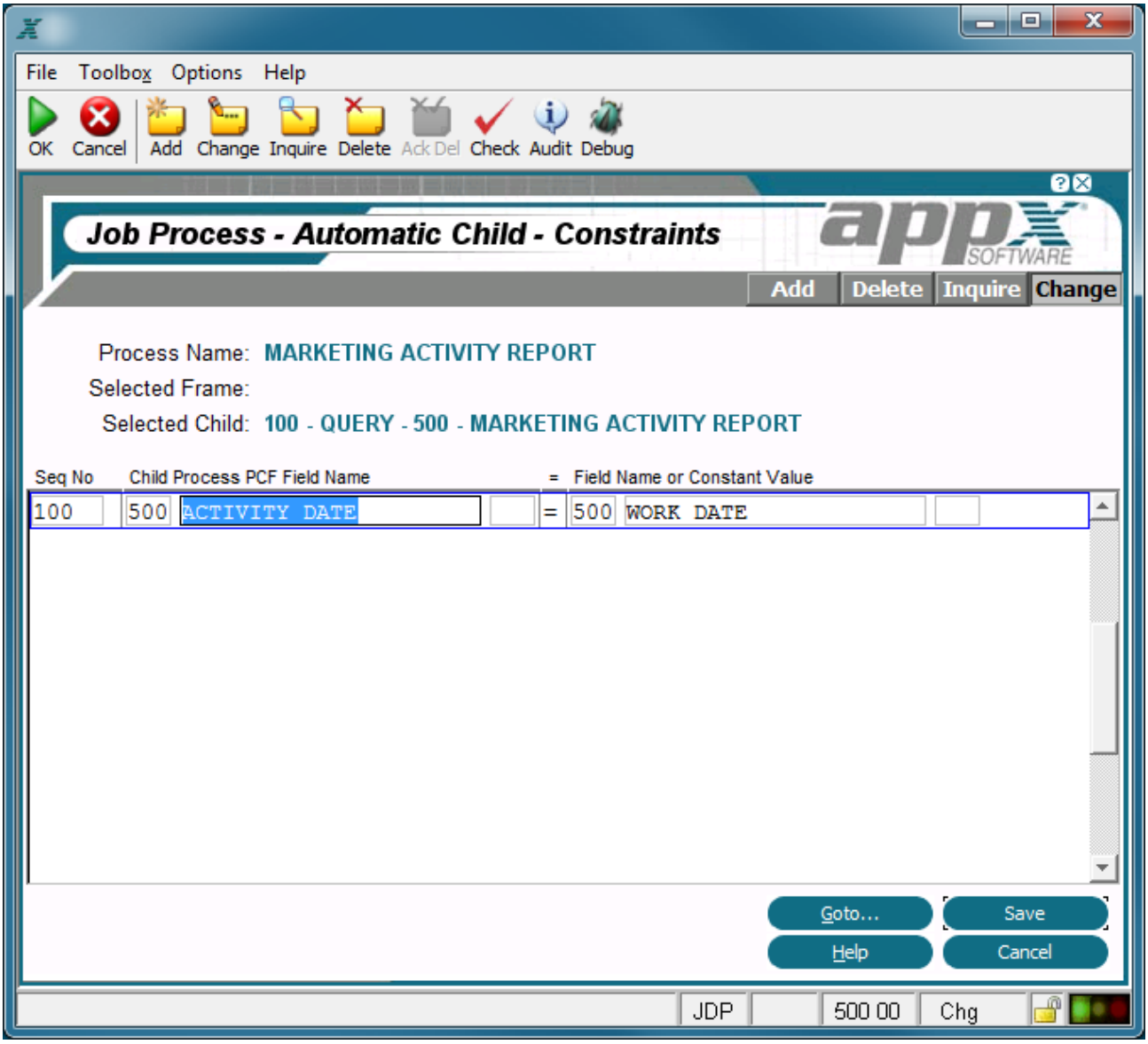
Default PCF Key determines the specific keypath that is initially presented to a user for this child process. This specification overrides the keypath that is defined at the process level. If keypath specifications are blank at all levels, the primary key is the default keypath.

Hidden Child? Indicates whether or not this child should be excluded from generated KEATerm displays. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Auto Update? For informational purposes only, this field indicates whether or not the child record will be automatically updated or deleted to correspond with updates/deletes of the parent record. The checkbox will contain 'yes' ☑ or 'no' ☐. If child records are specified with "Delete Protection", as defined in File Structures, Record Protection, then those child records will not be deleted by Auto Update processing.

Child Constraints Option

Child Constraints allows entry of child selection criteria specifications. The Child Constraints overlay, shown below, is a scrolling display.



Child Constraints Overlay

The Child Constraints Overlay contains some or all of the following fields.

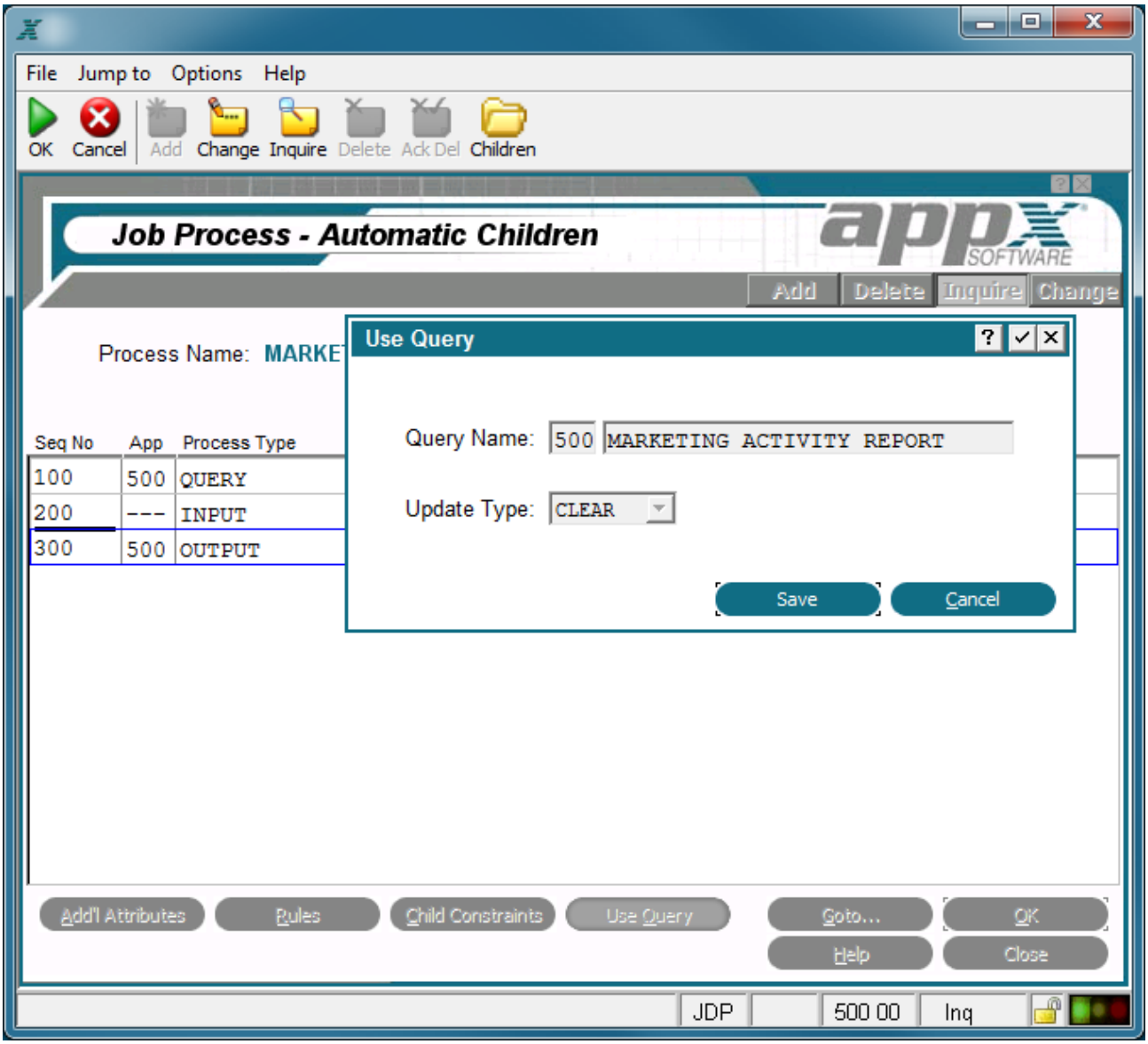
Seq No displays a sequence number that is defaulted by APPX. This default sequence number can be overridden, but must uniquely identify each constraint. Since all of the constraints are ANDed together, the order the constraints are applied in is not significant. The first field that is defined in add mode is assigned sequence number *100*, and additional fields are assigned a number equal to the highest existing sequence number, plus *100*.

Child Process PCF/App/Field Name/Occ designates the field (by application ID, field name, and occurrence number) from the child's process control file, which must be equal to the *Field Name or Constant* entered beside it. This entry is not restricted to a key field.

App/Field Name or Constant/Occ identifies a field or constant. The field you entered above must be *equal to* this field or constant. Other relations (for example, *LE* or *GT*) are not permitted.

Child Use Query Option

For automatic child processes, the Use Query option identifies a specific query process by *Application* and *Process Name* that determines the records available to this child process. This specification affects input, output, and update processes. The Query Name on the Use Query option screen will default to the prior query entered in the job stream. If the name of the query is changed you must change this entry on the Use Query specification to match if that is your intention. The child Use Query overlay is shown below.



Child Use Query Overlay

The child Use Query overlay contains the following fields.

Query Name. The PCF of the query that is identified by this specification must match the PCF of the child process.

Update Type determines the disposition of any existing pointer file for the query process to be used. The query *Update Type* options are:

1 - NORMAL. Generate the pointer file if it does not yet exist. If the pointer file exists, use it without re-executing the query.

2 - CLEAR. Discard any existing pointer file and generate a new one.

3 - CASCADE. Apply any new constraints to further restrict the contents of an existing pointer file.

> Note that if the new constraints are less restrictive than the constraints that were used to generate the existing pointer file, the *CASCADE* option will not add records to the pointer file. In such a case, you should use the *CLEAR* option.

Also, if you intend to reuse an existing pointer file and yet repeat the query setup, be sure that you specify CHANGE as the Override Default Mode in the Additional Attributes for the second query.

The default is *2 (CLEAR)*.

Child GUI Attributes Option

Graphical Attributes are available for optional child processes only. These user options can be listed and displayed in a variety of ways on menus and input images including pull-down and right-click context menus instead of the traditional option number or button-driven user options. This feature is discussed in the Defining Graphical Attributes for Optional Children section of Using GUI Features of the Image Editor.

CHAPTER 3-15

Using the Image Editor

Image Editor

The Image Editor, APPX's screen painting facility, is the means used to format menu, input, output, and inquiry process images. With Image Editor options described in the next section, you can design both the visual presentation of each item on an image as well as the background characteristics of the image itself. As you design the image, you are seeing the image exactly as it will appear to your users. Options are also provided to control cursor positioning and to perform data lookups.

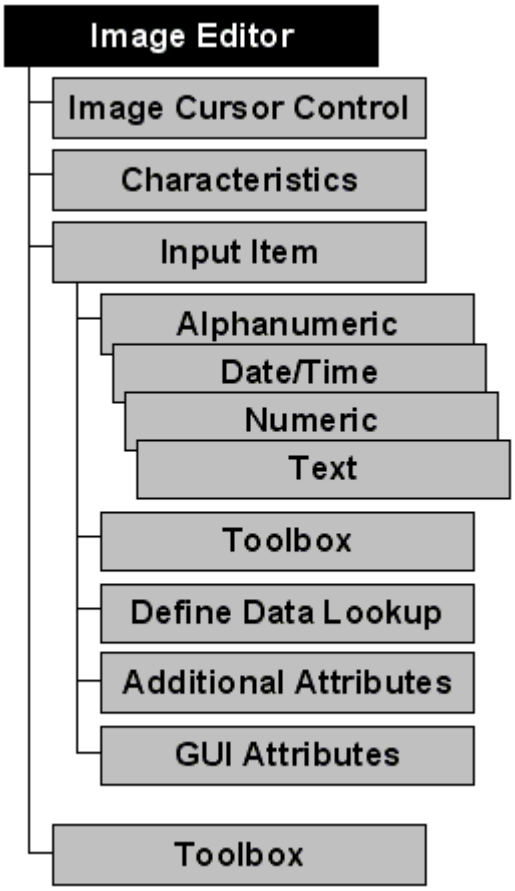


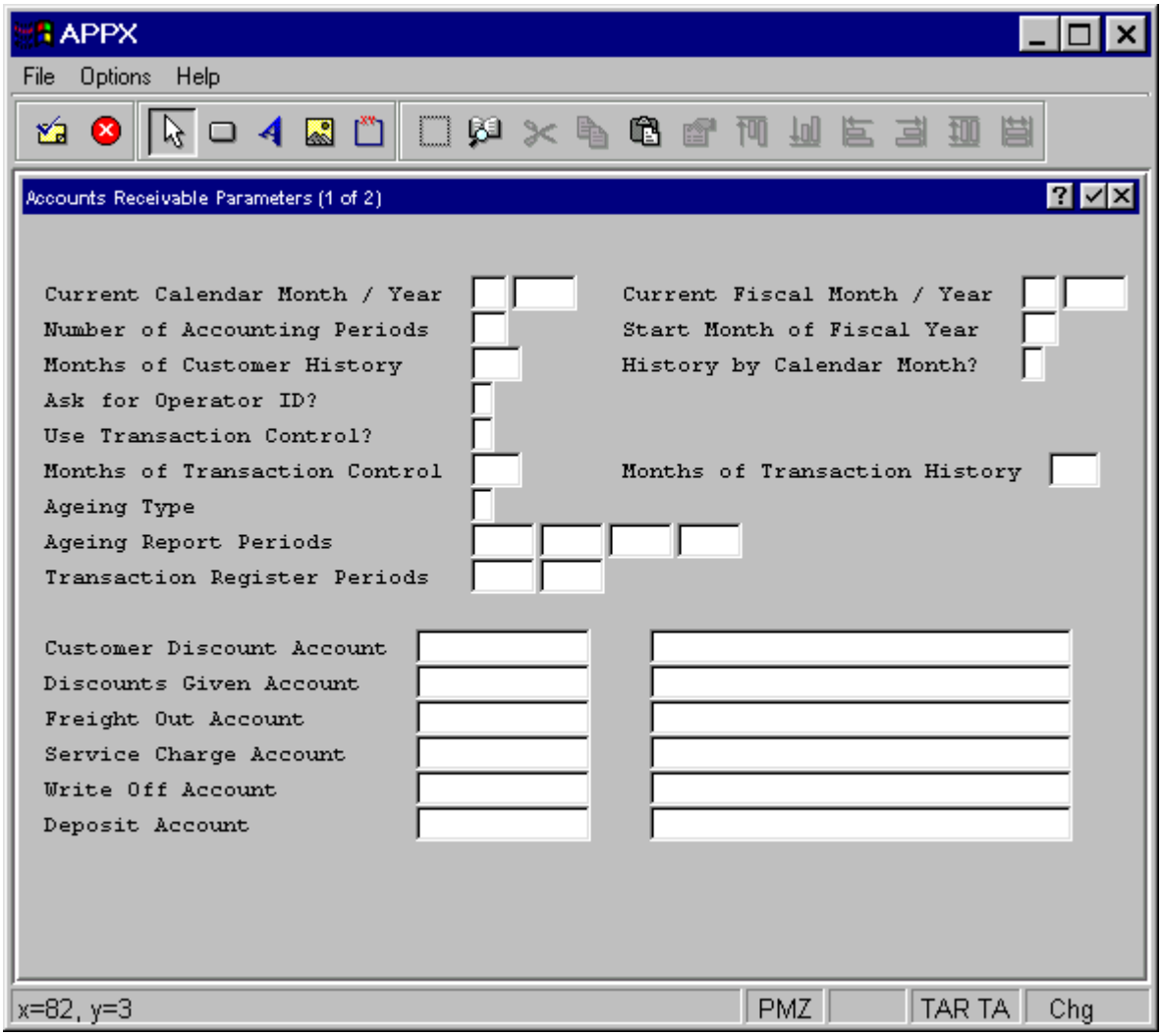
Image Editor

APPX automatically invokes the Image Editor when you press Enter after completing the appropriate specifications for menu, input, output, or inquiry images. When you access the layout for an existing image, APPX displays the image as it appears to a user, and you can edit its items, text, and background characteristics. If you are creating a new image, APPX displays a blank screen on which you can paint

items, text, and background characteristics. In either case, APPX creates a vertical and a horizontal line on the screen to indicate the bottom and right edges of the image, based upon your row and column specifications.

This chapter addresses the standard features of the Image Editor which are common to both character-based and GUI applications. However, if you are designing for a GUI-enabled environment, you will probably want to paint items using the GUI features of the Image Editor described later in this manual. Most of the icons on the Image Editor toolbar apply to the GUI features and are not discussed in this chapter. You can use both standard and GUI features on the same image and switch back and forth interchangeably without leaving the image.

The figure below shows an input image being edited in the Image Editor. This image uses only standard features of the editor and is suitable for a character-based application.



Input Image Using Standard Features of the Image Editor

Image Editor Options

APPX provides a number of tools in the Image Editor for use in designing a new image or redesigning an existing image. As mentioned earlier, most of the icons on the Image Editor toolbar apply to GUI features and require the use of a mouse. However, the standard features of the Image Editor can be employed from the keyboard using the cursor movement keys and various function and option keys. These options are listed on the Image Editor Options help screen, shown in below, and are summarized below. The help screen is available online by pressing F1 (help) from the Image Editor. If option numbers are not displayed and you wish to see them, select Show Option Numbers from the Options pulldown menu.

The Image Editor Options help screen is for informational purposes only; buttons, icons, and options are not operable on this screen. To perform these operations, you must first return to the Image Editor screen by pressing Enter, selecting the Close option, or selecting End ☒ from the titlebar.

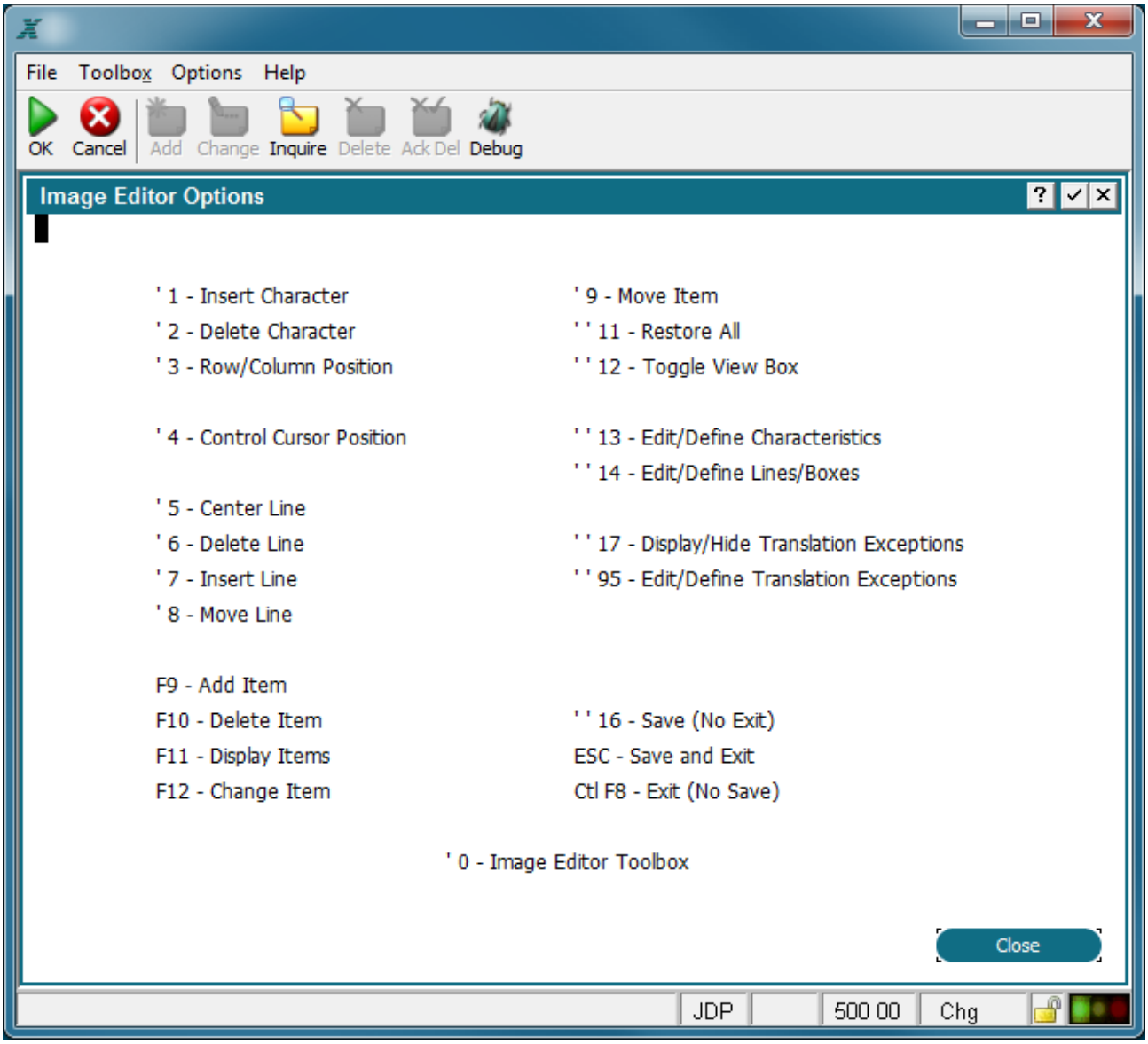


Image Editor Options Help Screen

The standard feature options within the Image Editor include the following:

Insert Character (Option 1) inserts a space immediately before the current position of your cursor.

Delete Character (Option 2) deletes the character (or space) you cursor is currently positioned on.

Row/Column Position (Option 3) displays an overlay that contains the current row/column position of your cursor. To clear the display, select Enter.

Control Cursor Position (option 4) accesses the Control Cursor Position overlay that controls cursor positioning when a menu or input image displays to a user. See the Control Cursor Position Option [reference unavailable in the source] section for details.

Center Line (Option 5) centers or re-centers an existing line of characters, based on the number of columns in an image. You must use this option if you edit a centered line and change its position or length.

Delete Line (Option 6) deletes the entire line your cursor is currently positioned on.

Insert Line (Option 7) inserts a new line immediately above the line your cursor is currently positioned on.

Move Line(s) (Option 8) moves one or more lines, starting with the line your cursor is currently positioned on. After selecting this option, you are prompted to identify the ending line you want to move, and the new position for the line or lines you want to move.

Move Item (Option 9) moves an item from its current position on an image and places it in a position that is established by the placement of your cursor. Position the cursor on the item before selecting this option. After you select the option, pseudo-blanks for the item disappear. Move the cursor to indicate the new starting position for the item, and select Enter ☑.

Restore All (Option 11) reverts to the last saved image.

Toggle View Box (Option 12) repositions an overlay such as the prompt for moving lines on a different part of the image.

Edit/ Define Characteristics (Option 13) edits or defines image characteristics. Such characteristics include bright and inverse video for menu and input images, bold and expanded print for output and inquiry images, plus underlining and foreground/background colors for any images. See Defining Image Characteristics for additional procedural information.

Edit/Define Lines/Boxes (Option 14) edits or defines lines and boxes. Once you have established the boundaries of the line or box (using the same procedure described in Defining Image Characteristics for (Option 13), a Box Properties overlay appears. See Painting Boxes or Lines [reference unavailable in the source] for specification details on the Box Properties overlay.

Display/Hide Translation Exceptions (Option 17) toggles between highlighting and removing the highlighting from any words, phrases or sentences that have translation exceptions defined for them. This feature is relevant only if the Language Translator feature is in use at your installation. Refer to the *Language Translation Manual* for more information.

Edit/Define Translation Exceptions (Option 95) allows you to select words, phrases or sentences on the image and define translations exceptions for them for APPX to use when performing language translations. This feature is only used if the Language Translator feature is in use at your installation. Refer to the separate *APPX Language Translator Manual* for more information.

F9 - Add Item defines an item representing a single appearance of a logic, numeric, alphanumeric, or data/time field. Position the cursor where the new item will start and press F9. Refer to *Defining Items for Input, Output, and Inquiry Images* for additional procedural information.

F10 - Delete Item removes an item from an existing image. Position your cursor on the item to be deleted and press F10.

F11 - Display Items calls the Items Display overlay, shown below, which lists the items defined on the current image along with many of their attributes. Certain attributes can be changed directly from this overlay. Item attributes are discussed in the *Image Item Specifications or in the various Additional Attributes* sections. You can press F11 at any time to access the *Items Display*.

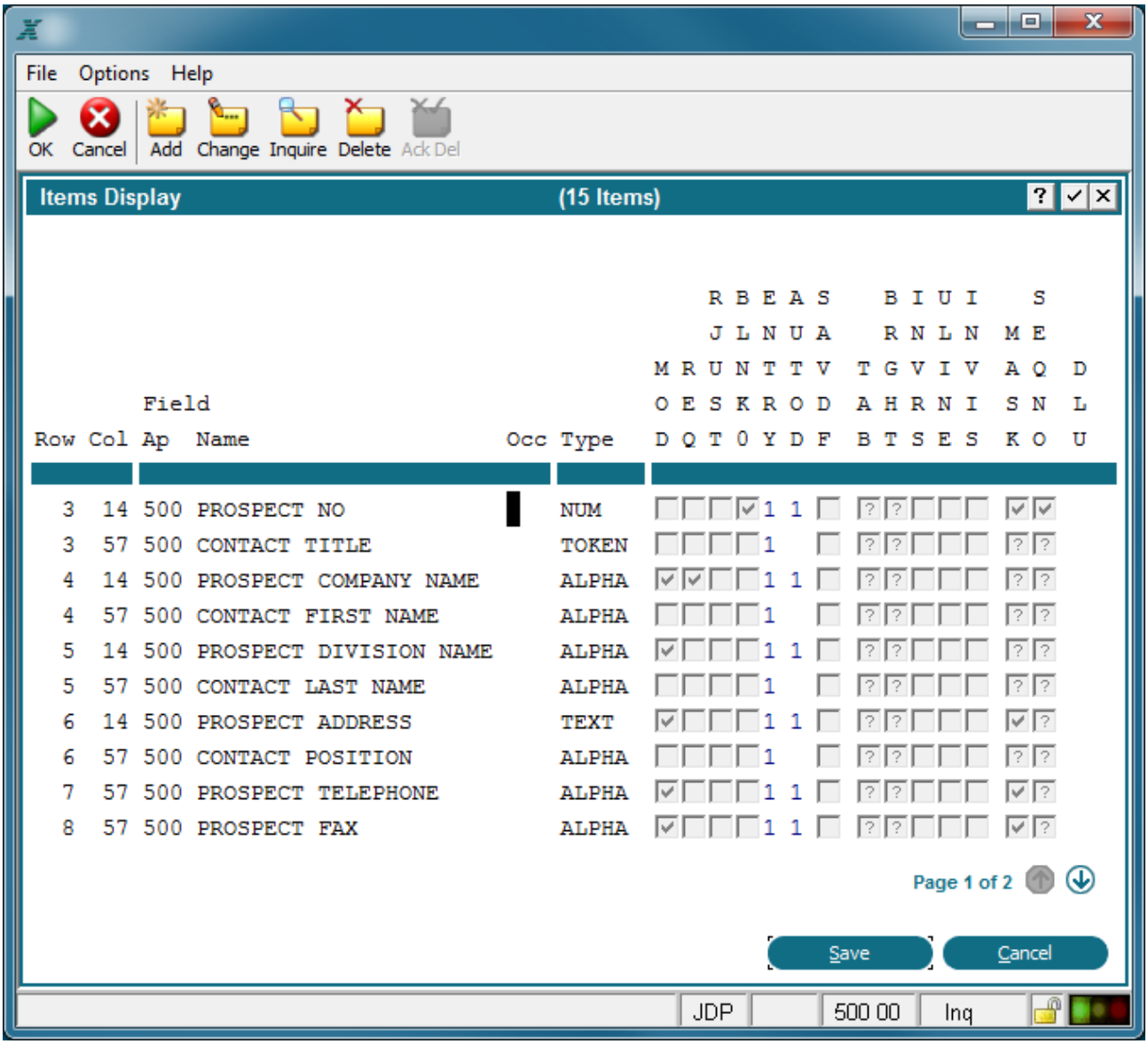


Image Editor Items Display

F12 - Change Item edits an existing item. Position the cursor on the item to be edited and press F12.

Save (No Exit) (Option 16) saves everything you added or changed on a painted image. APPX does not exit the image editor after saving an image.

Save and Exit automatically saves all additions or changes to an image and leaves the image editor environment. Select the Save and Exit icon from the toolbar.

Exit (No Save) exits the image editor and returns you to the previous screen without saving the additions or changes you made to an image. Select the Cancel icon from the toolbar.

Image Editor Toolbox (Option 0) calls the Image Editor Toolbox overlay from which you can access the data dictionary, the event points for the current process, or the optional processes for the current image. See the Image Editor Toolbox Option section for details.

Image Editor Layout Tools

Image Editor Options

The image editor layout tools are useful for manipulating groups of two or more widgets on an image. The tools provide the ability to align a group of widgets and resize a group of widgets.

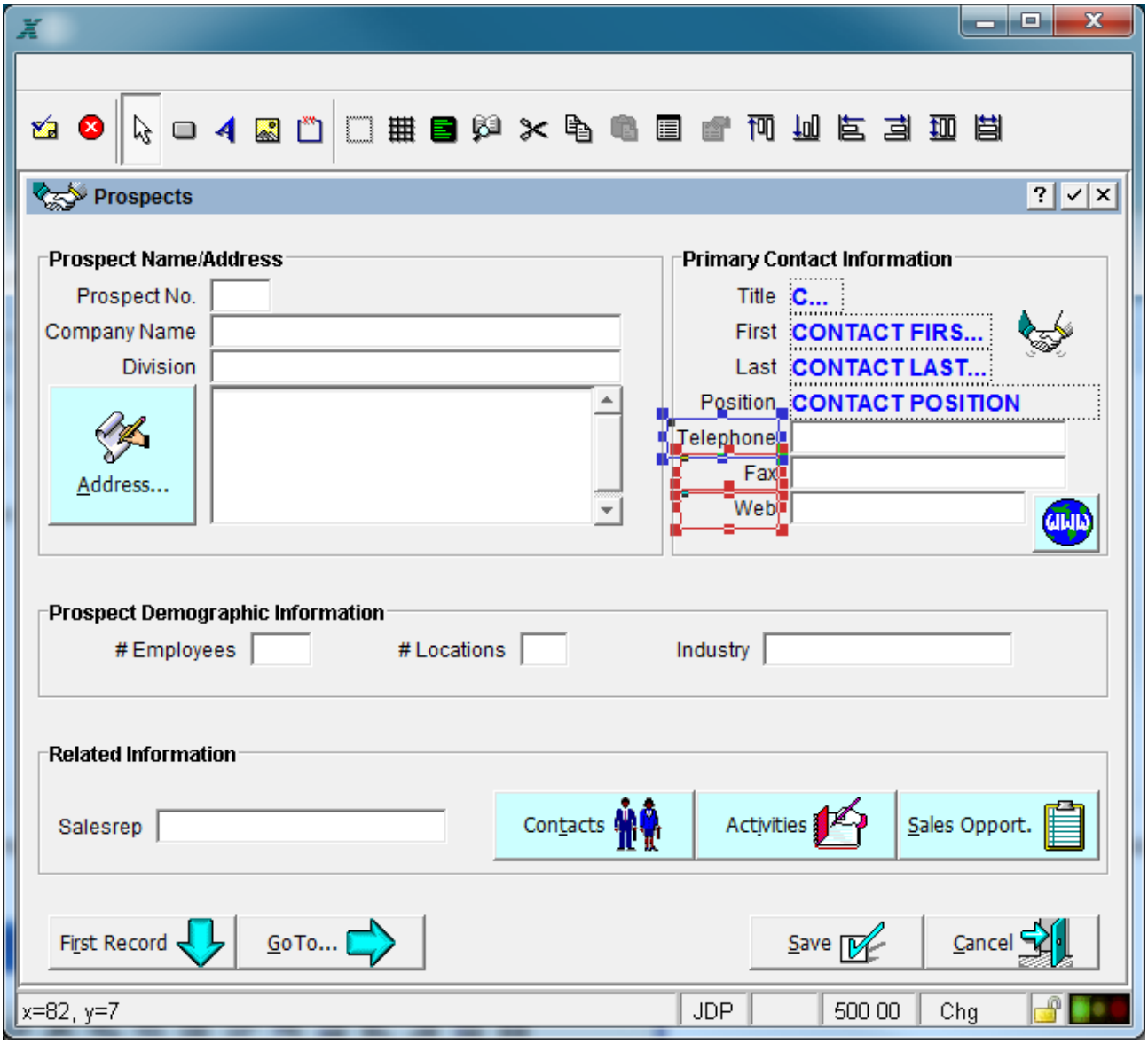


Image Alignment Tools

To enable the toolbar buttons, you must first select two or more widgets that are to be aligned or resized. The last widget selected is highlighted with a blue selection border and is the "base" widget that is used to manipulate the other selected widgets. The following toolbar buttons can then be used to manipulate the selected widgets:

Align Tops of widgets

Align Bottoms of widgets

Align Left Sides of widgets

Align Right Sides of widgets

Make same vertical size

Make same horizontal size

Image Editor Toolbox Option

The Toolbox option from the Image Editor screen calls the Image Editor Toolbox overlay shown in below:

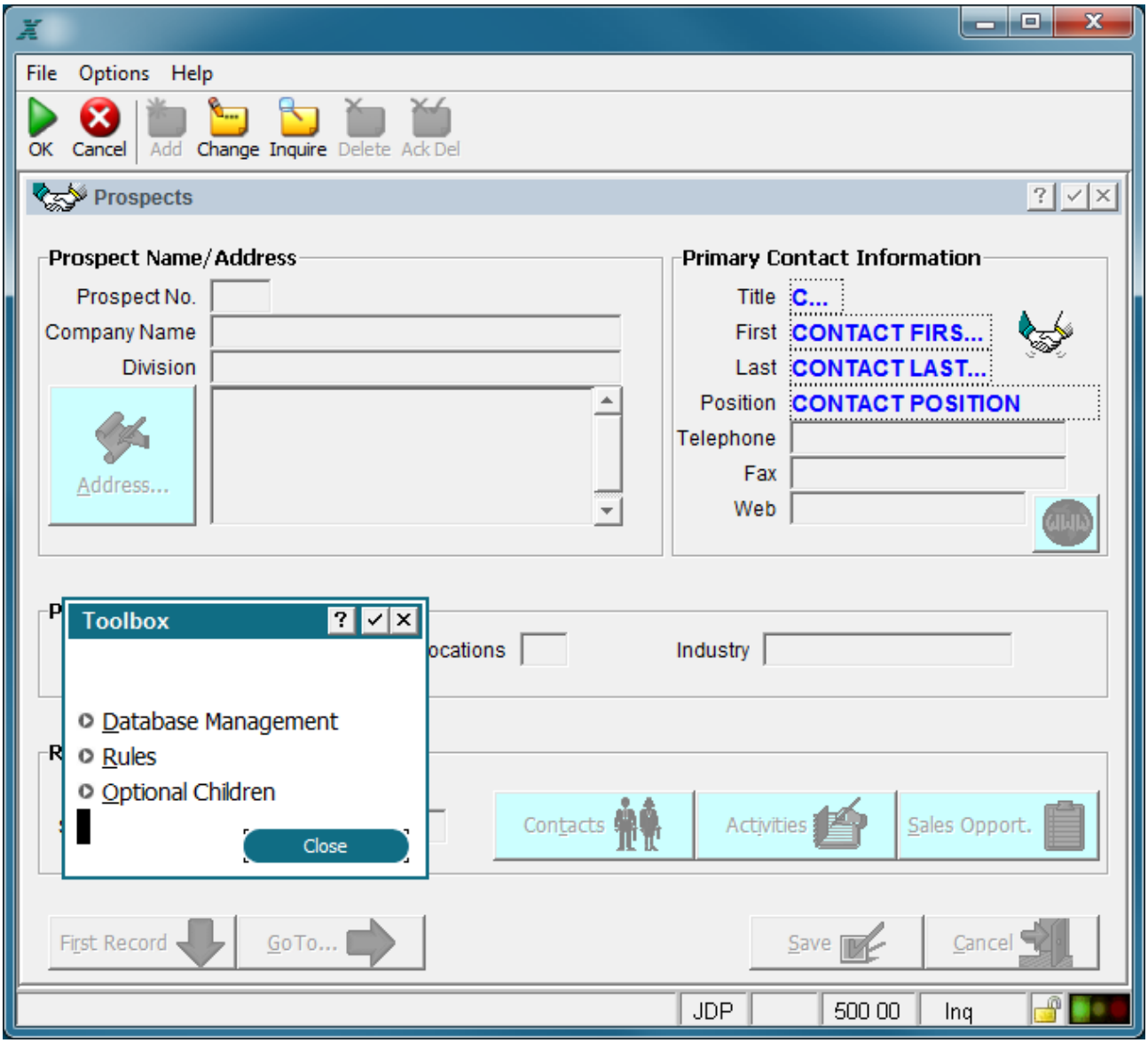


Image Editor Toolbox Overlay

The following options are available on the Image Editor Toolbox overlay:

Database Management Option

The Database Management option allows you to add new files or maintain existing ones without leaving the image editor. See Accessing the Data Dictionary for additional information.

Rules Option

The Rules option calls an Event Points overlay which provides options that allow you to access the ILF Editor for applicable event points. If statements exist in an event point, the event point option is highlighted. Refer to the Image Editor Toolbox Rules Option section as well as Using Event Points for more information.

Optional Children Option

This option accesses the Optional Children specification screen for the current image. These specifications include the name of the child process, the invocation type, and whether or not various activities at the child level affect the parent process. See Automatic and Optional Children for detailed information on defining optional child processes.

Upon completion of any option, you are returned to the Image Editor.

Image Editor Toolbox Rules Option

The Rules option from the Image Editor Toolbox presents an Events Point overlay with options to access the ILF Editor for applicable event points. If statements are defined in the event point, the event point option is highlighted. Refer to Using Event Points for more information.

The Image Editor Toolbox Event Points overlay may contain some or all of the following options, depending on the type of process:

Start of Process

Set Run-Time Defaults

Post PCF Read

Select Image

Global EP's for Images allowing access to four additional event points:

Start of Frame

Global Pre-Display

Global Option Intercept

End of Frame

Pre-Display

Pre-Display/Verify

Option Intercept

Verify

Pre-PCF Update

Post PCF Update

End of Process

File Level EP's allowing access to five additional event points:

File Open

Post Read

Pre-Update

Post Update

File Close

Upon completion of any event point, you are returned to the Event Points overlay. Press Enter, select the Close option, or select End ☒ from the titlebar to return to the Image Editor.

Editing or Defining Items on Images

An item is a single appearance of an APPX field that is painted on a menu, input, output, or inquiry image. You can edit or define an item using the keyboard as itemized below. However, if you are designing for a GUI-enabled environment, you will probably want to edit and define items using the GUI features of the Image Editor. Most of the icons on the Image Editor toolbar apply to the GUI features and are not discussed here.

F9 - To paint an item on an image, position the cursor on the desired row/column and press F9.

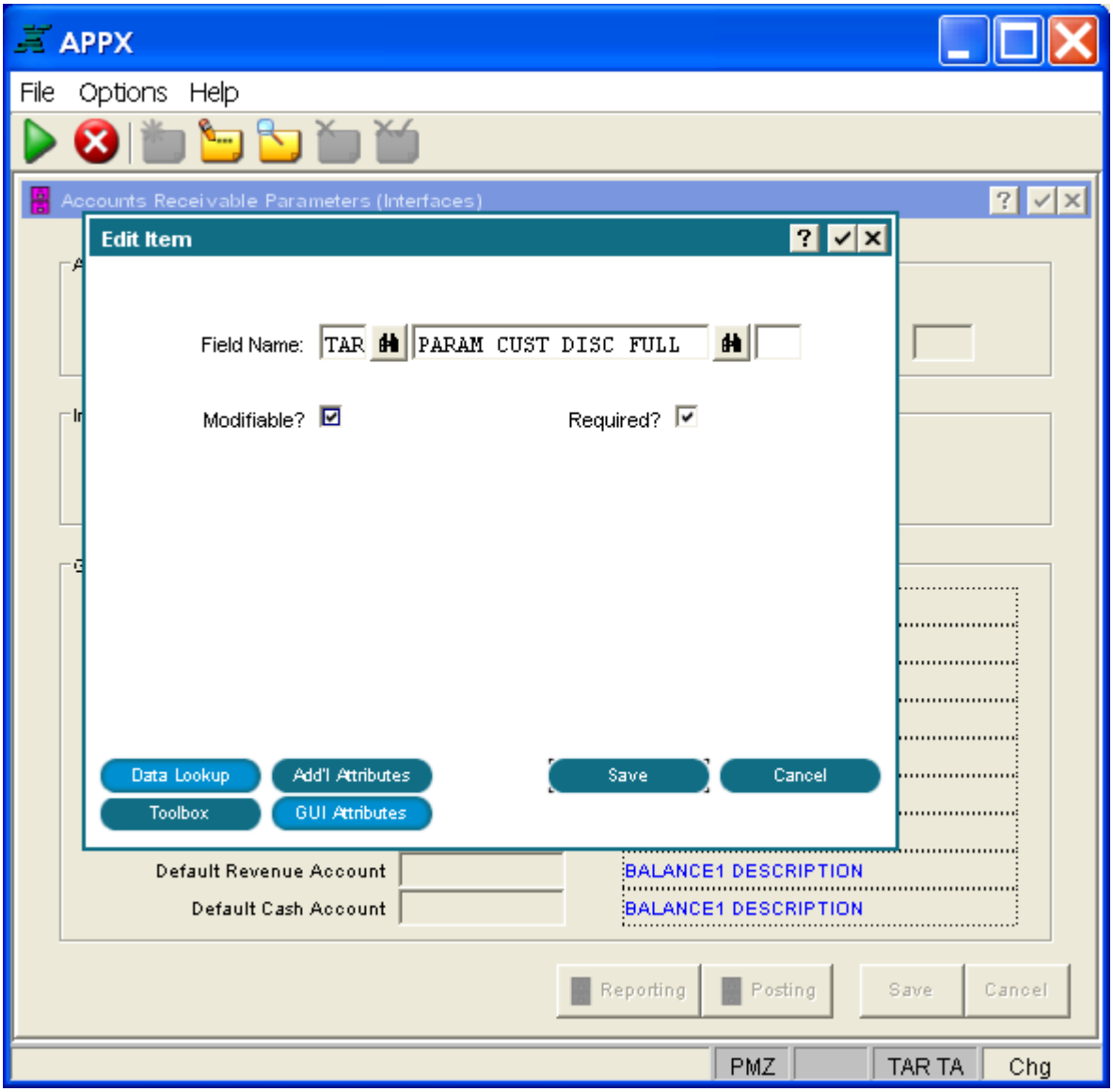
F12 - To edit an existing item, position the cursor on the item and press F12.

F10 - To delete an existing item, position the cursor on the item and press F10.

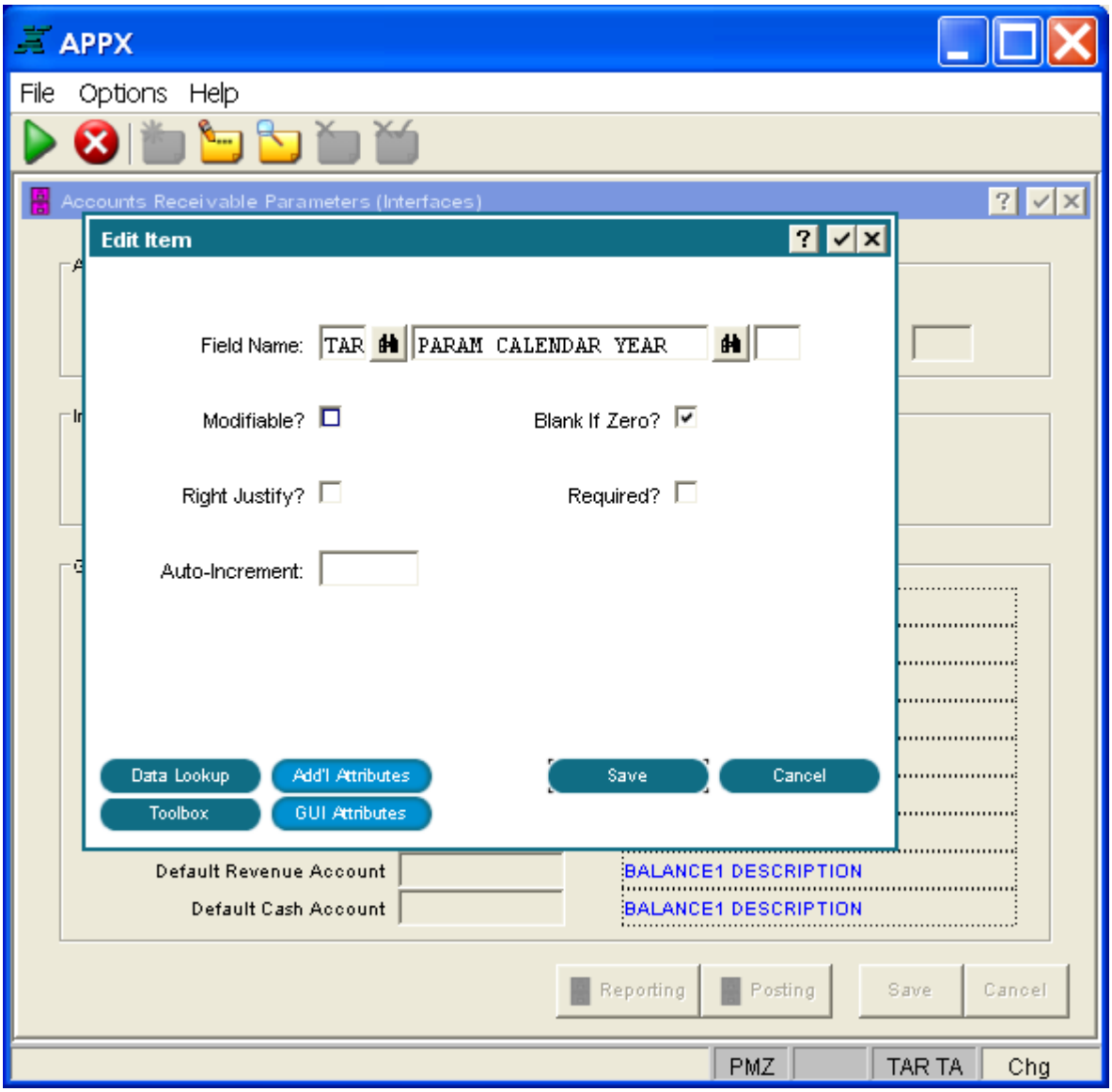
Image Item Specifications

If you are editing an existing item or adding a new item, APPX presents a number of specification screens that establish various operational and display attributes, as well as data lookup definitions.

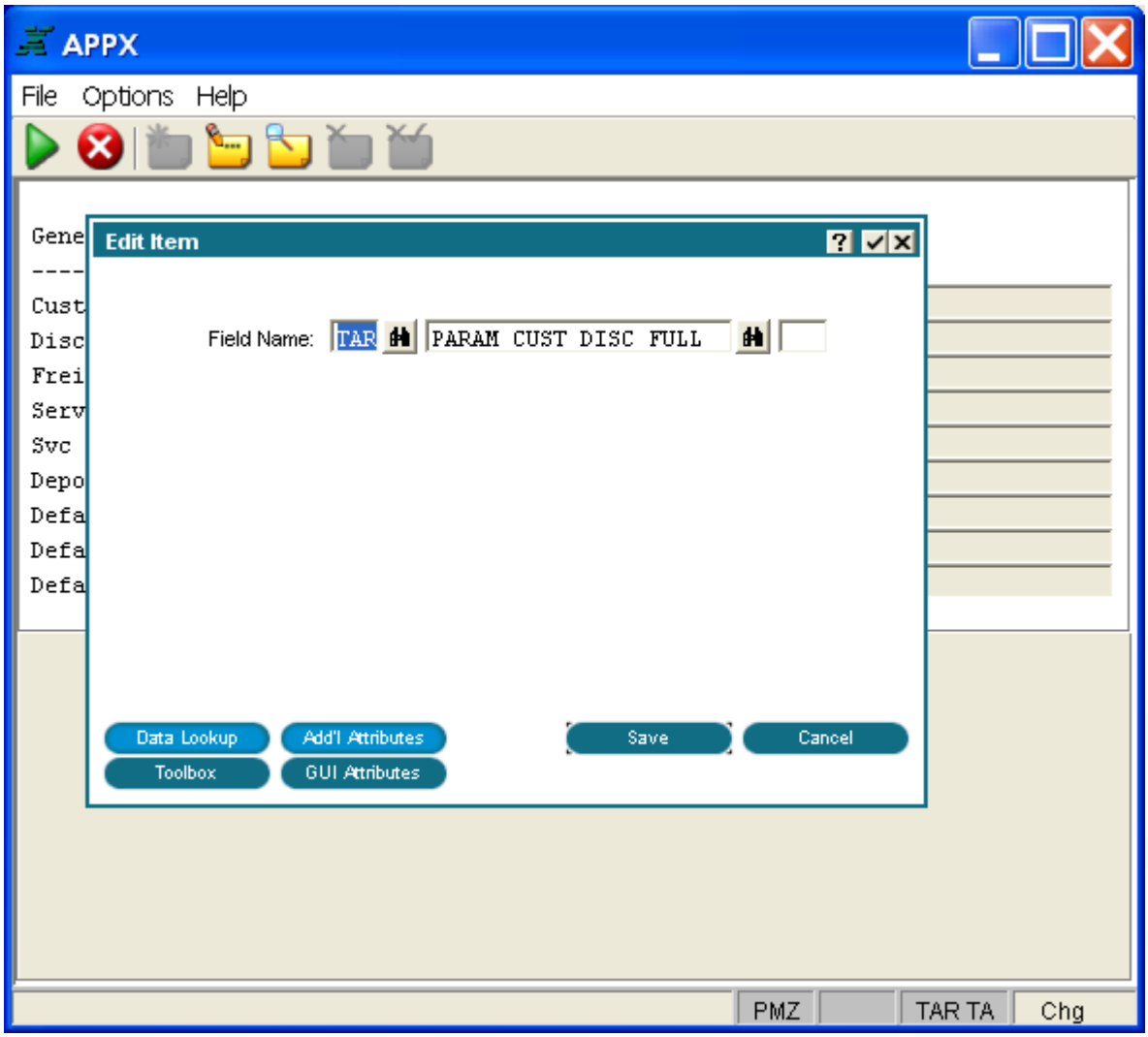
The item screen contains specifications that relate to the appearance of a data dictionary field on an input, output, or inquiry image. The specifications that follow are a composite of those you see when defining an input, output, or inquiry item. If a specification only displays for a specific type of process, the definition indicates so. The Item screens, shown The Inquiry Record Frames Additional Attributes overlay is shown below., displays when you choose to place a field on an image by selecting add or change mode for item definition.



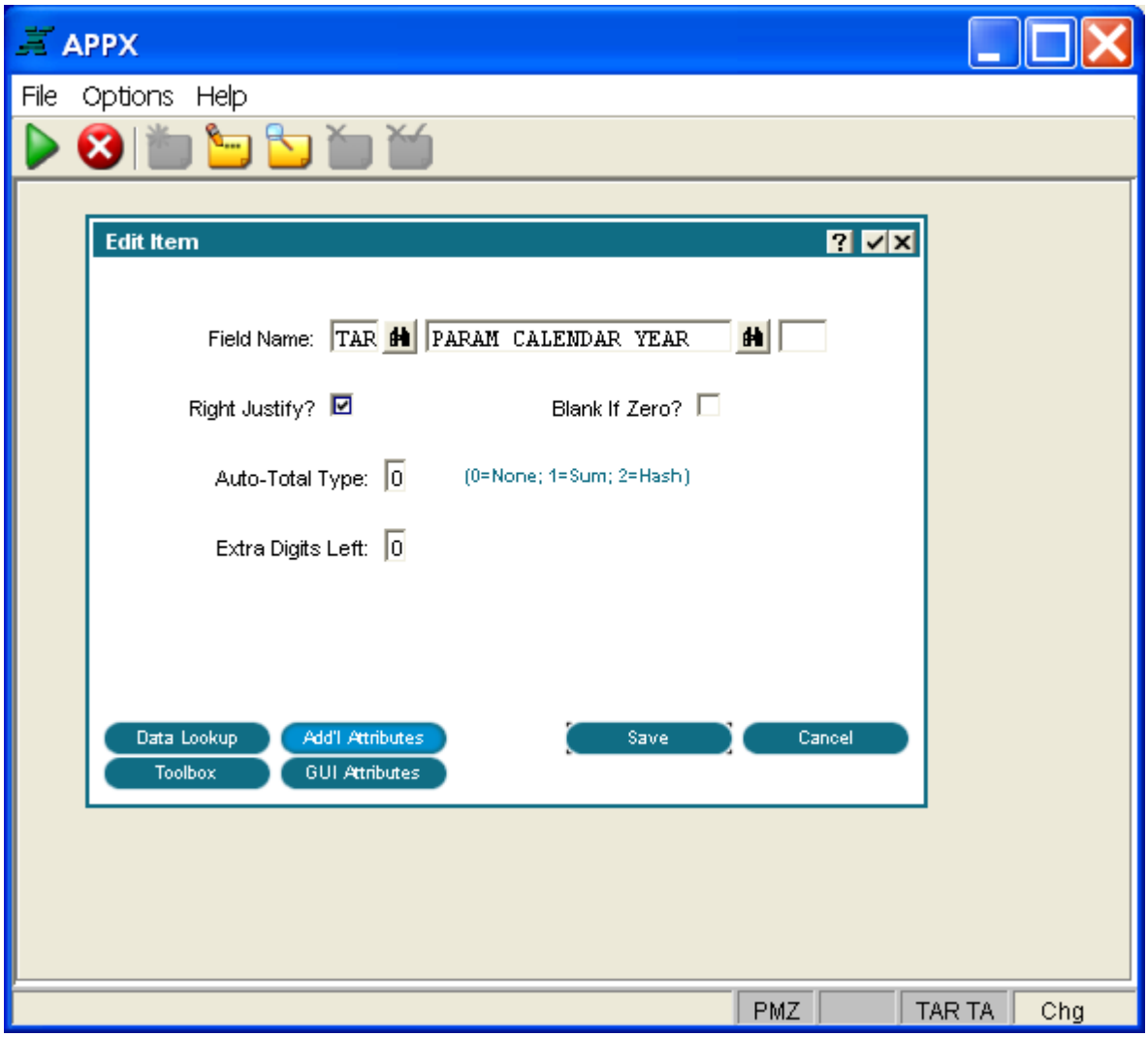
Input or Inquiry Key Entry Item Screen for Alphanumeric, Date, and Logic Fields



Input or Inquiry Key Entry Item Screen for Numeric Fields



Output or Inquiry Item Screen for Alphanumeric, Date, or Logic Fields



Output or Inquiry Item Screen for Numeric Fields

The item screens contain some of the following fields, depending on the type of process.

Field Name identifies a specific field (by application ID, field name, and occurrence) to be painted on an image. Predefined fields can also be painted on an image; their application ID is ---.

Modifiable? for input processes and inquiry *Key Entry* images, governs whether or not a user is permitted to change the value that displays. If 'no' (blank), APPX determines whether the item is modifiable, based upon the operational phase. If the operational phase is live operations, the item is not modifiable. If the operational phase is initial setup or recovery processing, the item is modifiable. The default is 'yes' ☑.

Required? for input processes and inquiry *Key Entry* images, determines whether or not a user is required to enter a value. The default is 'no' ☐.

Blank If Zero? indicates whether or not a value of 0 should display as a blank (rather than a 0) to a user. The default is 'no' ☐.

Right Justify? governs whether or not the contents of the item should align with the far right-hand character position in the mask. If 'no' ☐, the contents are aligned with the far left-hand character position in the mask. For input processes, the default is 'no' ☐. For output processes, the default is 'yes' ☑.

Auto Increment, for input processes, indicates that the default value for the item on each record added should be automatically incremented by the value that you enter here.

Auto-Total Type, for output processes, indicates whether or not the item is to be automatically totaled by APPX and, if so, the type of total. The *Auto Total Type* options are:

0 = None. The value in this numeric item for each record is not automatically totaled by the output process.

1 = Sum. The value in this numeric item for each record is automatically added together, and the total is printed for any subtotals or grand totals in the output.

2 = Hash. The value in the first 16 characters of this numeric item for each record is automatically added together, and the total is printed for any subtotals or grand totals in the output. Hash totals ignore overflow. For example, if an item is five characters in length, adding one to 99999 results in a value of 0. Numeric items that are hash-totaled must be defined as packed decimal storage type in the data dictionary.

The default is *0 = None*.

Extra Digits Left, for output processes, designates a number of digits (in addition to the digits in the data dictionary) to allow for the potentially greater size of totaled fields.

The following options are available at the bottom of every Item screen:

Data Lookup - See Data Lookup Option for details.

Additional Attributes - See Image Item Additional Attributes Option for details.

Toolbox - See Image Item Toolbox Option for details.

GUI Attributes varies depending on the type of field (alphanumeric, numeric, date, or logic) and the type of process. See the Defining Graphical Attributes for Image Fields section in Using GUI Features of the Image Editor.

Image Item Toolbox Option

The Toolbox option from the Image Item Specifications screen accesses the Image Item Toolbox overlay shown below.

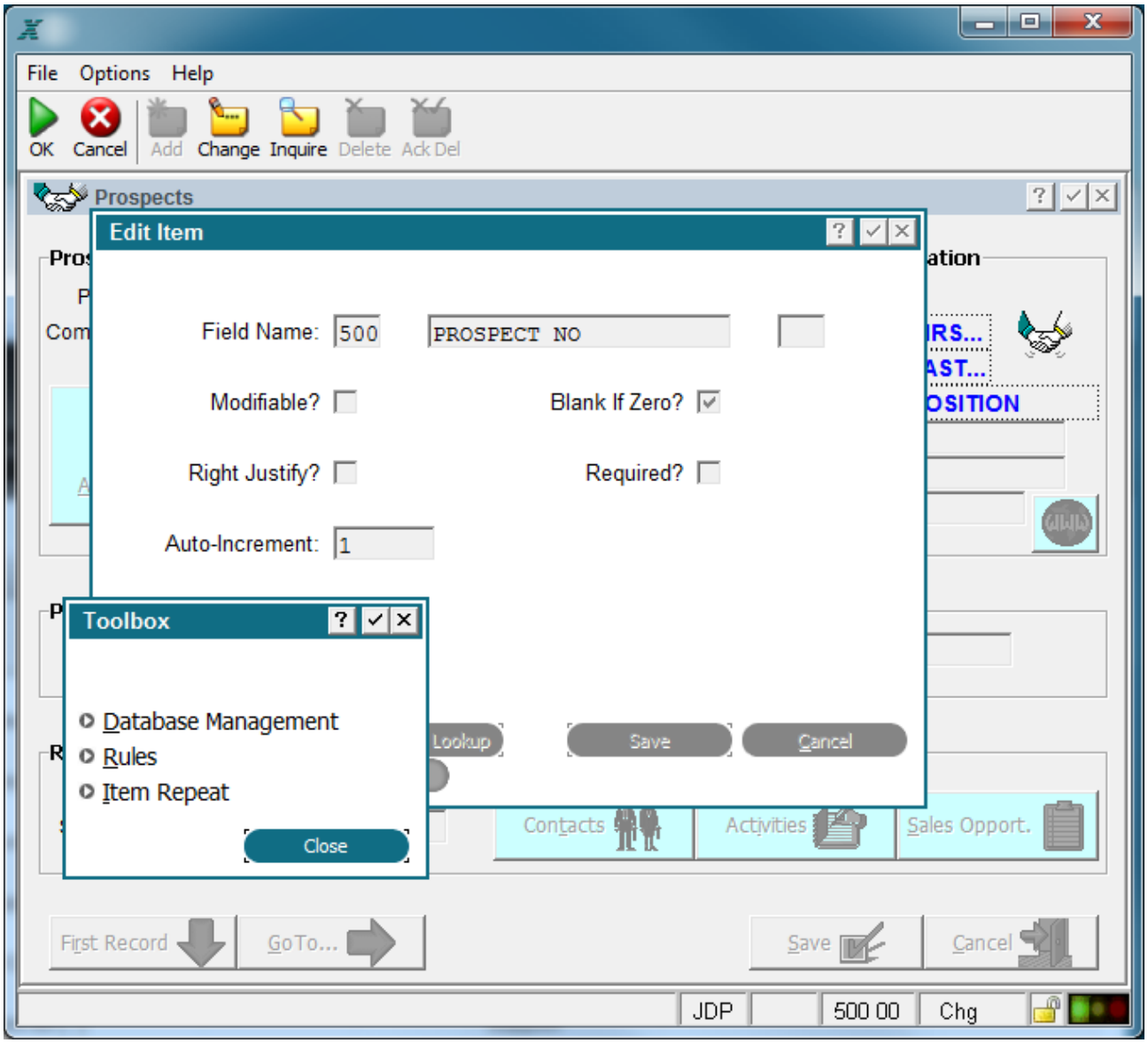


Image Item Toolbox Overlay

The following options are available on the Image Item Toolbox overlay:

Database Management Option

The Database Management option allows you to add new files or maintain existing ones without leaving the image item screen. See *Process Definition* for additional information.

Rules Option

The Rules option calls an Event Points overlay which provides options that allow you to access the ILF Editor for applicable event points. If statements exist in an event point, the event point option is highlighted. Refer to the Image Item Toolbox Rules Option section as well as Using Event Points for more information.

Item Repeat

The Item Repeat option provides for repeating items on the screen and is described in the Item Repeat Option [reference unavailable in the source] section later in this chapter.

Image Item Toolbox Rules Option

The Rules option from the Image Item Toolbox presents an Events Point overlay with options to access the ILF Editor for applicable event points. If statements are defined in an event point, the event point option is highlighted. The Image Item Toolbox Events Point overlay contains the following options:

Start of Process accessed the ILF editor for the Start of Process event point. Upon completion, you are returned to the Image Item Screen.

Post PCF Read, accesses the ILF editor for the Post PCF Read event point. Upon completion, you are returned to the Image Item Screen.

Select Image accesses the ILF editor for the Select Image event point. Upon completion, you are returned to the Image Item Screen.

Global EP's for Images overlay allows you to access four additional entry points.

Pre-Display accesses the ILF editor for the Pre-Display event point. Upon completion, you are returned to the Image Item Screen.

Pre-Display/Verify accesses the ILF editor for the Pre-display/Verify event point. Upon completion, you are returned to the Image Item Screen.

Option Intercept accesses the ILF editor for the Option Intercept event point. Upon completion, you are returned to the Image Item Screen.

Verify Accesses the ILF editor for the Verify event point. Upon completion, you are returned to the Image Item Screen.

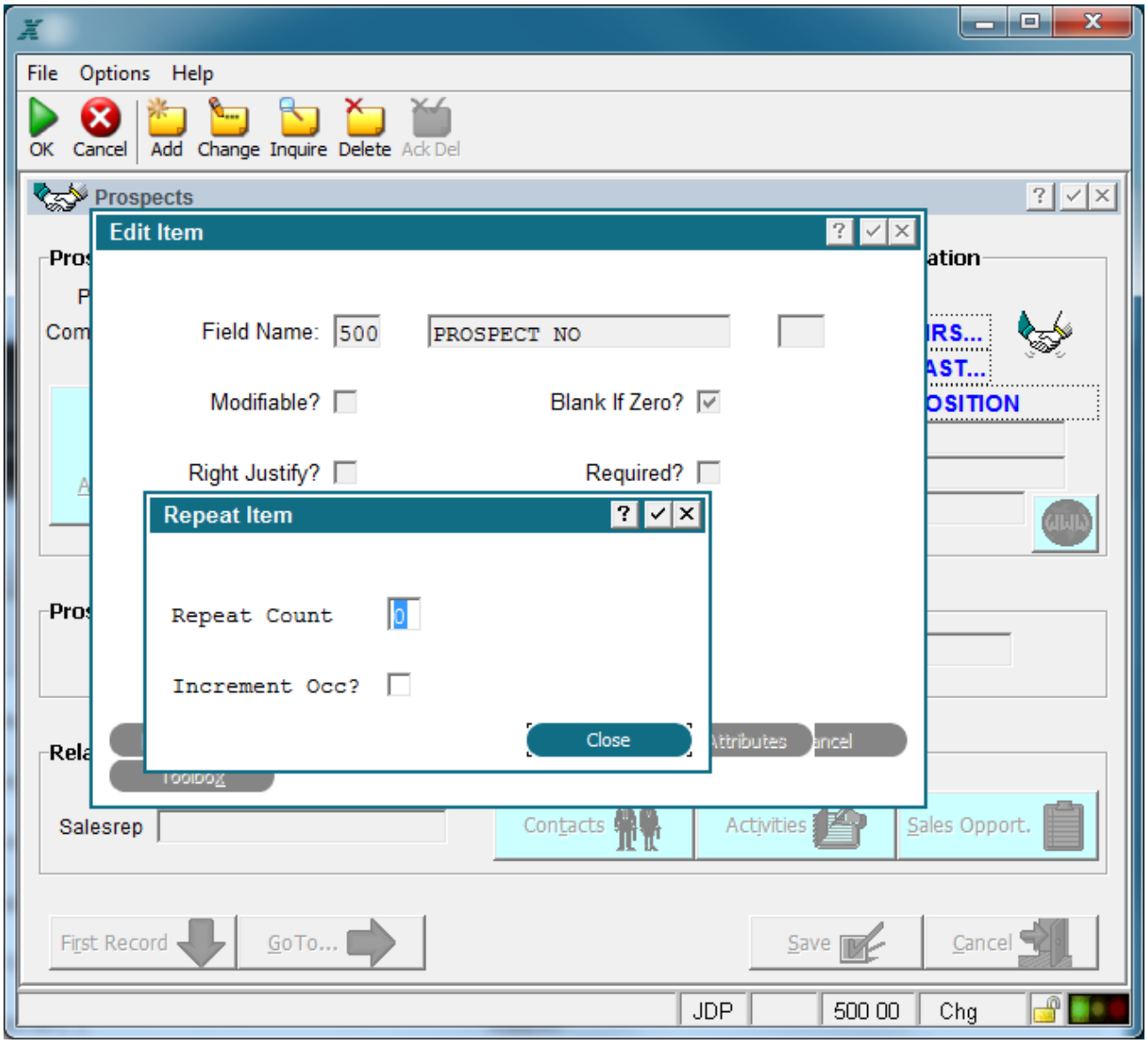
End of Process accesses the ILF editor for the End of Process event point. Upon completion, you are returned to the Image Item Screen.

PCF Level EPs provides access to the File Level Event Points for the PCF file. These Event Points are not directly associated with the process but with the PCF file. See the *Rules Option* section of *Files and Fields* for more information on using PCF Level Event Points.

Refer to Using Event Points for more information.

Item Repeat Option

The Item Repeat option from the Image Item Toolbox accesses the Repeat Item overlay shown below.



Repeat Item Overlay

The Repeat Item overlay contains the following fields:

Repeat Count field allows you to repeat an item on a screen any number of times that you specify, up to 99 times.

Increment Occ? tells APPX to automatically increment occurrence numbers for the repeated item.

Data Lookup Option

Data lookups link a field in one file to additional data in a related file by means of a key field in the related file. In other words, they tell APPX how to access another file during process execution. Lookups are defined for items on images in input, output, and inquiry processes. If the key field is a group, the order that the components are painted on the screen is significant. Parts of the key are assembled from left to right, and top to bottom.

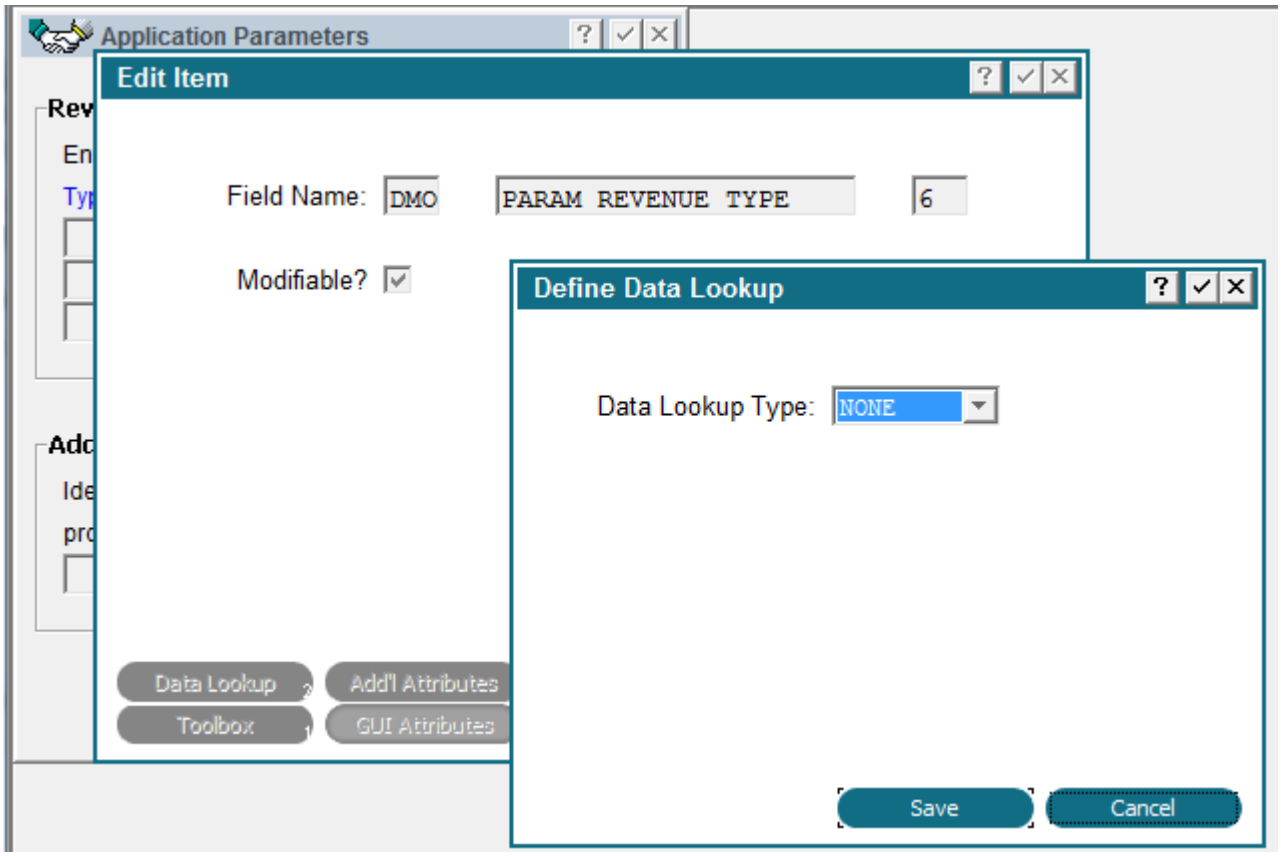
You can define the same field(s) and data lookup more than once on a single image. Each time you define the field, you can designate a data lookup. For example, you may have a Product File Maintenance screen that permits entry of three alternate suppliers. Each Supplier ID is used to perform data lookup in the Supplier file.

Values in the lookup file can display on an image automatically. *Auto displays* tell APPX which of the values from the lookup file should display on an image. For example, if you define a data lookup to a customer file with a customer number key field, you can automatically display such additional fields as the customer name, address, phone, and contact name without having to execute a DISPLAY statement for each field. If a field is not auto displayed, you must define a DISPLAY statement before the field will appear on the image. (For auto display purposes, the order that fields are painted in on an image is also significant if multiple lookups to the same file are defined. The auto displayed fields must be part of the file that is defined in the preceding data lookup definition, determined from left to right, top to bottom.)

Automatic actions can also be specified if the lookup record is not on file. For example, you can specify whether this should be considered an error or a warning condition.

The Define Data Lookup overlay includes two mutually exclusive overlays that are used to define a data lookup. One screen is for the painted item that represents the first part of the key for a lookup from a specific file and a second is for additional items, if any, that comprise the rest of the key.

When you select the Data Lookup option from the Image Item Specifications screen, the overlay shown The Inquiry Record Frames Additional Attributes overlay is shown below appears.



Define Data Lookup Overlay

The initial Define Data Lookup overlay contains one field. This field appears on all other Define Data Lookup overlays, as well.

Data Lookup Type governs whether or not the value of this item is used as a key, or part of a key, to automatically look up a record in another file. If so, this screen is followed by a specification screen that defines the data lookup. The Data Lookup Type options are:

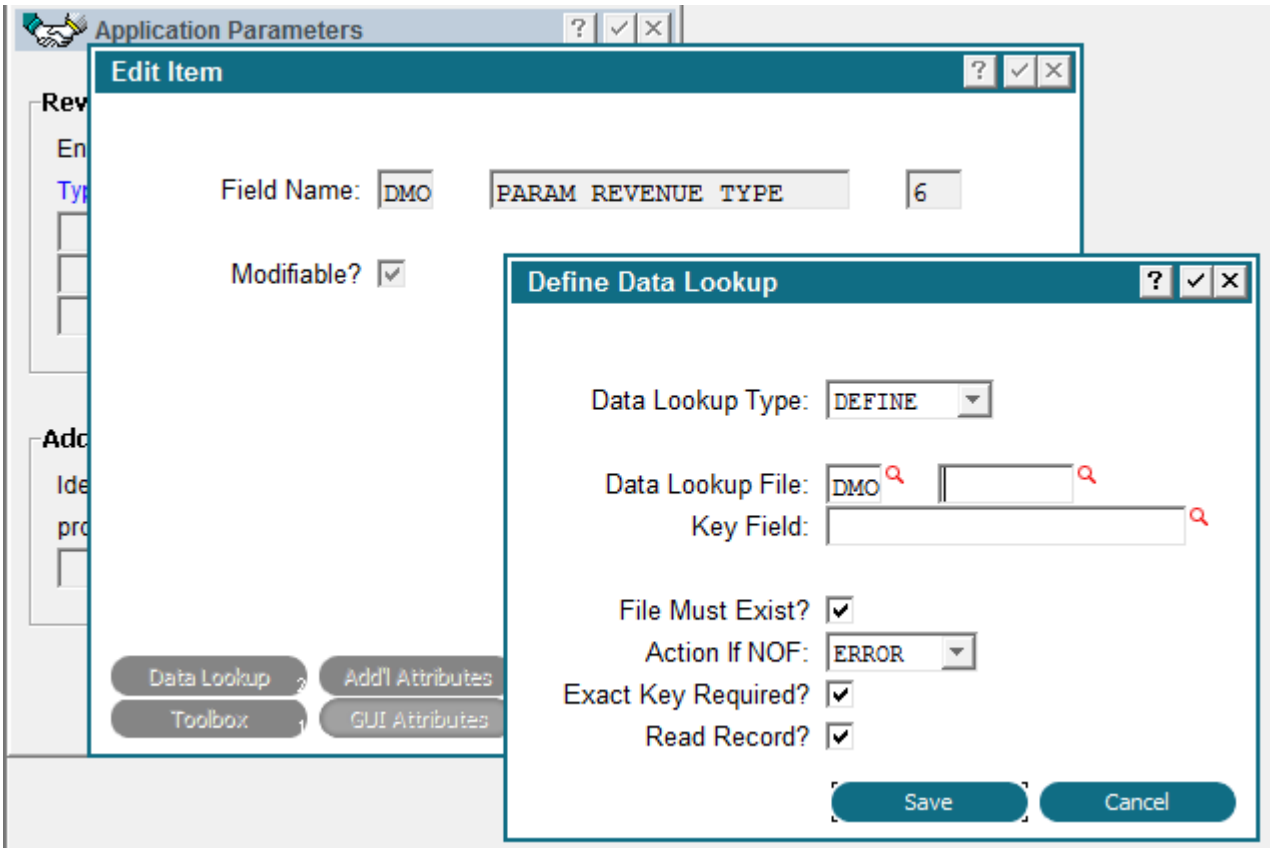
NONE. There is no data lookup associated with this item.

DEFINE. The value of this item establishes the first, or only, portion of the lookup key value.

CONTINUE. The value of this item establishes the second (or other subsequent) portion of the lookup key value. It must be preceded by an item that is created with a value of Define.

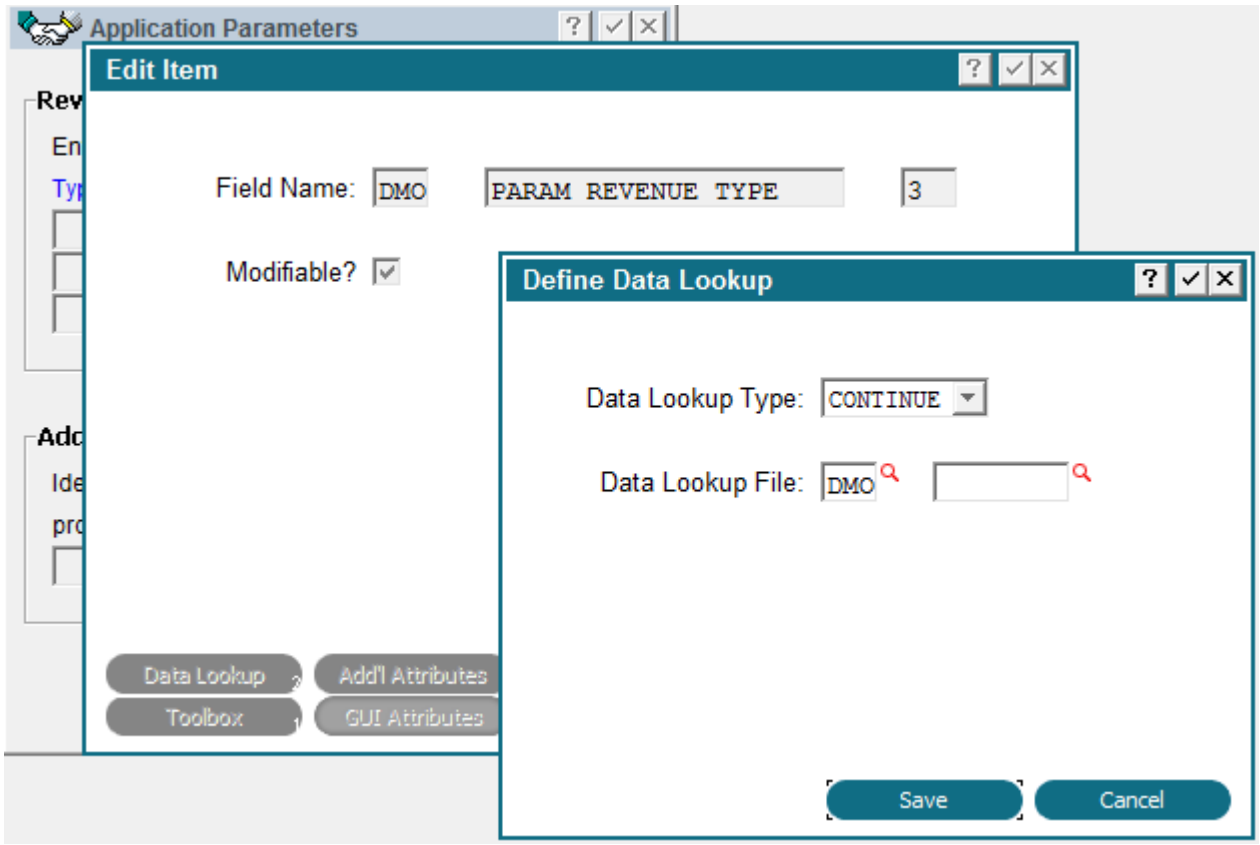
The default value is *None*.

If you enter *Define* for the *Data Lookup Type*, the overlay shown The Inquiry Record Frames Additional Attributes overlay is shown below appears.



Define Data Lookup Overlay, Define

If you enter *Continue* for the *Data Lookup Type*, the overlay shown The Inquiry Record Frames Additional Attributes overlay is shown below.



Define Data Lookup Overlay, Continue

The *Define Data Lookup* overlays for *Define* and *Continue* contain the following field in common:

Data Lookup File identifies the application and file that is to be read. The following additional fields only display for the *Define Data Lookup*, *Define* overlay.

The remaining fields appear on the *Define* overlay only:

Key Field determines the key field in the *Data Lookup File* that serves as the keypath for a lookup. This key field is identified by its *Field Name.*

File Must Exist? indicates whether or not the file that is entered in *Data Lookup File* above must exist. If 'yes' ☑ and the file does not exist, APPX reports an error condition. If 'no' ☐ and the file does not exist, the lookup is not performed. The default is 'yes' ☑.

Action if NOF governs APPX's response if the referenced record is not on file (NOF) in the *Data Lookup File*. The *Action if NOF* options are:

NONE. Takes no action with regard to the NOF condition.

WARNING. Displays a warning message to the user.

ERROR. Displays an error message to the user.

For output processes, APPX prints warnings and errors to the report file. They do not display on the screen. The default is *None*.

Exact Key Req'd? determines whether or not a user must enter a key value that exactly matches a value contained in the file defined for the lookup. If 'no' ☐, the user can enter a partial key value, and APPX will search for the first record that matches the partial key entry. The user can also enter a complete key value and, if not on file, APPX will retrieve the record with the next highest key value. The default is 'yes' ☑.

Read Record? governs whether or not the data lookup record is read into the current record area for this file. If 'no' ☐, APPX performs the lookup and auto displays fields in the lookup record. However, the record read does not affect the current record area in memory, and is not available with statements. This is useful, for example, when you want to establish a lookup to the process control file but do not want to modify the current PCF record. The default is 'yes' ☑.

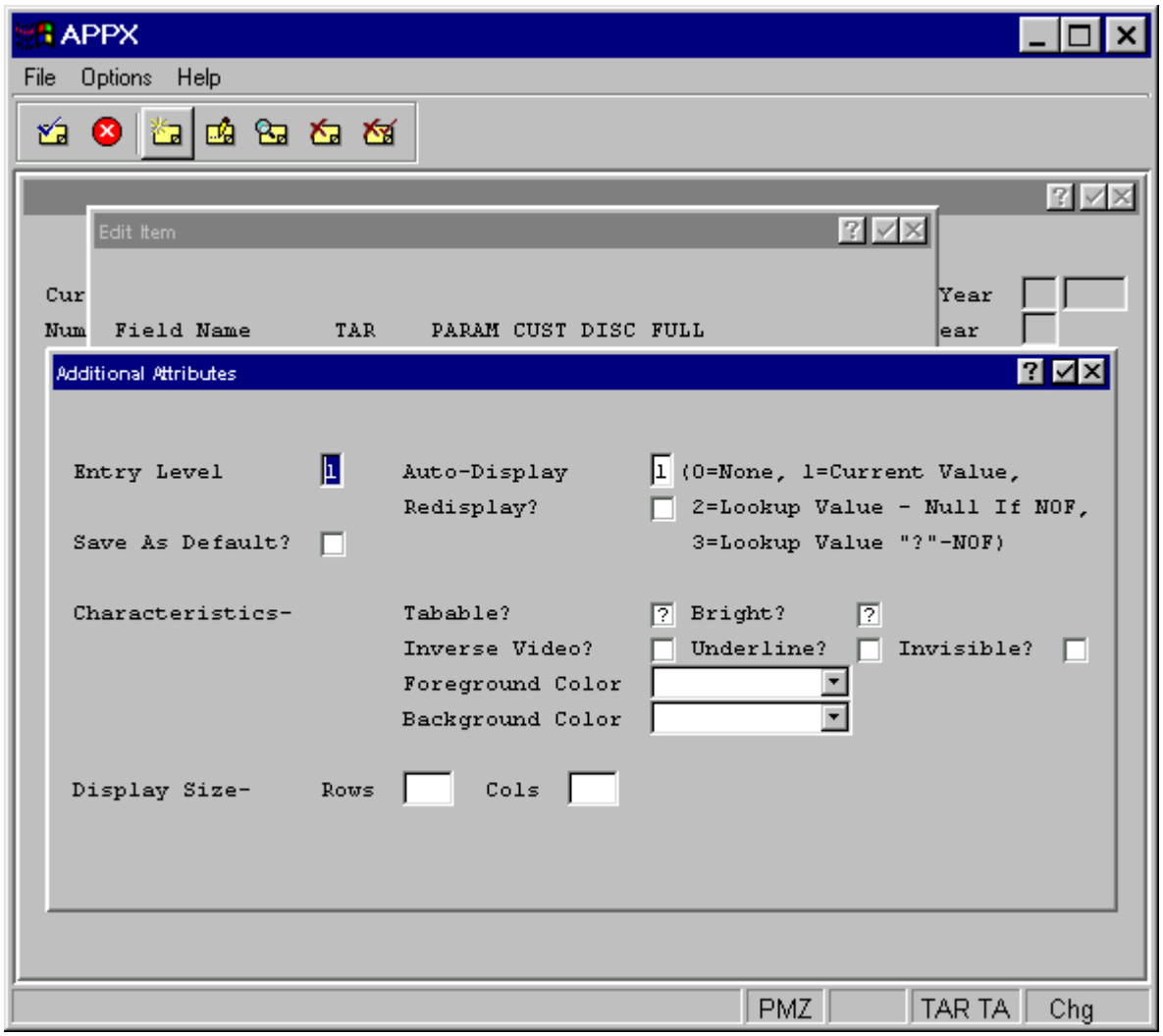
Image Item Additional Attributes Option

The Additional Attributes option from the Image Item Specifications screen varies depending on the type of process and the type of field (alphanumeric, numeric, date, or logic). For output and inquiry processes, this option varies depending on whether or not it is an *End of Range* frame. The following sections show the various *Additional Attributes* overlays and describe each overlay attribute.

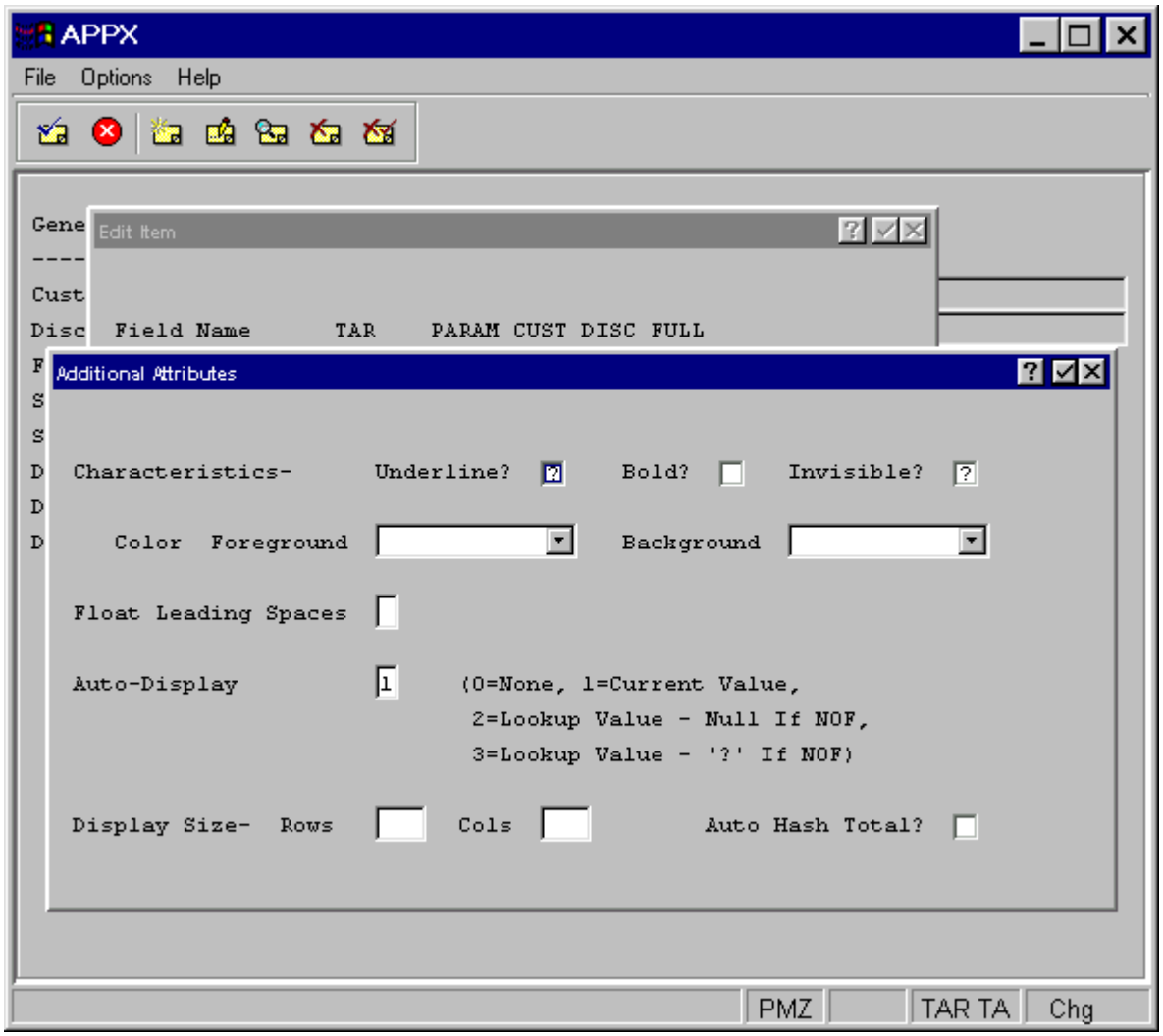
Alphanumeric Item Additional Attributes

The alphanumeric item Additional Attributes overlay screens, shown below, contain specifications that are unique to the appearance of an alphanumeric field painted as an item on an image.

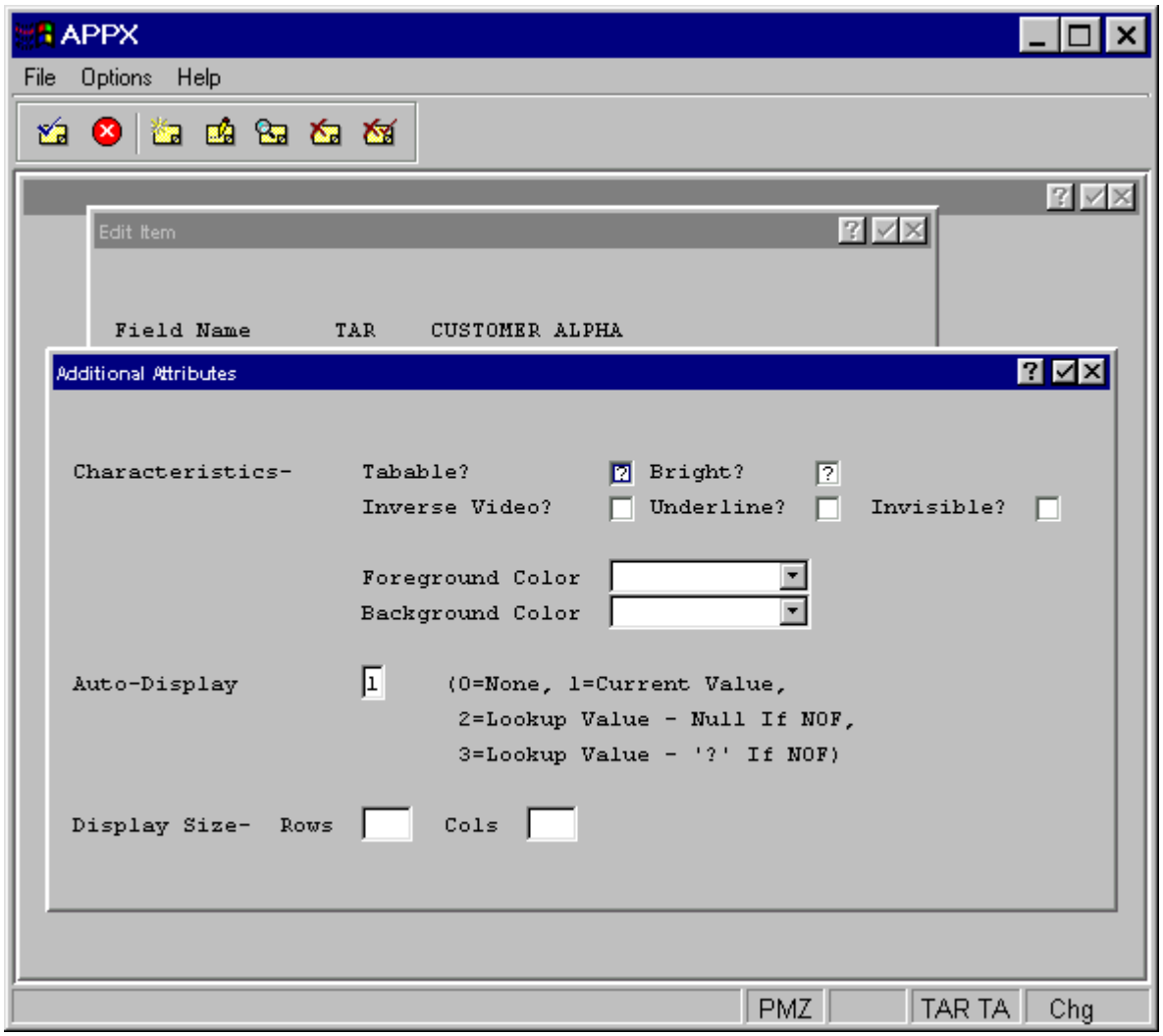
The options that follow are a composite of those you see when defining alphanumeric items for frames in input, output, and inquiry processes. If an option only displays for a specific type of process, the definition indicates so.



Alphanumeric Input Additional Attributes Overlay



Alphanumeric Output Additional Attributes Overlay



Alphanumeric Inquiry Key Entry Additional Attributes Overlay

Alphanumeric item Additional Attributes overlays contain some or all of the following fields, which may be common to date/time, numeric, and *End of Range* Additional Attributes overlays, as well.

Entry Level for input processes, designates the entry level this item belongs to. If *Entry level* is *0* (and *Modifiable?* is 'yes'), this field is always able to be edited, even during key entry. If nonzero, the user first accesses the field in the data entry level that is represented by this nonzero value.

Auto-Display indicates whether or not the value in this item automatically displays and, if so, both the source of the value and the action to be taken if the information is not on file. The *Auto-Display* options are:

0 = None. The value for this item will not automatically display. Its appearance is explicitly controlled by the designer with statements.

1 = Current Value. Displays the value of the field in the record currently in memory.

2 = Lookup Value - Null If NOF. Displays the value of the field in the record that is defined in the data lookup. If the information is not on file, the field displays blanks.

3 = Lookup Value - '?' If NOF. Displays the value of the field in the record that is defined in the data lookup. If the information is not on file, the field displays question marks (???).

The default is *1*.

Redisplay indicates whether or not the value in this item should be redisplayed when it changes. If a user enters a partial value (as with *token* fields), the complete value is displayed before allowing the user to continue with data entry. Note that if the field is set with ILF code, *Redisplay* will not cause the screen to redisplay and it is necessary to execute a *Display* statement to cause a redisplay of the screen.

Save As Default? for input processes, establishes the default value for the *Set Entry Attributes* option. If 'yes' ☑, a value entered in this item in add mode serves as a default value for the next record that is added during the session. The default is 'no' ☐. Refer to the *User Manual* for a discussion of the *Set Entry Attributes* option.

Characteristics. The alphanumeric Additional Attributes overlays contain some or all of the following *Characteristics* fields.

Tabable? for input process and inquiry Key Entry images, indicates whether or not a user can automatically move the cursor to the first character in this item from the preceding item by pressing tab. If blank, the item is tabable if modifiable, and non-tabable if not modifiable. The default is 'unknown' but can be toggled to 'yes' or 'no' by clicking the checkbox.

Bright? for menu and input processes, and inquiry Key Entry images, designates whether or not the appearance of this item on the screen is highlighted. If blank, the entry is bright if modifiable, and dim if not modifiable. The default is 'unknown' but can be toggled to 'yes' or 'no' by clicking the checkbox.

Bold? for output and inquiry processes, designates whether or not the appearance of this item on the report is bolded. The default is 'unknown' but can be toggled to 'yes' or 'no' by clicking the checkbox.

Inverse Video? for menu and input processes, and inquiry Key Entry images, designates whether or not the background and foreground colors as displayed on the screen are reversed for this item only. The default is 'no' ☐.

Underline? governs whether or not APPX adds a single underline below the value displayed for this item when the item appears on the screen or in hard copy. The default is 'no' ☐.

Invisible? for menu and input processes, indicates whether or not the appearance of this item is hidden from the user. The default is 'no' ☐.

Foreground Color indicates what color the value of this field should be displayed in. Colors can be selected from a drop-down list. Leave this field blank to use the default foreground color.

Background Color indicates what color the background of this field box should be displayed in. Colors can be selected from a drop-down list. Leave this field blank to use the default background color.

Float Leading Spaces for output and inquiry processes, controls positioning of the item. If nonblank, the position of the item is not absolute. It can move to the left, based on the position of the last character in the preceding item and the number you enter in this specification. An entry of *0* through *9* represents the number of spaces that must appear between this item and the last character of the preceding item. If blank, the item does not float. The default is blank.

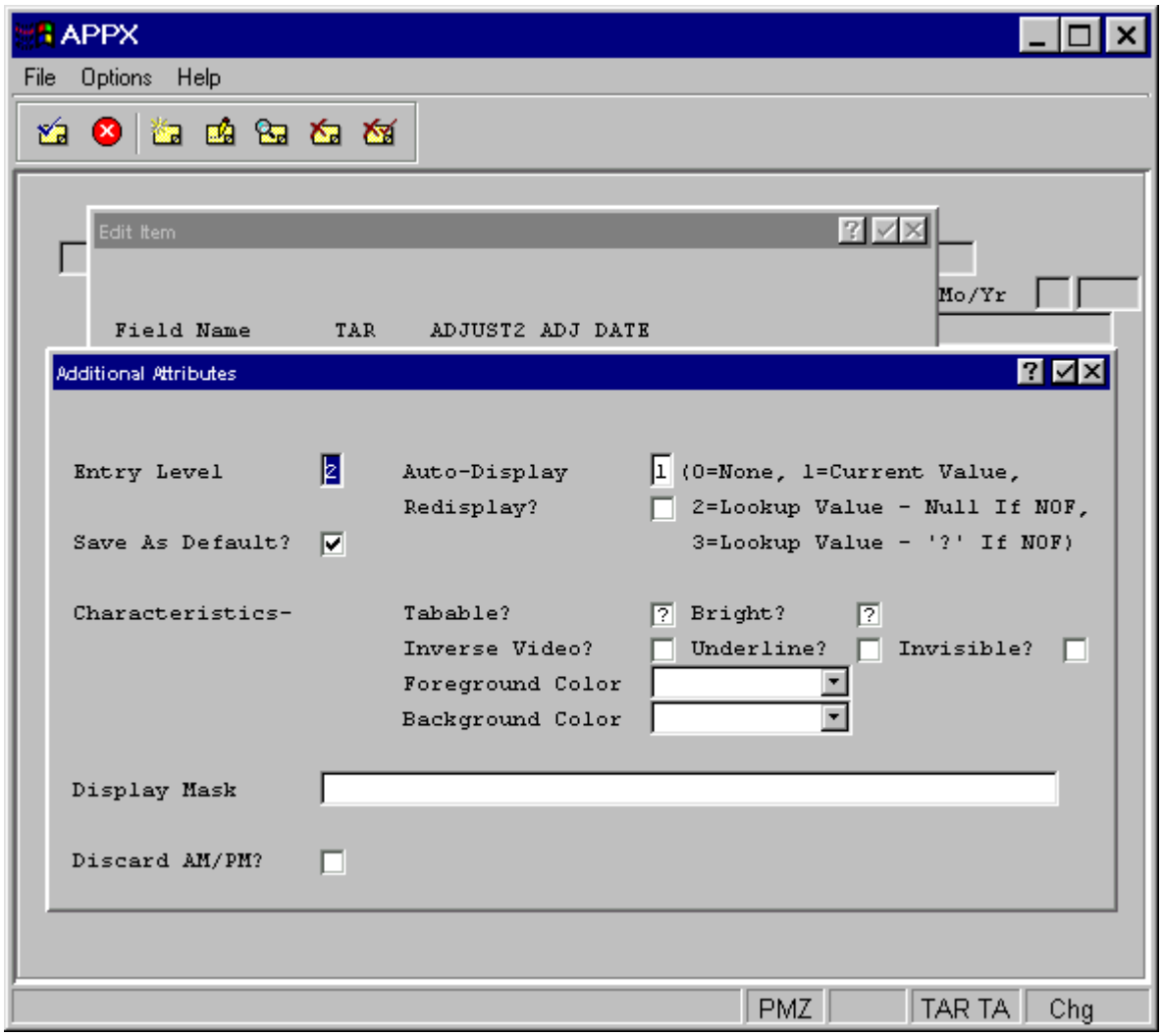
Display Size - Rows/Cols determines the number of rows, and the number of columns in each row, within which to display an item. The total number of characters that are defined by these specifications can be more or less that the actual length of a field in the data dictionary. If either one of these specifications is blank, APPX computes its value by dividing the value of the other specification into the item's length as defined in the data dictionary. For example, if you specify 30 columns for a 120-character field, APPX assumes a row entry of *4*.

If both specifications are blank, APPX determines the display format with reference to the field's data dictionary length and the current cursor position on the image. A column specification equal to the available positions between the current cursor position and the far right-hand position on the image is assumed. A row specification is calculated based upon the field length and the assumed column specification. If the field length is smaller that the available positions on the screen or output, the item displays as a single row. For nonblank specifications, a change to the field length in the data dictionary has no effect on the *Display Size*.

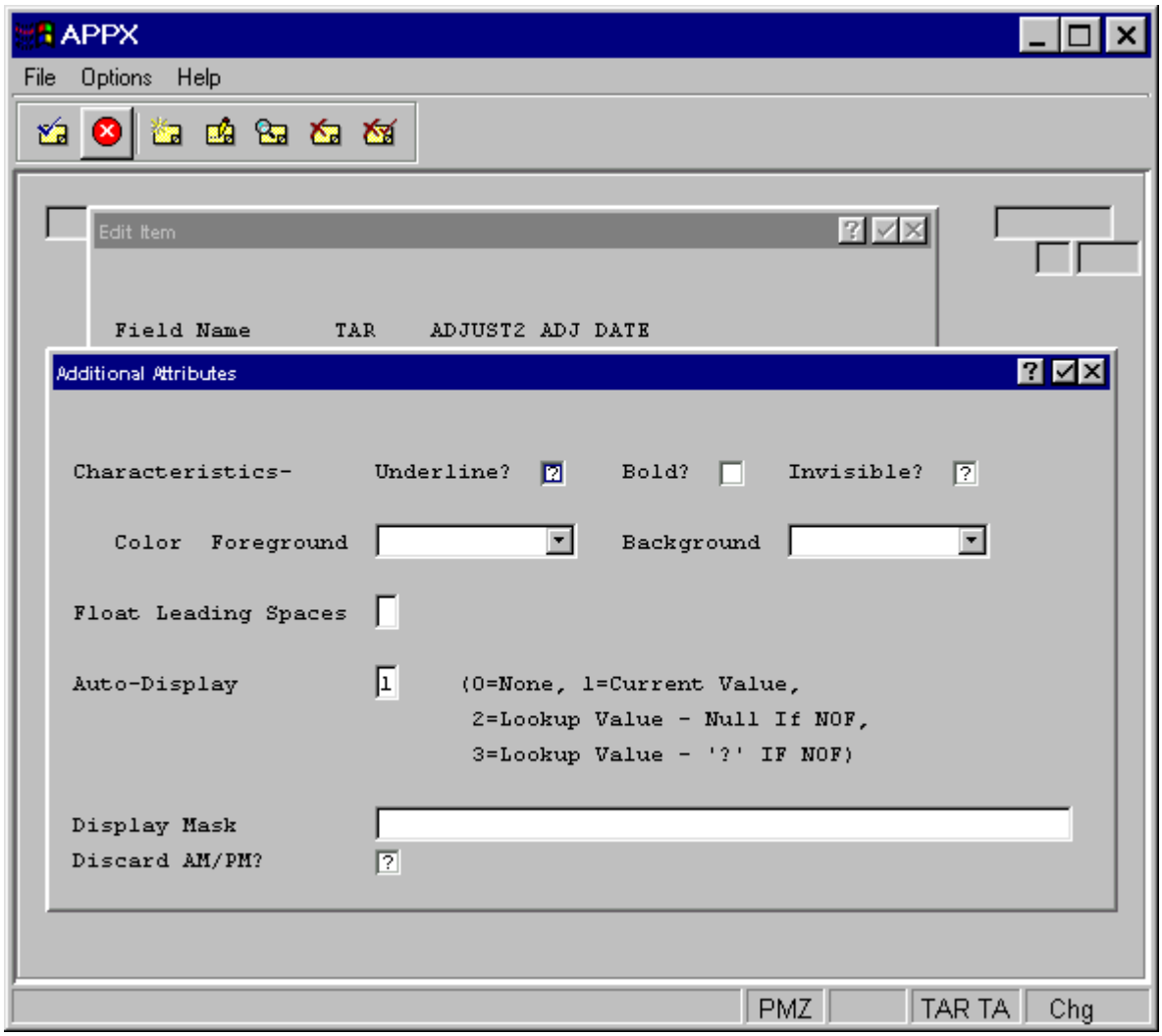
Auto Hash Total? for output processes and inquiry except for key entry, governs whether or not values in the alphanumeric field are to be hash-totaled. Nonnumeric characters are treated as *0*, except for trailing spaces. Hash totals ignore overflow. For example, if your item is five characters in length, adding one to 99999 results in a value of 00000. The default is 'no' ☐.

Date/Time Item Additional Attributes

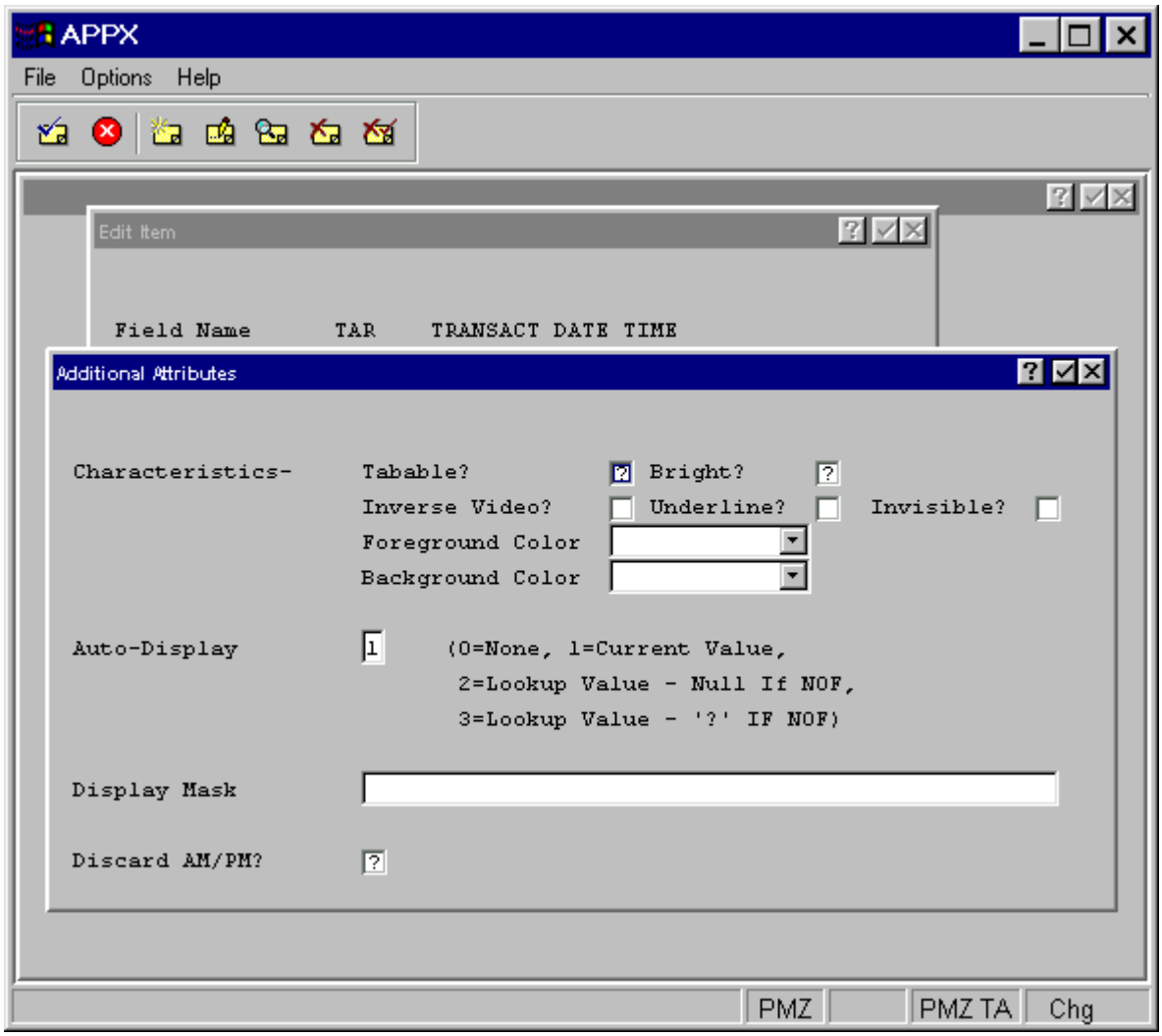
The date/time item Additional Attributes overlays, shown below, contain specifications that are unique to the appearance of a date/time field painted as an input, output, or inquiry *Key Entry* image. This overlay displays when you select the Additional Attributes option from the Item definition screen.



Date/Time Input Additional Attributes Overlay



Date/Time Output Additional Attributes Overlay



Date/Time Inquiry Key Entry Additional Attributes Overlay

The date/time item Additional Attributes overlays contain some of the same fields that the alphanumeric item Additional Attributes overlays do, as well as the following date/time-specific fields. These fields may also be common to the numeric Additional Attributes overlays.

Display Mask determines which parts included in the data dictionary *Store/thru* specification display on the image. See the Display Mask (Date/Time) section for details.

Discard AM/PM? establishes whether or not the AM or PM portion of a date/time mask that is specified in system administration should be discarded. It applies only to date/time fields that include an hour component. If the value in the date/time field represents an elapsed time, set this specification to 'yes' ☑. If the value represents a specific point in time, set the specification to 'no' ☐. The default is 'no' ☐.

Display Mask (Date/Time)

Display Mask for a date/time item determines which parts included in the data dictionary *Store/thru* specification (month, year, or hour, for example) display on an image. This entry can include more or less parts than the data dictionary, and can be presented in a different order. If more parts are included, those parts that are not present in the data dictionary are discarded from the mask before presentation to a user. Each position in a mask may contain a part placeholder, a pad character, a special character, text, or a separator character.

Part placeholder designates the parts of a date that are physically stored.Valid options are:

88	Century
77	Year
66	Month
55	Day
44	Hour
33	Minute
22	Second
11	Tick (hundredth of a second)

Pad characterof *0* to force the display of a leading *0* in any part that contains a single-digit value. For example, 04 could be used to indicate that you wish to store hours and wish for a leading zero to be printed whenever the hours are less than 10.

Special Characters

" ". Any characters enclosed within quotation marks, including special characters, are considered text and display on an image exactly as they appear on a mask.

\ (constant next character). Any single character immediately following the back-slash, including a special character, is considered text and displays on an image exactly as it appears on a mask.

~ (reserved for APPX's internal use). This character should never be used, unless enclosed in quotation marks or immediately preceded by a back-slash.

Text including, but not limited to, information in the categories listed below can be inserted anywhere on a mask.

Month names, such as January or Jan (the first three characters of a month)

Day names, such as Monday or Mon (the first three characters of the day)

AM/PM or am/pm designations

Punctuation, such as , or .

Numeric suffixes, such as th or rd

Literals enclosed in " "

Separator characters, such as :, /, or -

APPX automatically translates month and day names based on the actual month and day stored in the field. This text translation is case-sensitive. For example, if you enter *MONDAY* on a mask and the stored data is actually *Wednesday*, APPX translates it as *WEDNESDAY*, rather than *Wednesday*.

The text defined on a date/time display mask can include any characters with the exception of the special characters: quotation marks (" "), back-slashes (\), and tilde marks (~). To include any of these characters as text on a mask, each special character must be preceded by a back-slash (\). Special characters do not occupy space when a field displays on an image.

To include descriptions for a day of the week or month of the year on a display mask, simply enter any day or month description. APPX translates your entry into the appropriate day or month description based upon the data to be displayed. For example, a display mask defined as *Monday, January 05, 0807*, displays any of the following, depending on the data in the field: *Sunday, January 1, 1989*, or *Thursday, April 6, 1989*, or *Saturday, August 18, 1990*. The display expands or contracts as necessary to accommodate varying lengths of the possible day and month descriptions. (To avoid translation of *Monday*, for example, you must enclose the text in quotation marks: *"Monday"*.)

APPX's description translations are case-sensitive (APPX maintains the capitalization that is defined on a mask), and are also sensitive to abbreviations. If you enter *Monday* on a mask, APPX translates as *Tuesday* or *Wednesday* or *Thursday*, etc. If you enter *Mon* on a mask, APPX translates as *Tue* or *Wed* or *Thu*, etc. (The short version of a month or day name is always represented by the first three characters in the name.)

If you wish to display time information on a 12-hour rather than a 24-hour basis, you can include an *am* or *pm* designation anywhere on a mask. APPX translates the characters according to the stored data. If a mask includes *am* and the data is *3:00* in the afternoon, APPX substitutes *pm* for *am*. These translations are also case-sensitive (*am* versus *AM*, for example).

It is possible to encounter data with less or more digits than what is defined on a mask. If the data has more characters than defined on a display mask, the screen or printed output displays only the characters that are defined on the mask.

If the display mask defines more parts of a date or time than the *Store thru* parameter, any parts not stored are ignored when the mask is displayed.

APPX's date/time masking facility is designed to provide maximum flexibility. Any mask format, if not specifically excluded below, is permitted.

All part placeholders must be entered as two characters.

An am/pm designation is meaningful only in a mask that contains an hour placeholder. Otherwise, it is treated as text.

Masks cannot have noncontiguous part placeholders, such as a year and an hour placeholder. This should not be interpreted to place restrictions on the order that the parts display in the mask.

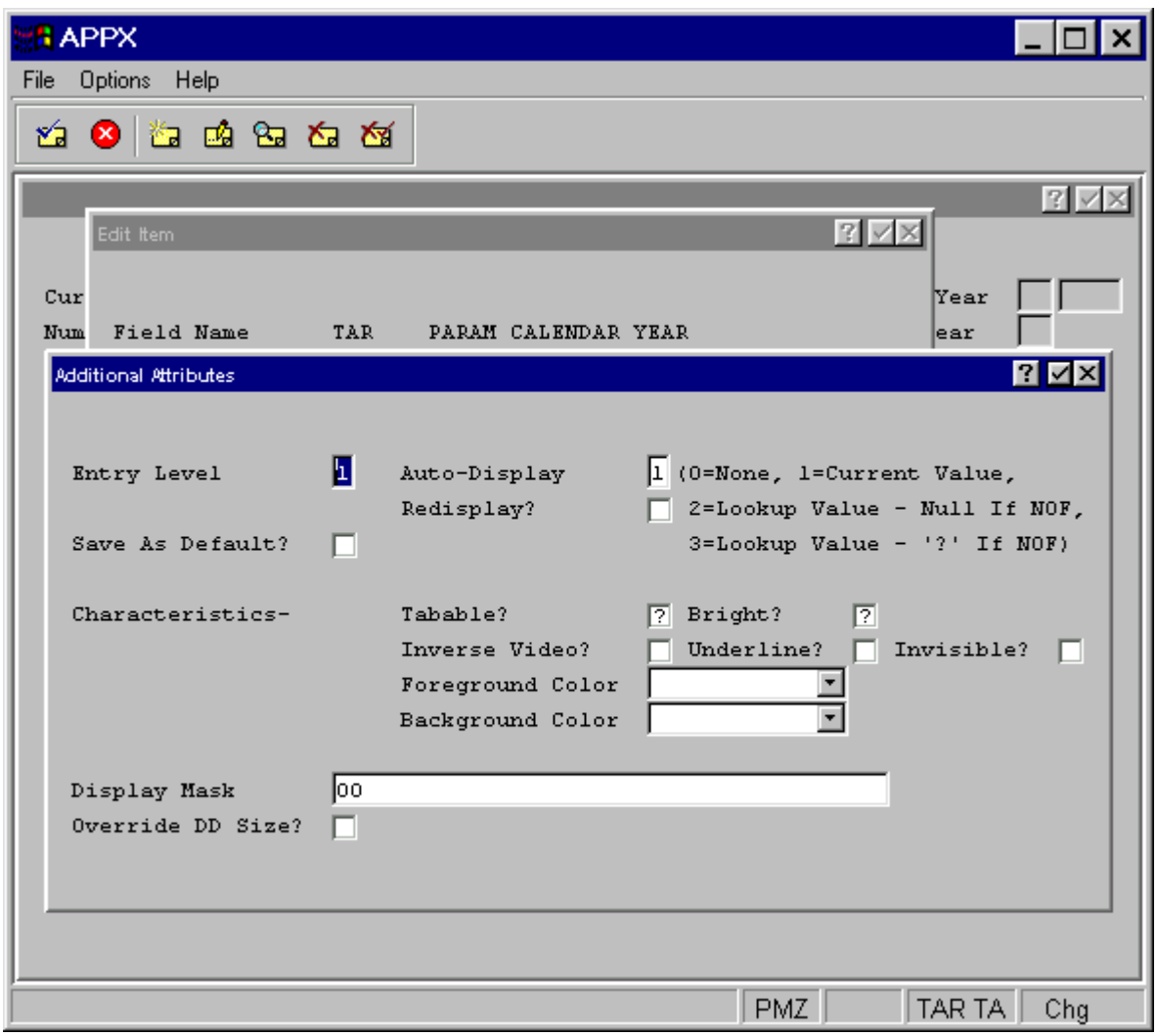
Month names or day names are only valid in masks that include sufficient part placeholders to identify a specific month or day within a specific year.

Logic Item Additional Attributes

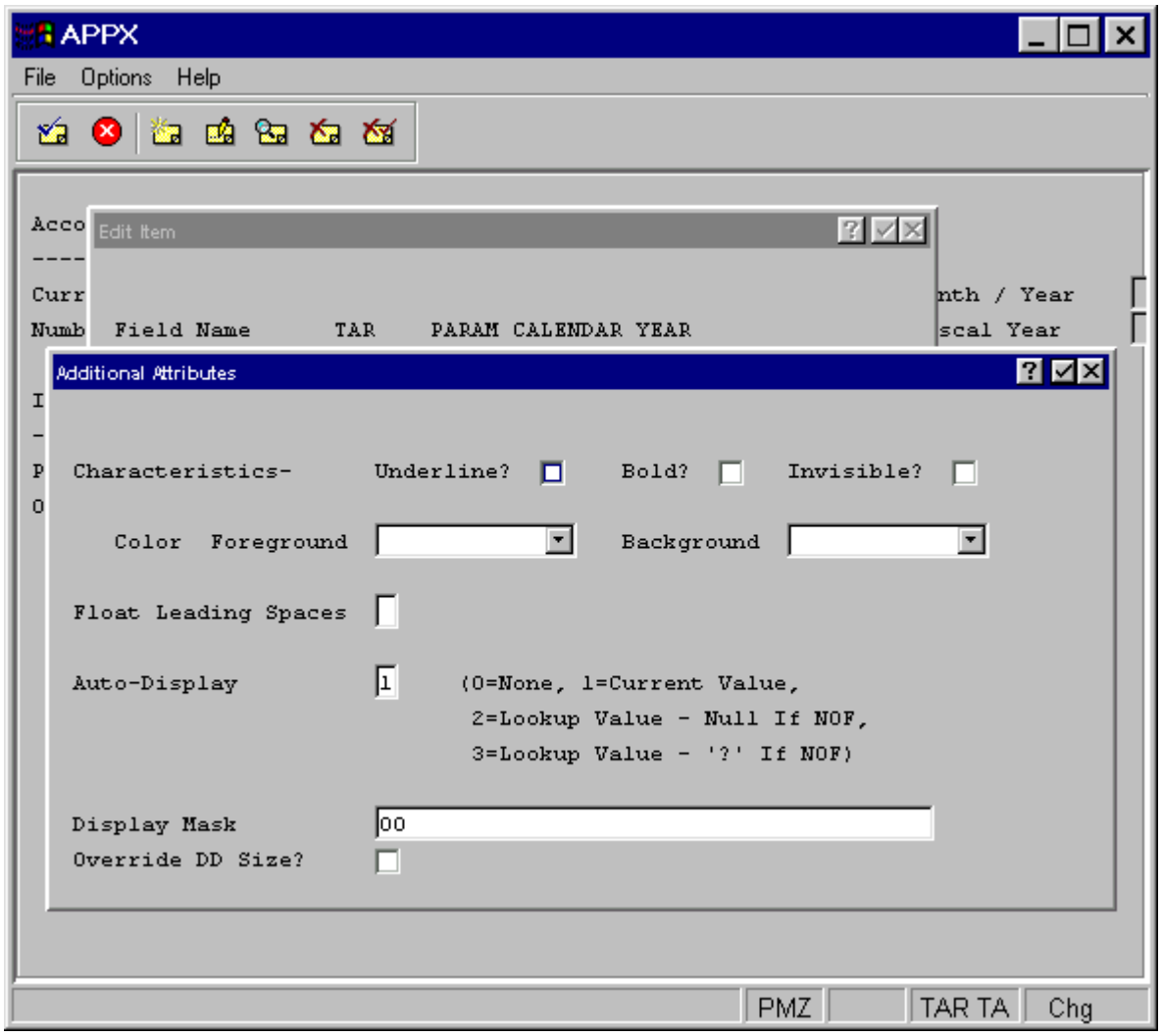
There are no additional specifications to enter for a logic item. - Yes, there are!

Numeric Item Additional Attributes

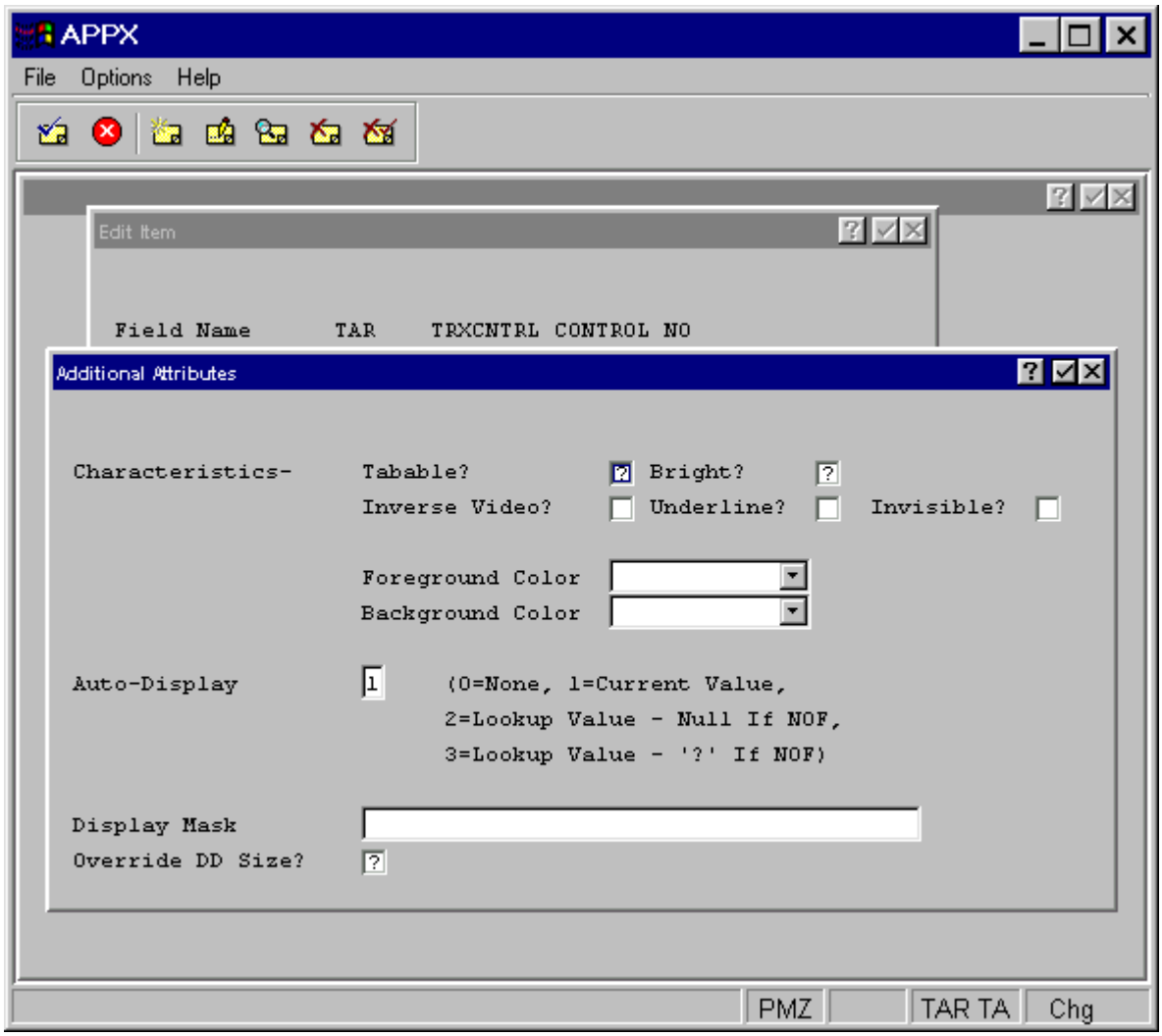
The numeric item Additional Attributes overlays, shown below, contain specifications that are unique to the appearance of a numeric field painted as an item on an image. The specifications that follow are a composite of those you see when defining a numeric input, output, or inquiry item. If a specification only displays for a specific type of process, the definition indicates so.



Numeric Input Additional Attributes Overlay



Numeric Output Additional Attributes Overlay



Numeric Inquiry Key Entry Additional Attributes Overlay

The numeric item Additional Attributes overlays contain some of the same fields that the alphanumeric and date/time item Additional Attributes overlays do, as well as the following numeric-specific fields.

Auto-Display indicates whether or not the value in this item automatically displayed and, if so, both the source of the value and the action to be taken if the information is not on file. The options are:

0 = None. The value for this item will not automatically display. Its appearance is explicitly controlled by the designer with statements.

1 = Current Value. Displays the value of the field in the record currently in memory.

2 = Lookup Value - Null if NOF. Displays the value of the field in the record that is defined in the data lookup. If the information is not on file, the field displays blanks.

3 = Lookup Value ? if NOF. Displays the value of the field in the record that is defined in the data lookup. If the information is not on file, the field displays question marks (???).

The following option only displays for End of Range frames in an output process.

4 = Range Total Value. Displays the sum of the values in this field for each record in the range.

The default is 0 = None. Refer to *Automatic Data Lookup and Display* and *Data Lookup Specifications* for additional information.

Display Mask designates the format that data should display in to a user, such as on screens and reports.

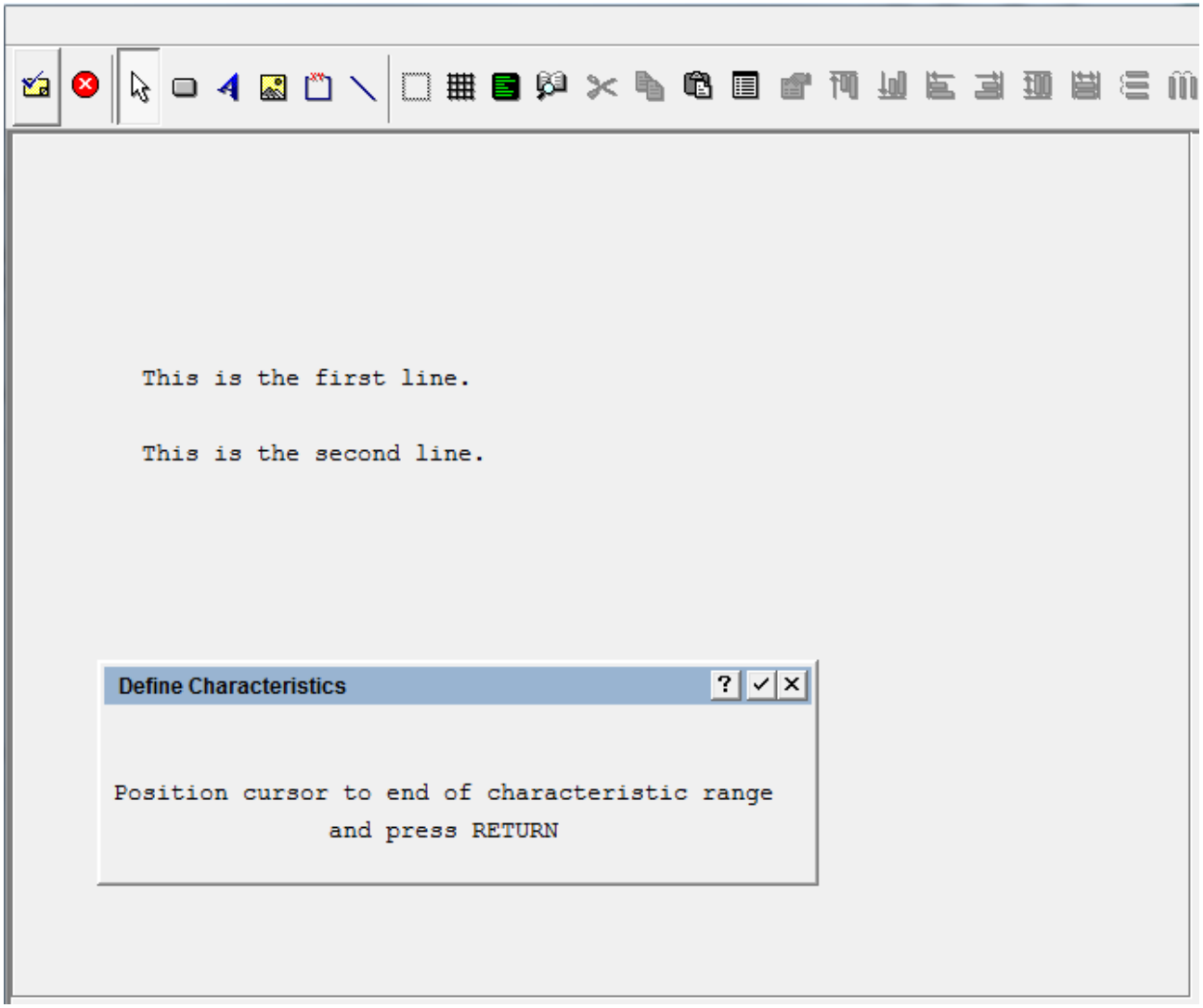
Override DD Size? Select 'yes' ☑ if you want the defined display mask to override the field size entered in the data dictionary for this input item. This mask can be either larger or smaller than the actual field size. The default is'no' ☐.

Re-Display. A 'yes' ☑ in this field instructs APPX to display the new value in a field if that value has changed. If a user enters a partial value, APPX will display the value before allowing the user to continue with data entry.

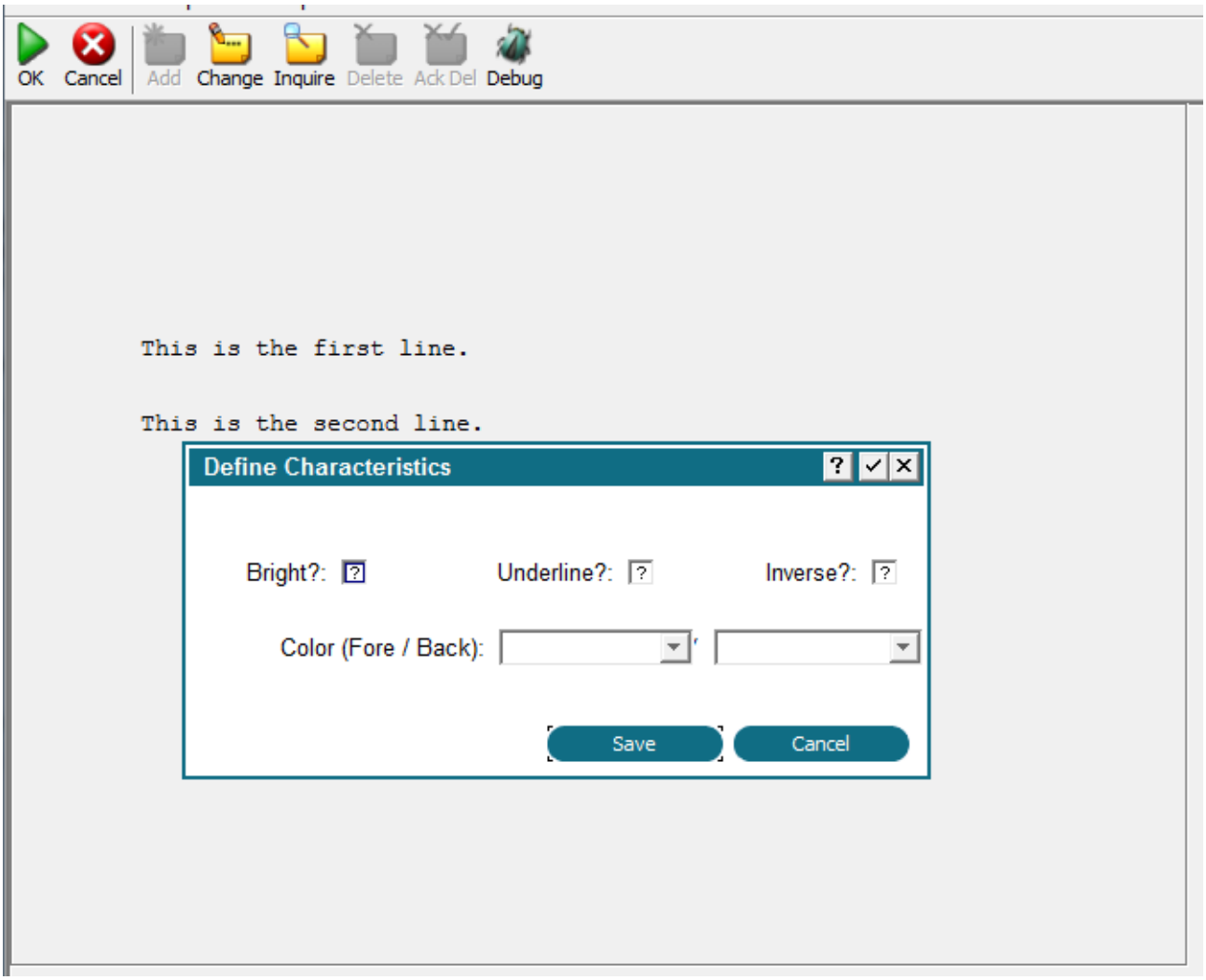
Defining Image Characteristics

In addition to defining display attributes for items on images, APPX permits you to establish display attributes (*characteristics*) for various regions of an image. Such characteristics include bright and inverse video for menu and input images, bold and expanded print for output and inquiry images, as well as underlining and foreground/background colors for all images. Of course, more sophisticated graphical displays are also possible by using the GUI features of the Image Editor.

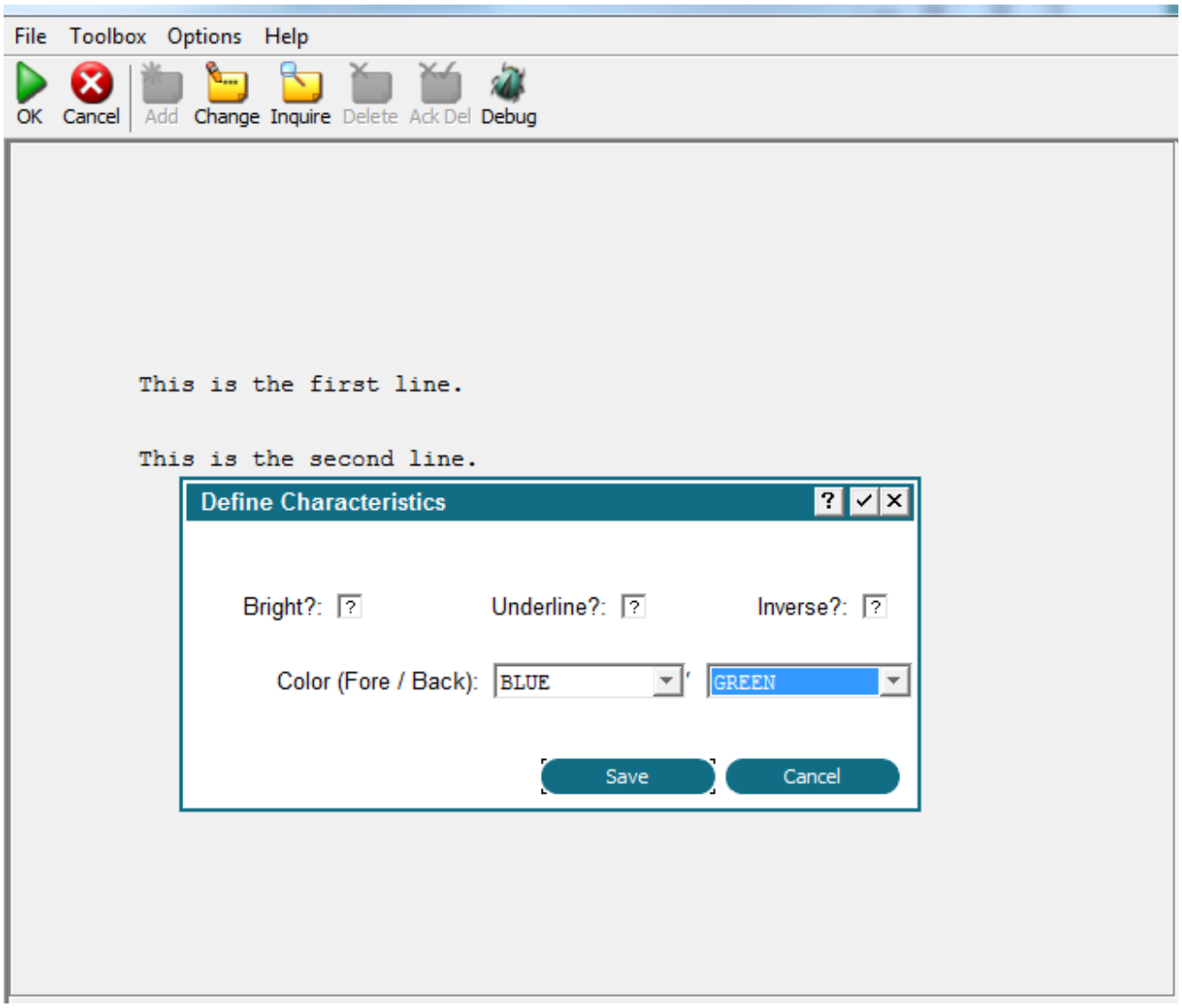
To define the characteristics of a region on an image (or edit an existing region), position the cursor at the starting row/column and, using the keyboard, select option 13. APPX prompts you to position the cursor at the ending row/column and press return.



This establishes the size of the region. APPX then displays a Define Characteristics overlay. You can select the characteristics you want to apply by toggling the appropriate checkboxes between 'yes' ☑ and 'no' ☐ values.



To set foreground and/or background colors, you can pick a color from the drop-down lists of available choices. When you have made your selections, press return or select Enter ☑ to apply the changes and return to the Image Editor.



The specifications that follow are a composite of those you see on the respective Define Characteristics overlays. If a specification only displays for a specific type of image, the definition indicates so.

Bright? for menu and input images, determines whether or not text within the region appears bright on the screen.

Underline? governs whether or not text within the region appears with an underline.

Inverse? for menu and input images, determines whether or not text within the region appears with its light and dark areas reversed on the screen.

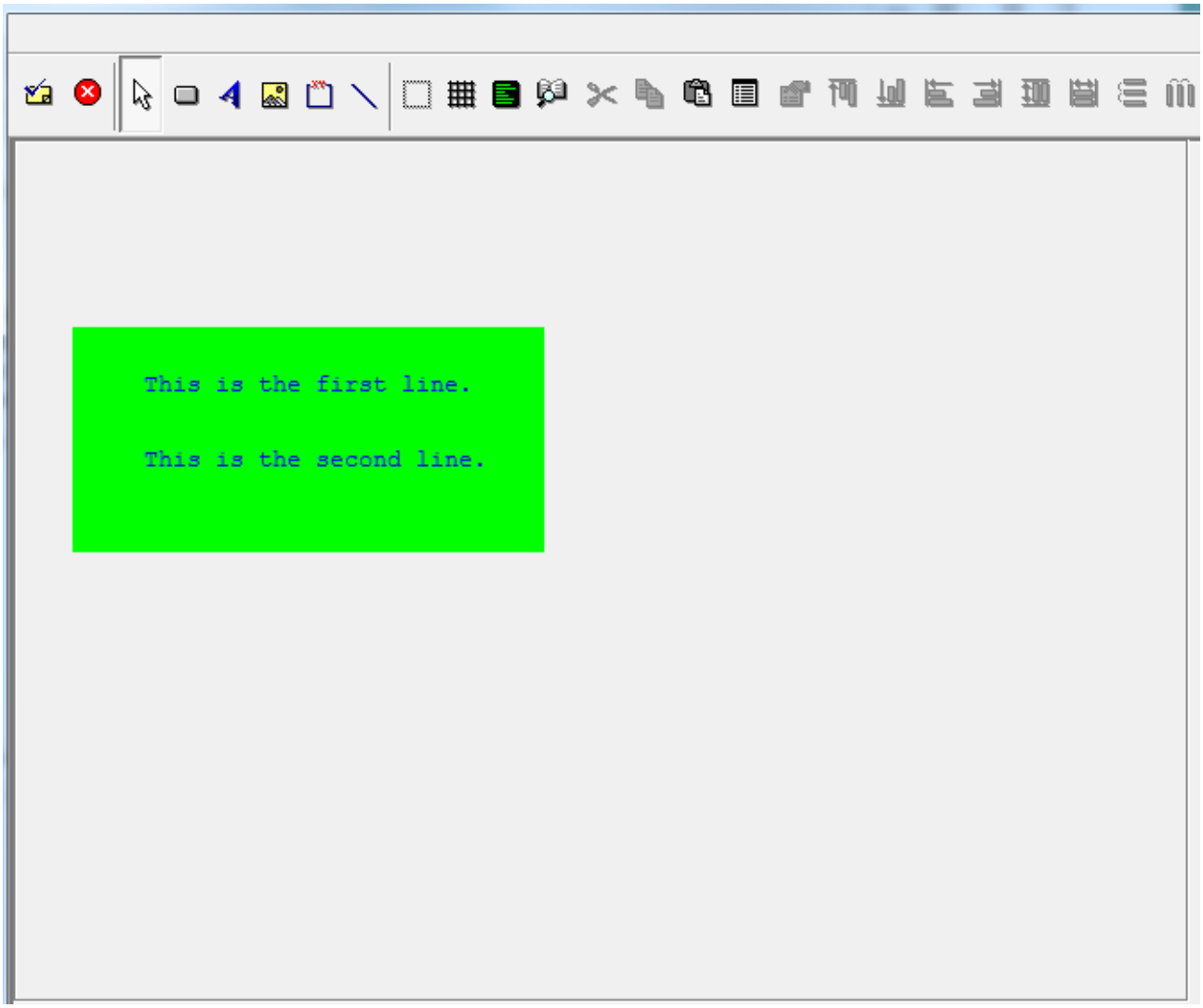
Bold? for output and inquiry images, indicates whether or not text within the region appears bold in the output.

Expand? for output and inquiry images, controls whether or not text prints in expanded format.

Foreground Color indicates the color the field value is displayed in. Select from a drop-down list of colors. Leave this field blank to use the default foreground color.

Background Color indicates the color the field box is displayed in. Select from a drop-down list of colors. Leave this field blank to use the default background color.

The default for these fields is blank.



Option Numbers in Design Mode

The option numbers assigned on an image can be displayed within User Mode and now also within Design Mode. The existing pull-down menu for Options and "Show Option Numbers" will control the option numbers displaying on the image for both modes.

Also, during Design Mode within the Image Editor, a right-click anywhere on the image provides the choice to "Toggle Option Numbers;" this choice operates the exact same as the "Show Option Numbers."

With the option numbers displayed in Design Mode Image Editor, you can easily determine what option numbers have been assigned to each button and what option numbers are available for new buttons.

CHAPTER 3-16

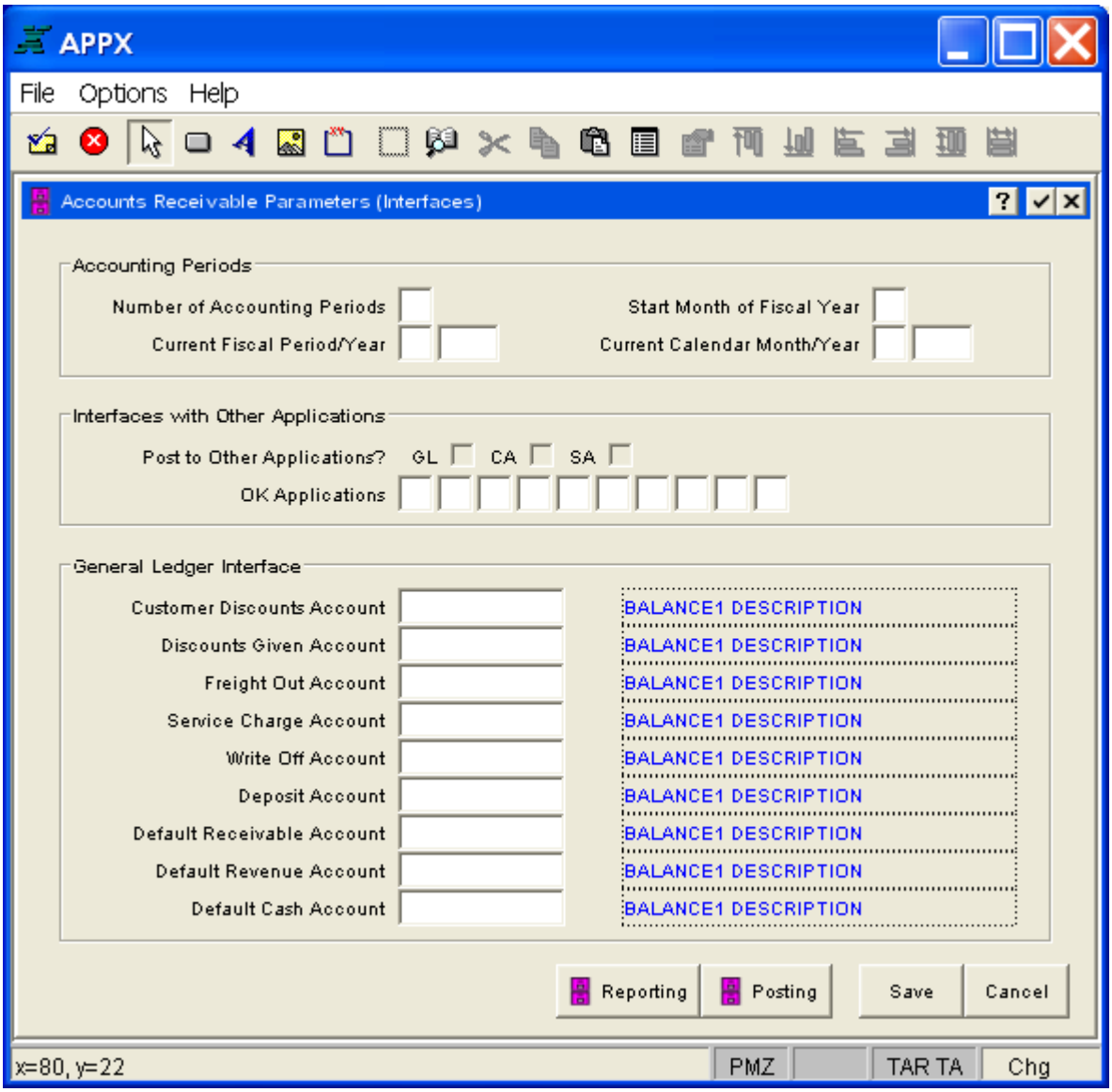
Using GUI Features of the Image Editor

GUI Features of the Image Editor

The Image Editor allows you to create menu, input, output, and inquiry images containing a variety of graphical components for use in GUI-enabled environments. Such images are designed using the mouse as the primary design tool instead of the keyboard. One of the Image Editor's most important GUI features is the APPX Data Palette which allows you to interactively view the dictionary of database components, select them, and "drag" them onto your screen image.

The APPX Image Editor works much like many other Windows-based screen design tools. You can make selections, move and resize items, and perform cut/copy/paste operations in a similar manner. Tools for many of the GUI features can be accessed from the Image Editor toolbar discussed in the next section. Graphical components can be added to menu, input, output, and inquiry processes at the frame, image, or field level. These components include wallpapers, titlebars, menu bar items, toolbar items, icons, and other features that are not part of the actual "image" you paint.

The figure below shows an input image using GUI features being edited in the Image Editor.



Input Image Using GUI Features of the Image Editor

Image Editor Toolbar

The Image Editor toolbar contains many design tools not found on the standard APPX runtime toolbar. These tools allow the designer to easily perform a variety of image design functions.

The items on the toolbar are grouped in four categories:

APPX Options

Save and Exit to save the image and exit the image editor.

Cancel to discard the changes made to the image and exit the image editor.

Paint Object Tools

Select a Region defines the region of the image you want to perform your design work in.

Paint a Button is used to place a button on a menu or input image and define its properties.

Paint a Label is used to place a label (text) on the image and define its properties.

Paint a Picture is used to place a picture (jpg or gif file, for example) on the image and define its properties.

Paint a Box is used to place a box on the image and define its properties.

Paint a Line is used to draw a line on the image and define its properties.

Paint a Table is used to paint a two demensional table on the image.

Other Tools

Show Object Bounds is used to display the boundaries of an object, useful for objects with no borders.

Show Grid Lines to display a grid on the image to assit in lining up various elements.

Toggle GUI Display use this to switch from GUI to Character display mode.

Data Palette opens the APPX Data Palette and allows you to select and add data objects to the image from the Data Dictionary.

Cut Selection is used to remove a selection from the image. It becomes available to be 'pasted' elsewhere on the image, if desired.

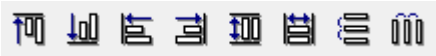
Copy Selection is used to copy a selection from the image so that it can be 'pasted' or duplicated elsewhere.

Paste Selection is used to place a previously 'cut' or 'copied' selection elsewhere on the image. Note that this icon cannot be selected until a selection has been 'cut' or 'copied'.

Edit Window Properties is used to edit properties of the current image or global properties of all images for the current frame.

Edit Object Properties is used to edit the properties of a previously defined and selected button, label, picture, box, line, or item.

Alignment and Sizing Icons



Align Tops aligns the tops of two or more selected objects.

Align Bottoms aligns the bottoms of two or more selected objects.

Align Left Sides aligns the left sides of two or more selected objects.

Align Right Sides aligns the right sides of two or more selected objects.

Make Same Size (vertically) makes two or more selected objects the same height.

Make Same Size (horizontally) makes two or more selected objects the same width.

Spread Space (vertically) increae the spacing between two or more selected objects.

Spread Space (horizontally) increae the spacing between two or more selected objects.

For details on selecting objects, see Making Selections.

Making Selections

The following rules apply when using the mouse to select individual objects or groups of objects on an image:

Click an object to select it and clear any previous selections.

Ctrl-Click an object to select it and retain any previous selections. This is required when selecting two or more objects to align or size. When two or more objects are selected in this manner, the selection border around the last item selected will be blue. All other selected items will have a selection border that is red. The item with the blue selection border is used by the alignment and sizing tools to determine how to align or size the other selected items.

Drag a rectangle around any combination of the above to select all objects within the rectangle. This will also clear any previous selections.

Using Guide Bars

Guide bars are used by the APPX designer to align objects on an image. They can be created and moved using these instructions:

Use the right-click menu (see the Image Editor Right-Click Menu) to create vertical and horizontal guide bars.

When the mouse is positioned over a horizontal guide bar, the cursor changes to an up/down move cursor that you can use to click and drag the guide bar to a new location on the image.

When the mouse is positioned over a vertical guide bar, the cursor changes to a left/right move cursor that you can use to click and drag the guide bar to a new location.

You can remove a guide bar (either vertical or horizontal) by dragging it off the screen.

Cursor Types

When moving the mouse over a selection, the cursor changes based on its position within the selection. If there are multiple selections active on the image, the cursor becomes a move cursor only. Otherwise, see Table 3-15-1 below for information on how mouse location affects cursor type.

Table 3-15-1. Cursor Types

Mouse Location	Cursor Type
NW drag handle	Upper-left drag cursor
N drag handle	Up/down drag cursor
NE drag handle	Upper-right drag cursor
E drag handle	Left/right drag cursor
SE drag handle	Lower-right drag cursor
S drag handle	Up/down drag cursor
SW drag handle	Lower-left drag cursor
W drag handle	Left/right drag cursor
All other locations	Crosshair (move cursor)

Moving and Resizing

Single or multiple selections of buttons, labels, pictures, and lines or boxes can be moved and/or resized. Moving and resizing selections are subject to these guidelines:

A single selection is resized by dragging a drag handle.

A selection (single or multiple) is moved by dragging the cursor if it is a move cursor, or by use of the arrow keys.

Dragging any selection when multiple objects are selected moves all selections.

Only one selection can be resized at a time using a drag handle. Multiple selections cannot be resized by dragging. However, you can make multiple selections the same size vertically or horizontally by using the sizing icons on the Image Editor Toolbar or the sizing menu items on the Image Editor Right-Click Menu.

If no objects are selected, the arrow keys move the cursor as expected.

Image Editor Right-Click Menu

The *Right-Click Menu*, shown below, is used to perform many of the same functions available on the Image Editor toolbar.

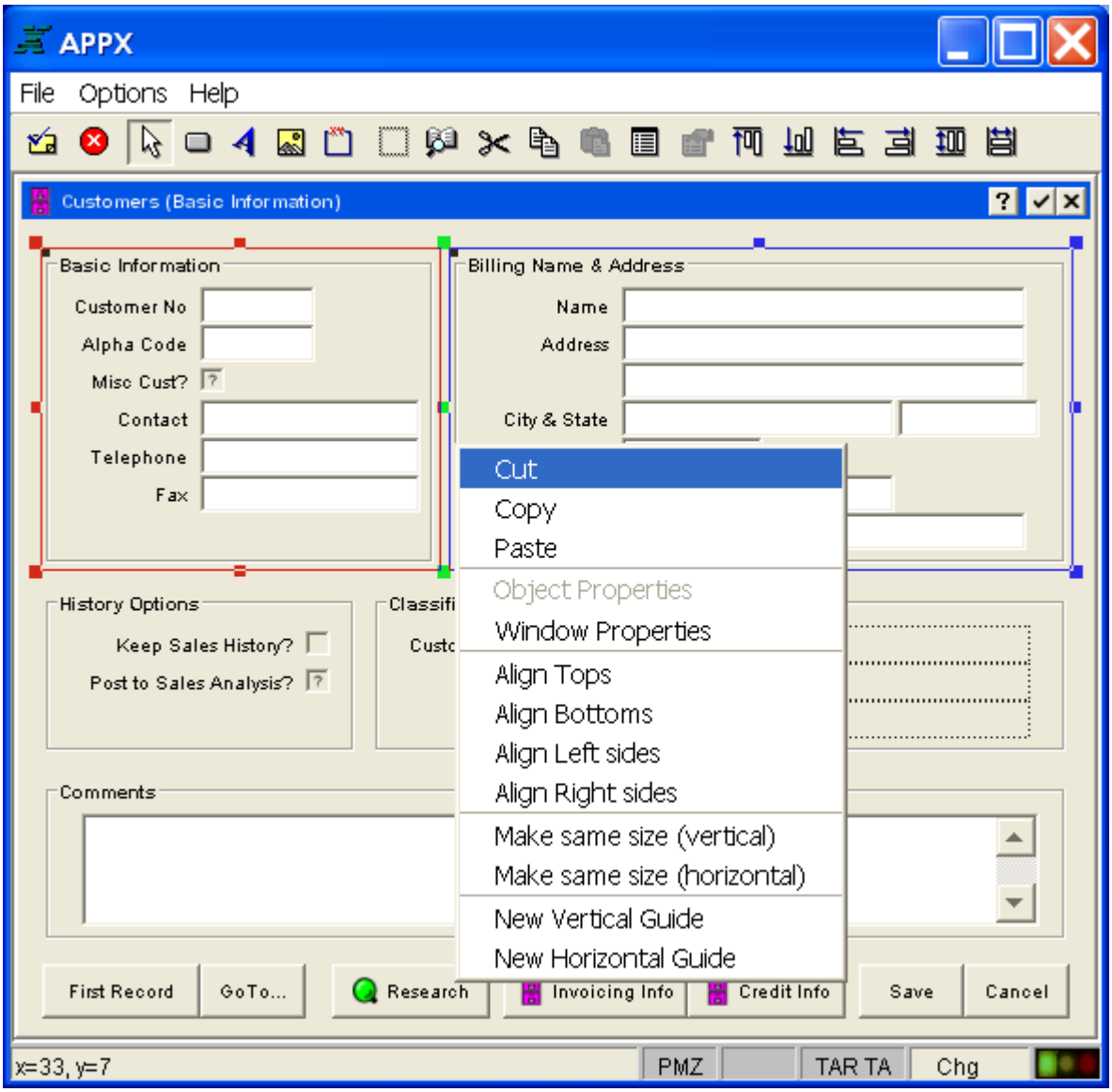


Image Editor's Right-Click Menu

To access the *Right-Click Menu*, simply click your mouse's right button. Note that positioning of your pointer is important as the top of the menu appears directly below where the mouse pointer is positioned. These functions are available:

Cut/Copy/Paste operate as described in the *Data Palette, Cut/Copy/Paste, and Edit Tools* section of the Image Editor Toolbar topic.

Object Properties edits properties of the selected object as described under Painting Buttons, Labels, Pictures, and Boxes or Lines.

Window Properties edits graphical attributes of the current image or all images for the current frame.

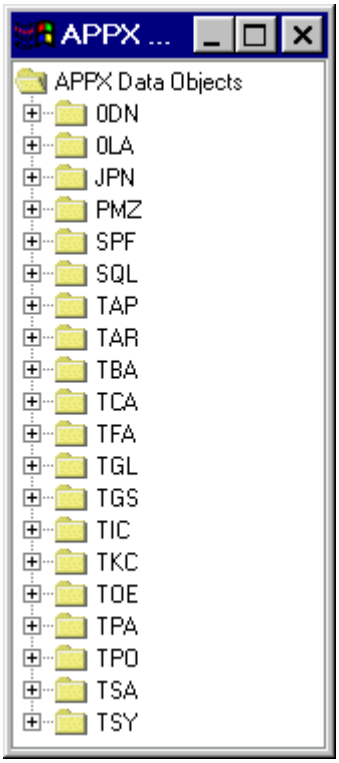
Alignment/Sizing operate as described in the *Alignment and Sizing Icons* section of the Image Editor Toolbar topic.

New Vertical/Horizontal Guide creates vertical and horizontal guide bars as described under Using Guide Bars.

APPX Data Palette

The APPX *Data Palette* is used to paint APPX data objects on the image when using the GUI features of the Image Editor. To access the Data Palette from the Image Editor, just select the data palette tool from the Image Editor Toolbar.

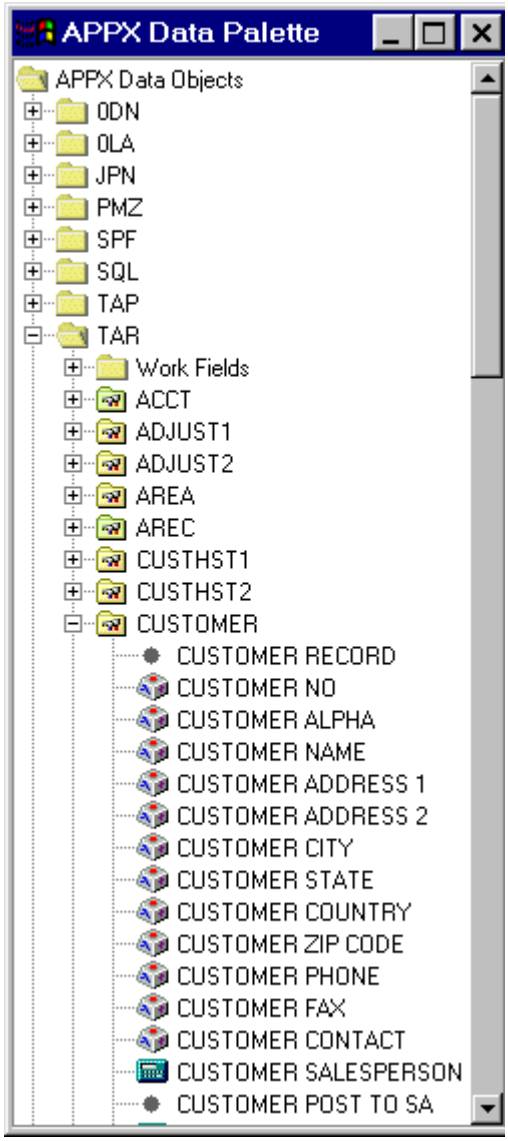
The APPX Data Palette overlay appears as shown below. You can move the Data Palette Overlay by clicking the Data Palette's titlebar and dragging the overlay to the desired location. You can also resize the overlay by clicking and dragging any corner or side of the overlay's border, thus enlarging or shrinking the overlay.



APPX Data Palette Overlay

APPX Data Objects

The APPX Data Objects section of the Data Palette provides you with an expandable list of data items that are available for placement on your image. See below. Note that different symbols tell you the data type (alphanumeric, numeric, date, etc.) of each field. To select an item and paint it on your image, just select the item and drag it to the image and its desired position.

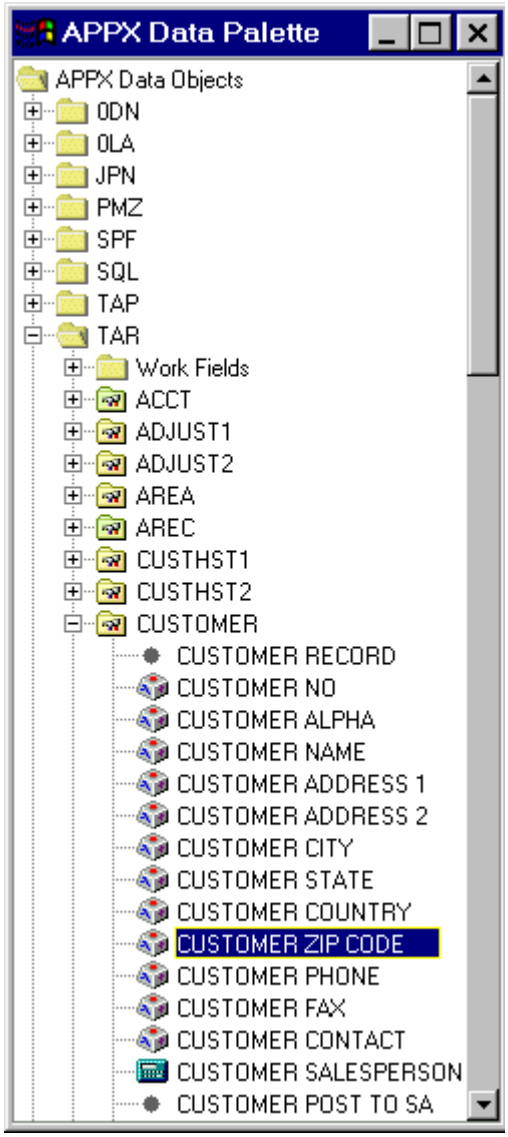


APPX Data Palette Data Objects List

Editing or Defining Data Objects for Images

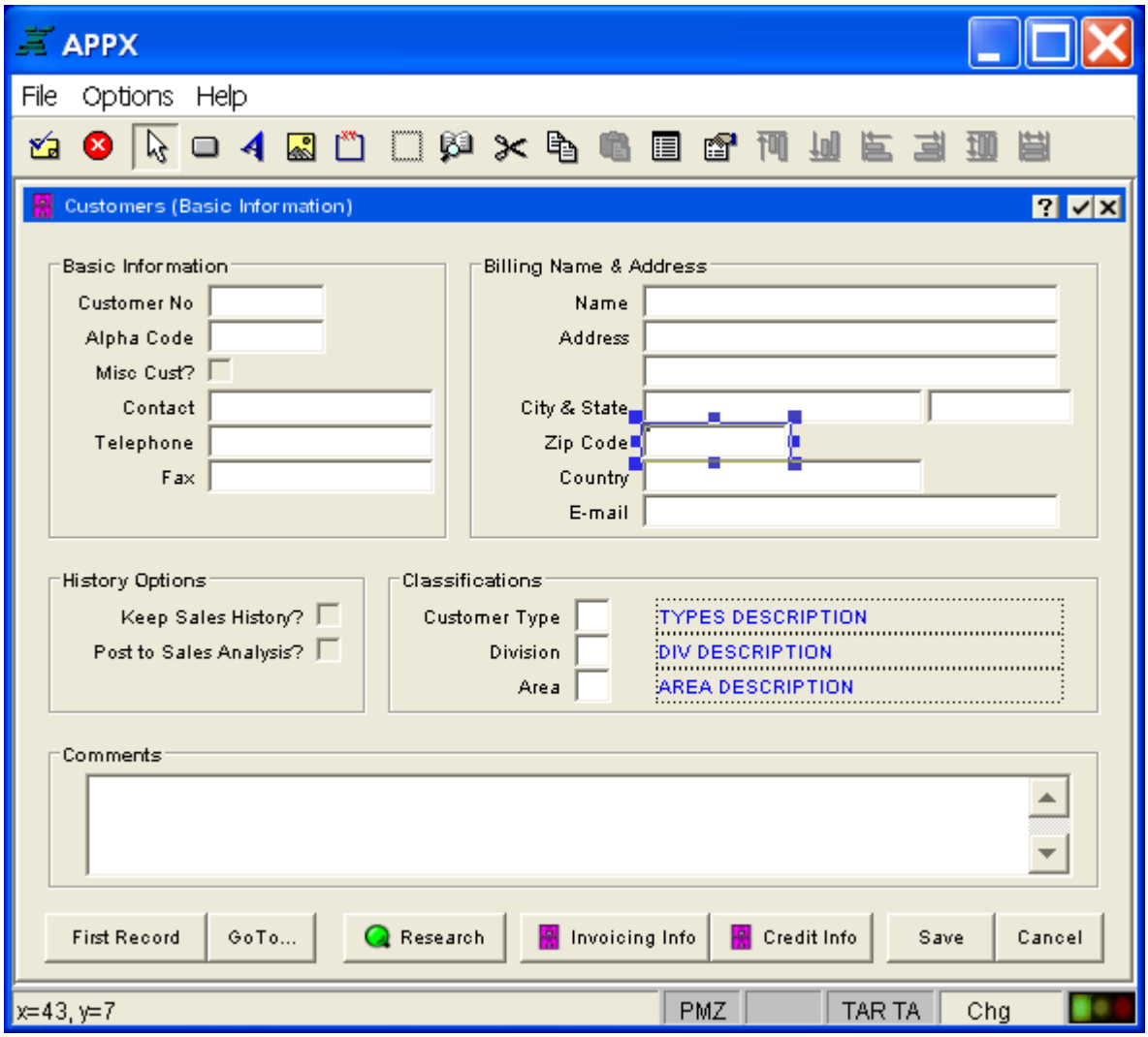
The Data Palette is only used to add new data objects to an image. Activate the Data Palette by selecting the Data Palette option from the Image Editor toolbar. Available APPX applications are listed in the APPX Data Options sections of the Data Palette. Double-click one of the applications listed to expand the list to *Work Fields* and file names. Double-click *Work Fields* to view a list of the application?s work fields, or double-click a file name to view a list of fields defined within the chosen file. Using the left

button of your mouse, click the desired field name and drag it to the desired location on the image (position the pointer to where you want the first character of the field to be placed). See below. Release the mouse button to insert the field.



Selecting Data Object

The following screen shows the image after inserting the new field and clicking on it to select it.



Using the Data Palette to Paint Objects on an Image

The selected data object will be painted on the image using its default attributes. If you want to change those attributes, simply double click on the object or select the object and then select 'Edit Object Properties' from the toolbar. To remove it from the image, select the object and then select 'Cut Selection' on the toolbar.

Data Object Specifications

If you are editing an existing data object or adding a new data object, as described in Editing or Defining Data Objects for Images, APPX presents a number of specification screens that establish various operational and display attributes, as well as data lookup definitions.

The item screen contains specifications that relate to the appearance of a data dictionary field on an image. Such specifications are described in the Image Item Specifications section in Using the Image Editor. The GUI Attributes option on the *Item Specifications* overlay contains fields that vary depending

on the type of field (alphanumeric, numeric, date, or logic) and on the type of process. These fields are used to define graphical attributes such as widgets, font characteristics, and colors. For details, see the Defining Graphical Attributes for Image Fields section.

Painting Buttons, Labels, Pictures, and Boxes or Lines

You can add buttons, labels, pictures, lines and boxes to your image by using the GUI features of the Image Editor. To learn more about using ILF statements to control the display of pictures, see the PICTURE statement in ILF Keyword Reference.

To add buttons, labels, pictures, lines or boxes to an image, you follow the same basic steps:

Select the Icon

Select the icon from the Image Editor tool bar that corresponds to the graphic you want to paint on the image.

To paint a button

To paint a picture

To paint a box (or a line)

Select the Region

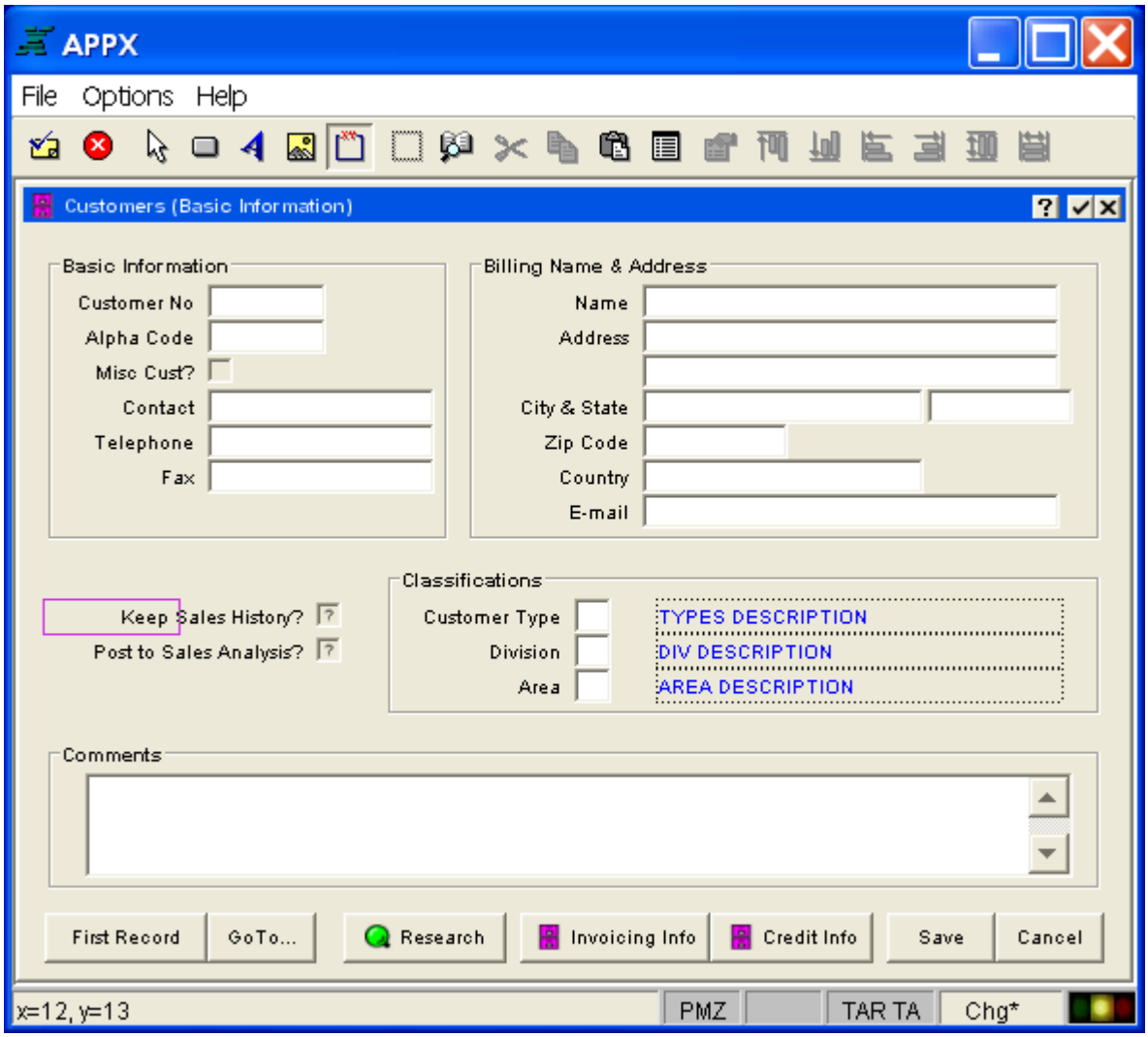
Select the region in which you want to place the graphic. Using the mouse, position the pointer to the upper leftmost corner of the intended region. Click the left mouse button and hold, and start dragging the pointer to the lower right most corner of the region. This should create the outline of a box on the image, as shown below

Release the mouse button when the region is outlined approximately where you want the graphic to appear, as shown further below. You can always make fine adjustments later.

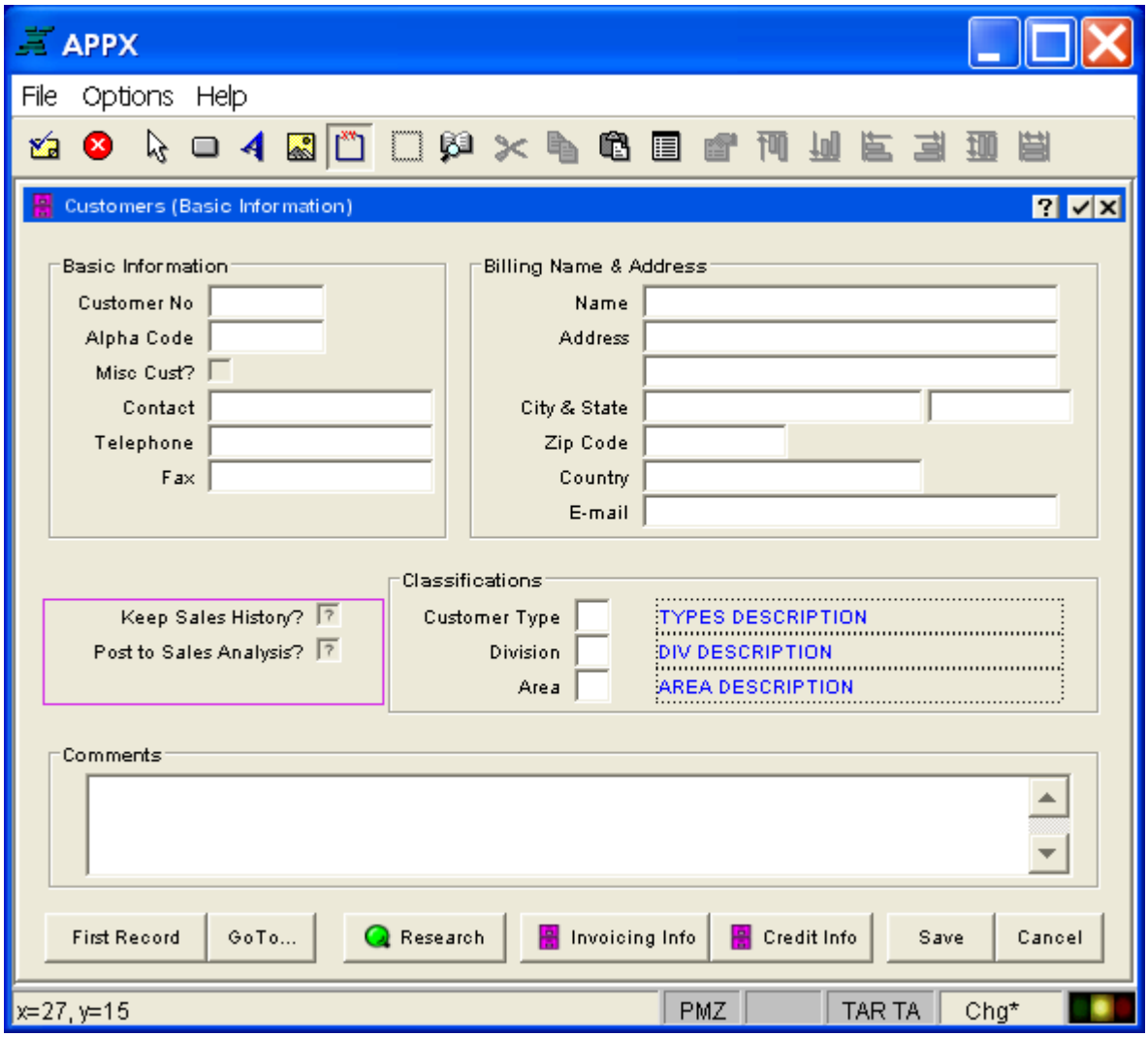
When defining the region for lines or boxes, the end of the region must be the same row for lines and a subsequent row for boxes. For boxes, you cannot begin in column 1 or end in the last column of your image.

Define the Graphic

Define the graphic by filling in the overlay that appears. The overlays are different depending on the graphic you are adding. See the appropriate topic (Painting Buttons, Painting Labels, Painting Pictures, or Painting Boxes or Lines [reference unavailable in the source]) for specifics on defining a particular graphic.



Selecting a Graphics Region (Part 1)

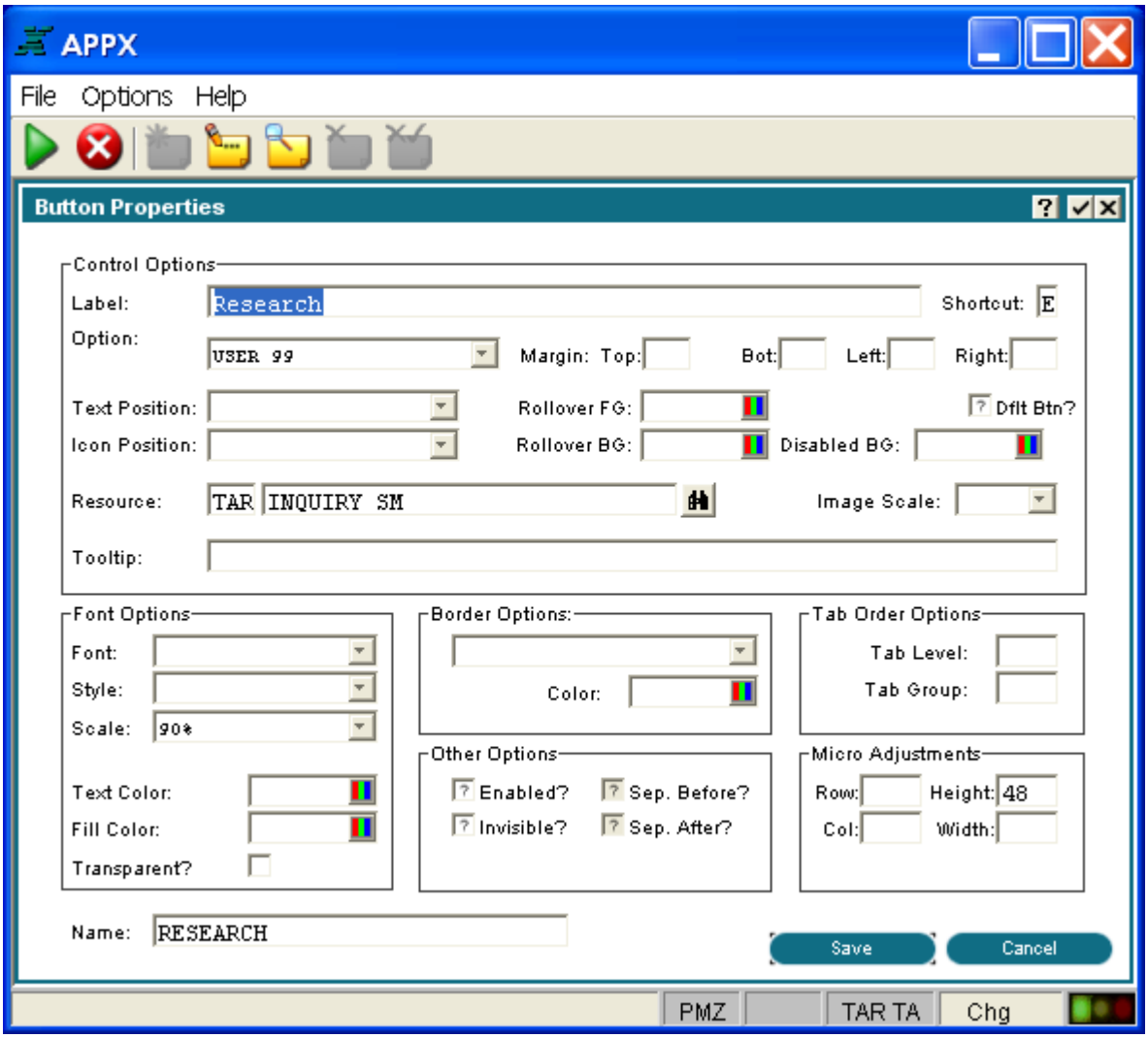


Selecting a Graphics Region (Part 2)

Painting Buttons

A button is used to provide users with a simple means of initiating an APPX process, function, or option. For example, the button labeled 'Research' shown on the bottom of the screen in *here* allows users to quickly reference another process to perform Accounts Receivable research. You can add buttons to any menu or input process to enhance the functionality of the process.

After selecting the region in which you want to paint the button, as described in Painting Buttons, Labels, Pictures, and Boxes, the *Button Properties* overlay shown below appears. The information entered in this example produced the Research button shown earlier here.. When the user selects this button, the process defined as Option 99 in the Optional Children for this image is executed.



Button Properties Overlay

The *Button Properties* overlay contains several fields you can use to define the characteristics of your button:

Control Options

Label marks the button with the option, function, or process name.

Shortcut defines a single key that serves as a shortcut to this button's functionality.

Option selects a pre-defined APPX option or an option specific to the user or process. This option corresponds to a specific process defined in the Optional Child Processes for this image.

Margin (Top, Bottom, Left, Right) sets extra margin space between the contents of the button and the border of the button. This value is in pixels and must be less than or equal to 255.

Text Position indicates where the text should appear inside the button. Click the list button for a drop-down list of selections that include CENTER, TOP, RIGHT, BOTTOM, LEFT, UPPER RIGHT, UPPER LEFT, LOWER RIGHT and LOWER LEFT.

Icon Position indicates where the defined icon (if any) should be placed in relation to the text inside the button. Click the list button for a drop-down list of selections that include BEHIND TEXT, ABOVE TEXT, TRAILING TEXT, BELOW TEXT, LEADING TEXT, ABOVE & TRAILING, ABOVE & LEADING, BELOW & TRAILING, BELOW & LEADING and EXPAND TO FILL.

Rollover FG indicates the foreground color of this button when the mouse pointer is positioned over the button. Click the color icon to begin and see the *Making Color Selections* section for further instructions.

Rollover BG indicates the background color of this button when the mouse pointer is positioned over the button. Click the color icon to begin and see the *Making Color Selections* section for further instructions.

Disabled BG indicates the background color of this button when it has been disabled. Click the color icon to begin and see the *Making Color Selections* section for further instructions.

Dflt Btn? indicates whether or not this button is the default button.

Resource specifies the application and name of a resource defined in Named Resources which links to one or more graphics files. Different graphics can apply depending upon resource state (disabled, enabled, rollover, pressed, etc).

Image Scale defines the size of the graphic as a percentage of the runtime font size. Click the list button to make your choice.

Tooltip defines one line of help text that is displayed after the mouse pointer has been positioned over the button for a few seconds.

Font Options

Font selects the font (Arial, Courier, etc.) the button's label is to be displayed with. Click the list button to make your choice. If left blank, the default font determined by your system administrator will be used.

Style selects the label's font style (bold, italic, etc.). Click the list button to make your choice. If left blank, the regular font style is used.

Scale defines the size of the label's font as a percentage of the runtime font size. Click the list button to make your choice.

Text Color defines the label's font color. Click the color icon to begin and see the *Making Color Selections* section for further instructions.

Fill Color defines the button's fill color. Click the color icon to begin and see the *Making Color Selections* section for further instructions.

Transparent? indicates whether or not the background of the button should be opaque or transparent.

Border Options

Type defines the type of border that will surround the button. Click the list button to make your choice.

Color defines the color of the border. Click the color icon to begin and see the *Making Color Selections* section for further instructions.

Tab Order Options

Tab Level defines the physical pass over the whole screen with respect to tab order. If left blank, this the button is considered to be in tab level 0. APPX will tab from top-left to bottom-right for all data objects in tab level 0. Then it repeats the sequence for all button objects in tab level 0. The cycle is repeated as necessary for each successive tab level. This behavior can be altered by the specification of Tab Groups.

Tab Group marks related fields and buttons so that they are grouped together as part of a tab order. When making a pass over the screen for a particular "Tab Level", if a field is encountered that has a non-null "Tab Group", then the tab order proceeds to all the fields and buttons that are part of that Tab Level/Tap Group. After reaching the last field or button in the group, the order will continue where it left off prior to entering the group. Note that for "Tab Groups", fields and buttons are consolidated into the same top-left to bottom-right pass.

Drag Option

The Button Widget can be moved around the screen by the user. This must be set by the designer by defining what --- OPTION value is to be sent if the button is moved. In addition to setting and firing the specified option the values of --- CURSOR ROW and --- CURSOR COLUMN are set to the location the button was moved to. It is assumed that you already know where the Button was originally defined on the screen. For the button to stay in it's new location you must position it there in the Pre-Display Event Point. One technique is to dynamically create the buttons in Pre-Display based on data in your files. In Option Intercept, if the button is moved you can update that data with the new button location from --- CURSOR ROW and --- CURSOR COLUMN, and when screen displays again the generated buttons will be created based on the updated data. Depending on the optional children attached to your image and which option number you choose to fire when moved, you may also have to set --- OPTION to a value to cause the screen to redisplay. Be aware that setting --- OPTION to REDISPLAY will cause the Pre-Display event point to run again, which in turn reloads the --- WIDGET file from the values in the executable module and the moved buttons will return to their original positions. To keep the relocated buttons in the new positions you may need to store the changed information and update the widgets each time Pre-Display is executed.

This option is specified as an @ macro entered into the Label or Tooltip widget fields.
Usage:

@ Macro Specification:

* Set Movable - @SMV=# Sets the Button widget to be movable and causes --- OPTION to be set to USER #. You can use values > 255, but you will have to move --- OPTION to a numeric field to test for them.

Other Options

Enabled indicates whether or not the button is initially enabled for use when this image is first presented to the user. If 'no' then the button must be enabled via ILF code in order for the user to be able to select it. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Invisible indicates whether or not the button is initially invisible when this image is first presented to the user. If 'yes' then the button must be made visible via ILF code in order for the user to be able to select it. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Sep. Before? is not a valid option when defining an button and is disabled.

Sep. After? is not a valid option when defining an button and is disabled.

Micro Adjustments

Row, Col, Height, and Width make slight adjustments to the size and position of the button. They are entered as a percentage of an image cell (1 row x 1 column) and must be less than or equal to 100.

Name allows you to 'name' the button so it can be controlled (enabled, disabled, etc.) via ILF statements.

Access to the GUI attributes at runtime with ILF code is done via the --- WIDGET file. The WIDGET records from the process are copied into this file and are available in the *Pre-Display* event point. WIDGET NAME is a key to this file. You can read and rewrite records in this file to affect the GUI attributes at runtime.

When you have finished defining the button you have two options available to you:

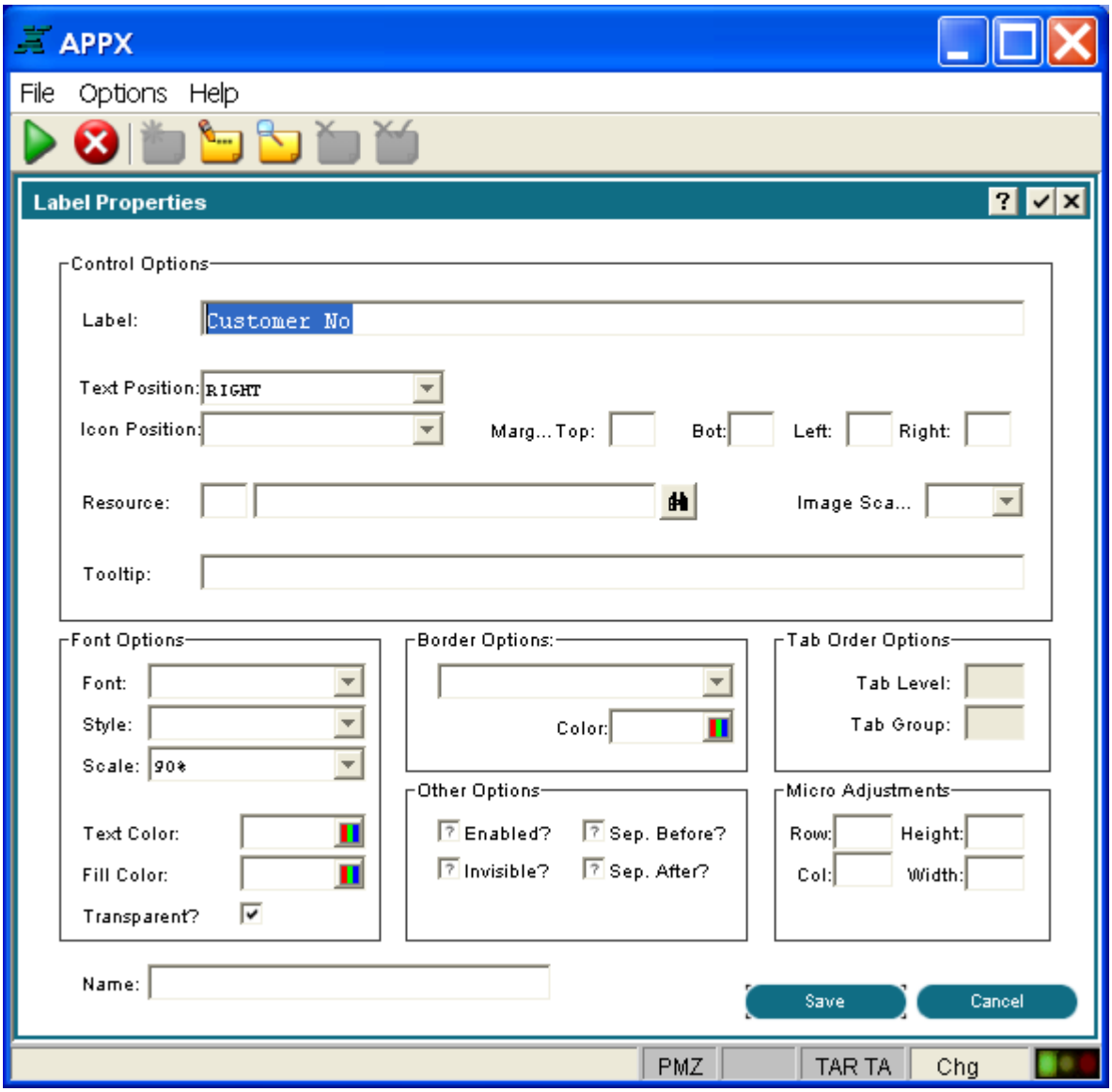
Select the Save option on the bottom right corner of the screen to save the definition and return to the Image Editor.

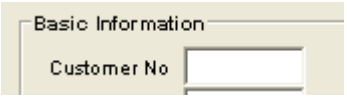
Or, you can select the Cancel option to discard the new definition or changes to an existing definition, and then return to the Image Editor.

Painting Labels

A label is used to define image text with GUI attributes that enhance the appearance of your image. Labels can be defined for descriptive text beside data objects. Label can also be used for a variety of other situations such as column headings above a scrolling region or other text which is to appear on the image.

The >Label Properties overlay shown below appears after you have selected the region on the image in which you want the label to appear, as described in Painting Buttons, Labels, Pictures, and Boxes.





Label Properties Overlay

The Label Properties overlay contains several fields which are used to define the characteristics of a label:

Control Options

Label to define the label's text.

Text Position indicates where the label should appear inside the selected region. Click the list button for a drop-down list of selections that include CENTER, TOP, RIGHT, BOTTOM, LEFT, UPPER RIGHT, UPPER LEFT, LOWER RIGHT and LOWER LEFT.

Icon Position indicates where the defined icon (if any) should be placed in relation to the label inside the selected region. Click the list button for a drop-down list of selections that include BEHIND TEXT, ABOVE TEXT, TRAILING TEXT, BELOW TEXT, LEADING TEXT, ABOVE & TRAILING, ABOVE & LEADING, BELOW & TRAILING, BELOW & LEADING and EXPAND TO FILL.

Margin (Top, Bottom*, Left, Right) sets* extra margin space between the label text and the border of the region. This value is in pixels and must be less than or equal to 255.

Resource specifies the application and name of a resource defined in Named Resources which links to one or more graphics files. Different graphics can apply depending upon resource state (disabled, enabled, rollover, pressed, etc).

Scale defines the size of the graphic as a percentage of the runtime font size. Click the list button to make your choice.

Tooltip defines one line of help text that is displayed after the mouse pointer has been positioned over the label for a few seconds. Tooltip does not apply to labels on output and inquiry images.

Font Options

Font selects the font (Arial, Courier, etc.) the label is to be displayed with. Click the list button to make your choice. If left blank, the default font determined by your system administrator will be used.

Style selects the label's font style (bold, italic, etc.). Click the list button to make your choice. If left blank, the regular font style is used.

Scale defines the size of the label's font as a percentage of the runtime font size. Click the list button to make your choice.

Text Color defines the label's font color. Click the color icon to begin and see the >Making Color Selections section for further instructions.

Fill Color defines the region's fill color. Click the color icon to begin and see the >Making Color Selections section for further instructions.

Transparent? indicates whether or not the background of the region should be opaque or transparent.

Border Options

Type defines the type of border that will surround the region. Click the list button to make your choice.

Color defines the color of the border. Click the color icon to begin and see the >Making Color Selections section for further instructions.

Tab Order Options

Tab Level is not a valid option when defining a label and is disabled.

Tab Group is not a valid option when defining a label and is disabled.

Other Options

Enabled indicates whether or not the label is initially enabled for use when this image is first presented to the user. If 'no', then the label must be enabled via ILF code in order for the enabled state to apply. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Invisible indicates whether or not the label is initially invisible when this image is first presented to the user. If 'yes' then the label must be made visible via ILF code in order for the user to see it. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐ values.

Sep. Before? determines whether or not a vertical line precedes the label.

Sep. After? determines whether or not a vertical line follows the label.

Micro Adjustments

Row, Col, Height, and Width make slight adjustments to the size and position of the label. They are entered as a percentage of an image cell (1 row x 1 column) and must be less than or equal to 100.

Name allows you to 'name' the label so it can be controlled (enabled, disabled, etc.) via ILF statements.

Access to the GUI attributes at runtime with ILF code is done via the --- WIDGET file. The WIDGET records from the process are copied into this file and are available in the Pre-Display event point. WIDGET NAME is a key to this file. You can read and rewrite records in this file to affect the GUI attributes at runtime.

When you have finished defining the label you have two options available to you:

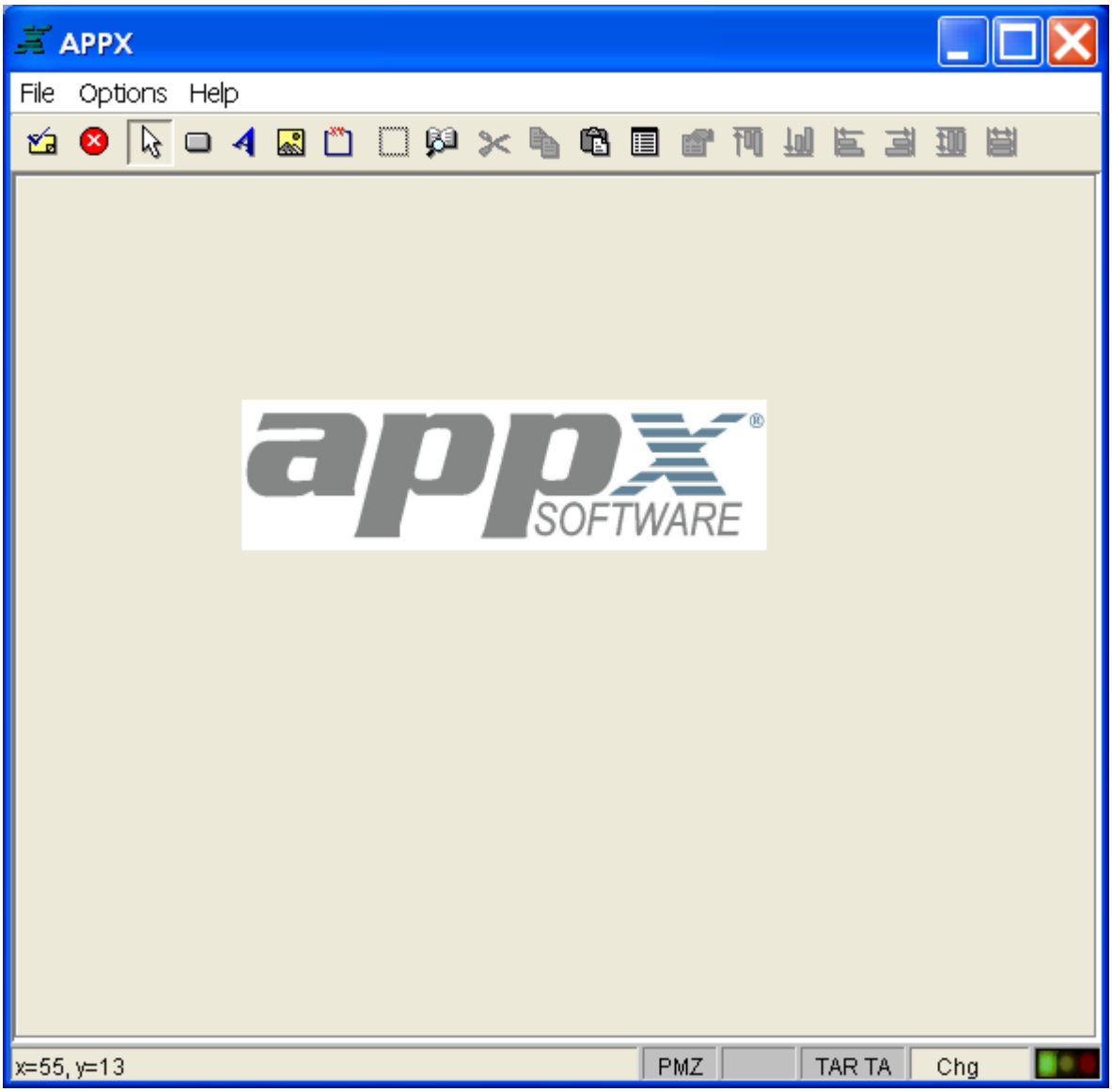
Select the Save option on the bottom right corner of the screen to save the definition and return to the Image Editor.

Or, you can select the Cancel option to discard the new definition or changes to an existing definition, and then return to the Image Editor.

Painting Pictures

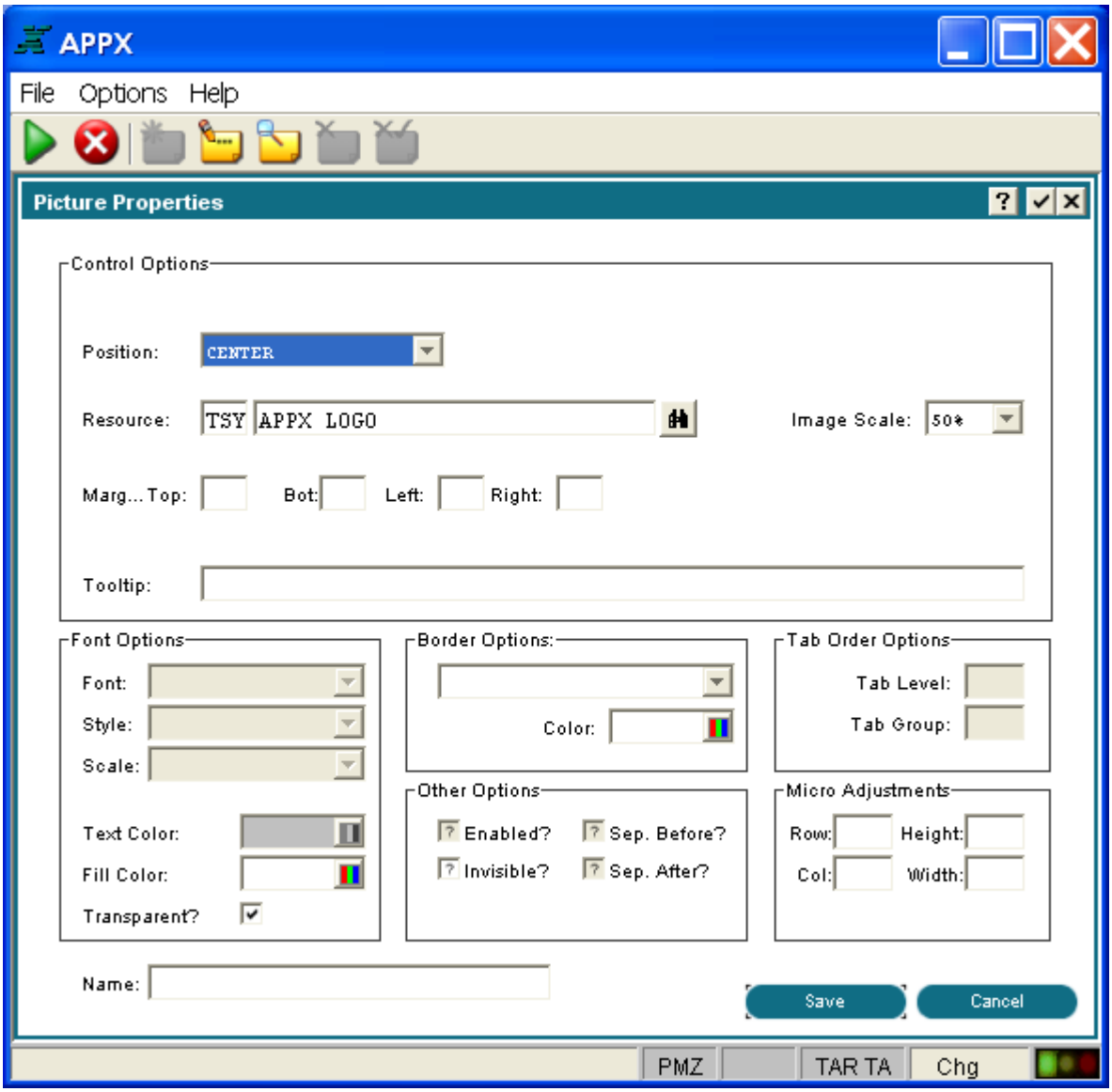
A picture object is used to add static graphic designs to a menu, input, output, or inquiry process, or to provide visual detail regarding, for example, a place, a product, or a person. To do so, you must first know the name and location (folder name) of the graphics file you want to add to the image.

An example input process with a picture on the image is shown below.



An Input Image Containing a Picture Icon

The overlay shown below was used to define the picture for this image. The Picture Properties overlay appears after you select your picture region, as described in Painting Buttons, Labels, Pictures, and Boxes. Notice that a Resource Name was used to identify the picture which is to be displayed. Picture objects are static and do not change at runtime. Picture objects can be used to display various types of static picture objects such as the corporate logo, a picture of the company's headquarters building, or a picture of the company's founding father.



Pictures Properties Overlay

The Picture Properties overlay contains several fields that are used to define the characteristics of a picture.

Control Options

Position indicates where the picture should appear inside the selected region. Click the list button for a drop-down list of selections that include CENTER, TOP, RIGHT, BOTTOM, LEFT, UPPER RIGHT, UPPER LEFT, LOWER RIGHT and LOWER LEFT.

Resource specifies the application and name of a resource defined in Named Resources which links to one or more graphics files. Different graphics can apply depending upon resource state (disabled, enabled, rollover, pressed, etc).

Image Scale defines the size of this appearance of the graphic as a percentage of the normal graphic. Click the list button to make your choice.

Margin (Top, Bottom, Left, Right sets extra margin space between the picture and the border of the region. This value is in pixels and must be less than or equal to 255.

Tooltip defines one line of help text that is displayed after the mouse pointer has been positioned over the picture for a few seconds. Tooltip does not apply to pictures on output and inquiry images.

Font Options

Font is not a valid option when defining a picture and is disabled.

Style is not a valid option when defining a picture and is disabled.

Scale is not a valid option when defining a picture and is disabled.

Text Color is not a valid option when defining a picture and is disabled.

Fill Color defines the region's fill color. Click the color icon to begin and see the Making Color Selections section for further instructions.

Transparent? indicates whether or not the background of the region should be opaque or transparent.

Border Options

Type defines the type of border that will surround the region. Click the list button to make your choice.

Color defines the color of the border. Click the color icon to begin and see the Making Color Selections section for further instructions.

Tab Order Options

Tab Level is not a valid option when defining a picture and is disabled.

Tab Group is not a valid option when defining a picture and is disabled.

Other Options

Enabled is not a valid option when defining a picture and is disabled.

Invisible indicates whether or not the picture is initially invisible when this image is first presented to the user. If 'yes' then the picture must be made visible via ILF code in order for the user to see it. Click the checkbox to toggle between 'yes' and 'no' values.

Sep. Before? is not a valid option when defining a picture and is disabled.

Sep. After? is not a valid option when defining a picture and is disabled.

Micro Adjustments

Row, Col, Height, and Width make slight adjustments to the size and position of the picture. They are entered as a percentage of an image cell (1 row x 1 column) and must be less than or equal to 100.

Name allows you to 'name' the picture so it can be controlled (enabled, disabled, etc.) via ILF statements.

Access to the GUI attributes at runtime with ILF code is done via the --- WIDGET file. The WIDGET records from the process are copied into this file and are available in the *Pre-Display* event point. WIDGET NAME is a key to this file. You can read and rewrite records in this file to affect the GUI attributes at runtime.

When you have finished defining the picture you have two options available to you:

Select the Save option on the bottom right corner of the screen to save the definition and return to the Image Editor.

Or, you can select the Cancel option to discard the new definition or changes to an existing definition, and then return to the Image Editor.

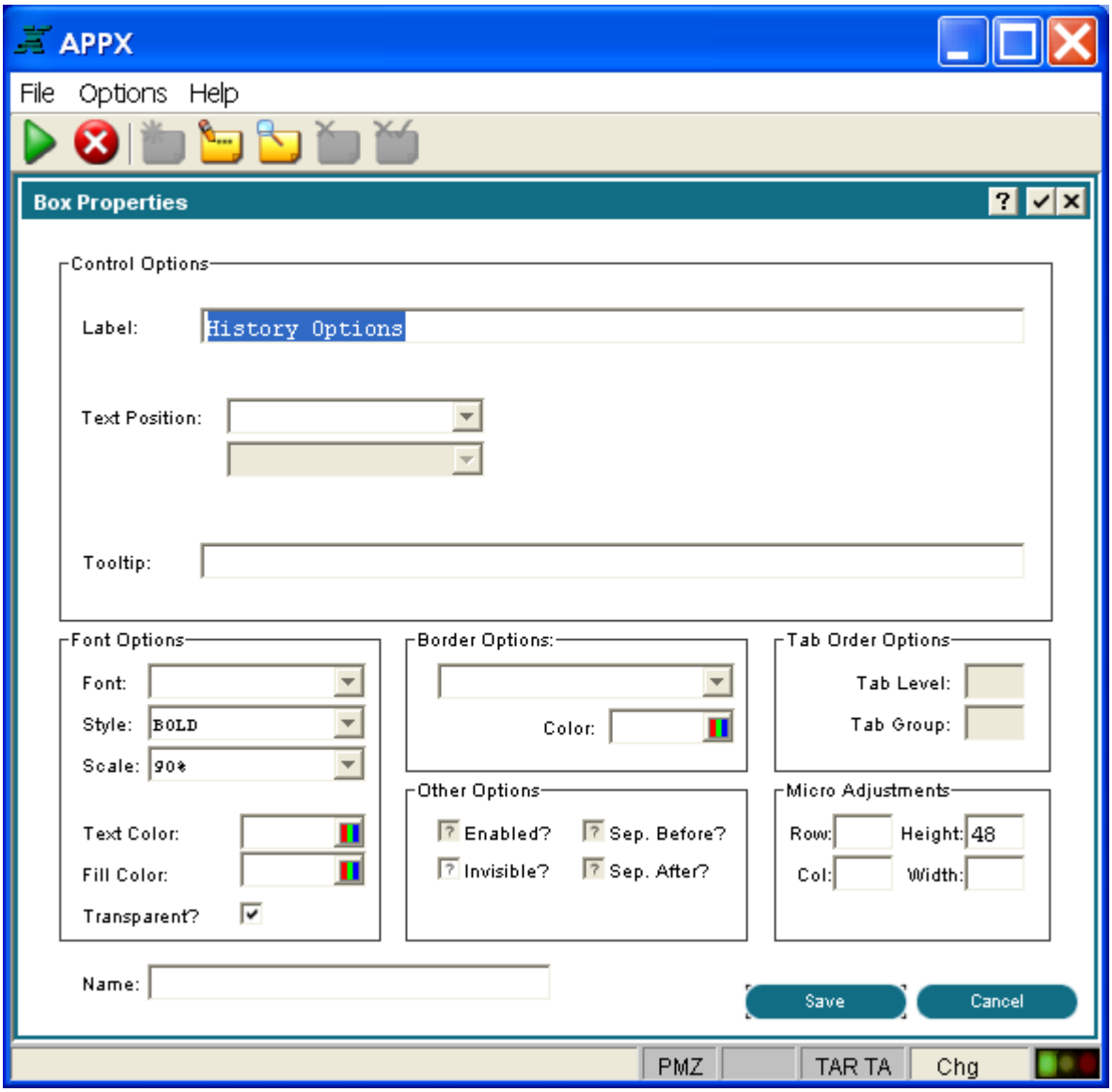
Setting the Picture Position attribute field at runtime via ILF requires setting three Widget File fields as illustrated in the following diagram. See The WIDGET File/Record page in this chapter for more information on altering the WIDGET file at runtime.

Position Attribute	WIDGET ALIGN HORIZ	WIDGET ALIGN VERT	WIDGET TILING MODE
(blank, default)	LEFT	CENTER	
Center	CENTER	CENTER	
Top	CENTER	TOP	
Right	RIGHT	CENTER	
Bottom	CENTER	BOTTOM	
Left	LEFT	CENTER	
Upper Right	RIGHT	TOP	
Upper Left	LEFT	TOP	
Lower Right	RIGHT	BOTTOM	
Lower Left	LEFT	BOTTOM	
Expand to Fill	ignored	ignored	EXPAND
Expand Prop'l	CENTER, TOP, BOTTOM	CENTER, TOP, BOTTOM	TILE

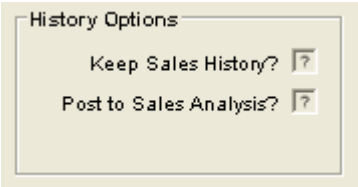
Widget field settings

Painting Boxes

After selecting the region in which you want your box or line to appear, as described in Painting Buttons, Labels, Pictures, and Boxes, the Box Properties overlay shown below appears. This example defines the "History Options" box shown further below.



Box Properties Overlay for History Options Box



History Options Box

Control Options

Label to define any text to appear as a box title.

Text Position indicates where the text should appear inside the box border. Click the list button for a drop-down list of selections that include CENTER, TOP, RIGHT, BOTTOM, LEFT, UPPER RIGHT, UPPER LEFT, LOWER RIGHT and LOWER LEFT.

Tooltip defines one line of help text that is displayed after the mouse pointer has been positioned over the box for a few seconds. Tooltip does not apply to boxes on output and inquiry images.

Font Options

Font selects the font (Arial, Courier, etc.) the box's label is to be displayed with. Click the list button to make your choice. If left blank, the default font determined by your system administrator will be used.

Style selects the label's font style (bold, italic, etc.). Click the list button to make your choice. If left blank, the regular font style is used.

Scale defines the size of the label's font as a percentage of the runtime font size. Click the list button to make your choice.

Text Color defines the label's font color. Click the color icon to begin and see the Making Color Selections section for further instructions.

Fill Color defines the region's fill color. Click the color icon to begin and see the Making Color Selections section for further instructions.

Transparent? indicates whether or not the background of the region should be opaque or transparent.

Border Options

Type defines the type of border for the box. Click the list button to make your choice.

Color defines the color of the border. Click the color icon to begin and see the Making Color Selections section for further instructions.

Tab Order Options

Tab Level is not a valid option when defining a box and is disabled.

Tab Group is not a valid option when defining a box and is disabled.

Other Options

Enabled is not a valid option when defining a box and is disabled.

Invisible indicates whether or not the box is initially invisible when this image is first presented to the user. If 'yes' then the box must be made visible via ILF code in order for the user to see it. Click the checkbox to toggle between 'yes' and 'no' values.

Sep. Before? is not a valid option when defining a box and is disabled.

Sep. After? is not a valid option when defining a box and is disabled.

Micro Adjustments

Row, Col, Height, and Width make slight adjustments to the size and position of the box. They are entered as a percentage of an image cell (1 row x 1 column) and must be less than or equal to 100.

Name allows you to 'name' the box so it can be controlled (enabled, disabled, etc.) via ILF statements.

Access to the GUI attributes at runtime with ILF code is done via the --- WIDGET file. The WIDGET records from the process are copied into this file and are available in the *Pre-Display* event point. WIDGET NAME is a key to this file. You can read and rewrite records in this file to affect the GUI attributes at runtime.

When you have finished defining the box you have two options available to you:

Select the Save option on the bottom right corner of the screen to save the definition and return to the Image Editor.

Or, you can select the Cancel option to discard the new definition or changes to an existing definition, and then return to the Image Editor.

Painting Lines

Line Widget

Overview:

The Appx Line widget allows you to draw a straight line between any two endpoints. You have complete control over the line weight, the line color, how the endcaps are rendered, the stroke pattern used, the offset of the stroke pattern, and the base units used to calculate these values. The values are given as a percentage of the base unit. The default base unit is the height of a grid cell on the screen or output page. Due to space considerations in the current WIDGET file, the most used appearance options are specificed as specifications on the Widget definition screen. The lesser used options are specified as @ macros entered into the Label or Tooltip widget fields.

Usage:

Widget Screen Specifications:

* Line Weight - A number specifying the percentage of the base unit defining the width of the line. The default base unit is the height of a grid cell. The default line weight is 32.

* Line Color - The color of the line in standard Appx RGB values. This is stored in the same WIDGET fields as Border Foreground color (WIDGET COLOR DB FG). The default color is black.

* Endcaps - This determines how line ends are drawn. They can be NONE, ROUND, or SQUARE. NONE and SQUARE look very similar. They are actually both square. The difference is that NONE squares the end off at the edge of the grid cell. SQUARE extends the endcap past the end of the line. This makes a difference when you butt up to lines at a 90 degree angle. SQUARE creates a nice square corner. NONE creates a messy corner. ROUND creates a nice corner no matter what angle two lines meet. The default endcap is ROUND.

@ Macro Specification:

* Unit Base - @SLUB=[W | H | #] The unit base setting takes one of three values. A value of W sets the unit base to the current Width of a grid cell. A value of H sets the unit base to the current Height of a grid cell. A numeric value sets the unit base to that exact number of pixels. The advantage of using W or H is that if you scale your screen or page, the line weight and stroke pattern will scale proportionally. if you use a numeric pixel value, it will not change.

* Stroke Pattern - @SSP=#,#,... The stroke pattern, if not set, assumes a solid line. If set, you must give a list of numeric pairs as a comma separated list. The pair tells the line widget how many units to draw the line then how many units to draw the gap. The pattern will repeat for the length of the line. You can specifiy an unlimited number of Draw,Gap pairs to get an array of line patterns. The units are specified as a percentage of the page unit. Note: If you define an endcap other than NONE, the endcap will be drawn into the gap area and will make the drawn segments look longer and the gap segments look shorter.

* Stroke Pattern Offset - @SSPO=# The stroke pattern offset tells the line widget to start drawing the stroke pattern partially into the pattern instead of at the beginning of the pattern. This can help you even out the appearance of how the pattern starts and ends to look more symetrical.

Changing and Deleting Graphical Items

Buttons, labels, pictures, boxes, and lines that already exist on an image can be changed or deleted.

To **change** a button, label, picture, box, or line, double click on it to select it and to display the corresponding properties overlay. Make your changes and remember to select Save when finished.

To **delete** the item, click it once to select it, then click the Cut Selection icon on the Image Editor toolbar.

Use of Graphical Attributes

Graphical attributes define the way menus, input, output, and inquiry processes, options, and fields *appear, print,* and/or *operate.* They are recognized only when running the GUI-based version of APPX (also know as the APPX Client). While these attributes may be defined by the designer while using either the GUI or character-based version of APPX, they are ignored when users are running APPX in character mode and will not affect the display of character-based images.

Types of graphical attributes include the following:

Wallpaper consisting of a graphic image or a solid color background.

Borders to offset a frame.

Titlebars that can include graphics such as a corporate logo.

Buttons and Icons to provide graphical representation of available tasks and processes.

Widgets such as checkboxes, radio buttons, slide bars and date selection calendars.

Menu types such as pull-down menus, pop-up menus, and right-click context menus.

Graphical attributes can be defined within these APPX components:

Menu Processes for adding graphical features to a menu image.

Input, Output, and Inquiry Processes for adding graphical elements to a specific image, or if defined as global, all images within the frame.

Optional Children of Menu Processes and Input Process images. At this level, graphical attributes are used to display lower level processes in a manner other than traditional APPX option formats.

Image Fields for adding graphical elements to specific items (fields) on an image.

The Defining Graphical Attributes for Images section discusses the options available for menu, input, output, and inquiry processes through the use of Window Properties from the Image Editor Right-Click Menu.

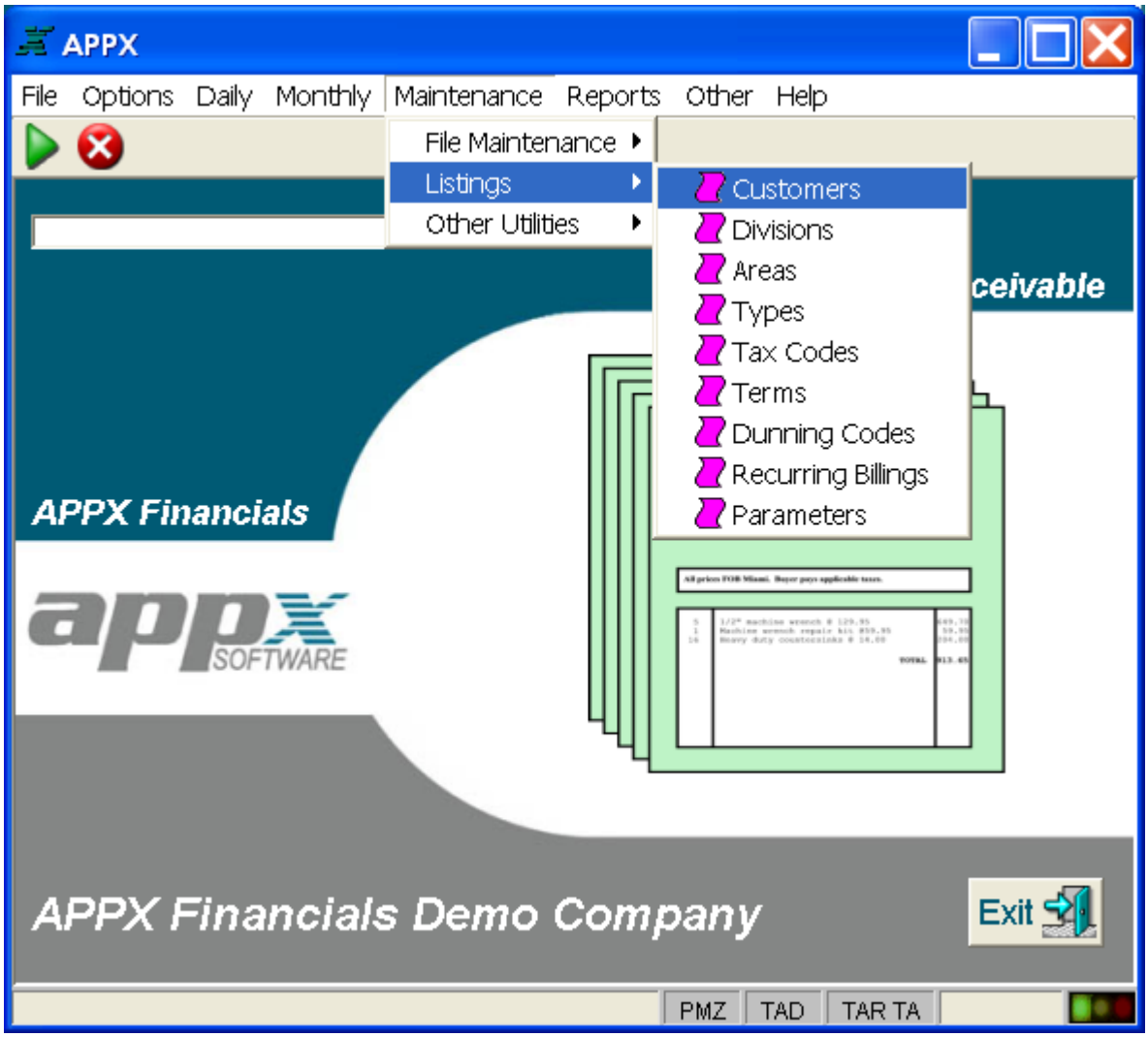
Another section, >Defining Graphical Attributes for Optional Children, explains how to design the way optional child processes appear and are selected on your menu or input process image. You can use the default traditional button approach, or define pull-down and right-click menus.

Finally, the Defining Graphical Attributes for Image Fields section covers the various attributes that can be attached to data objects.

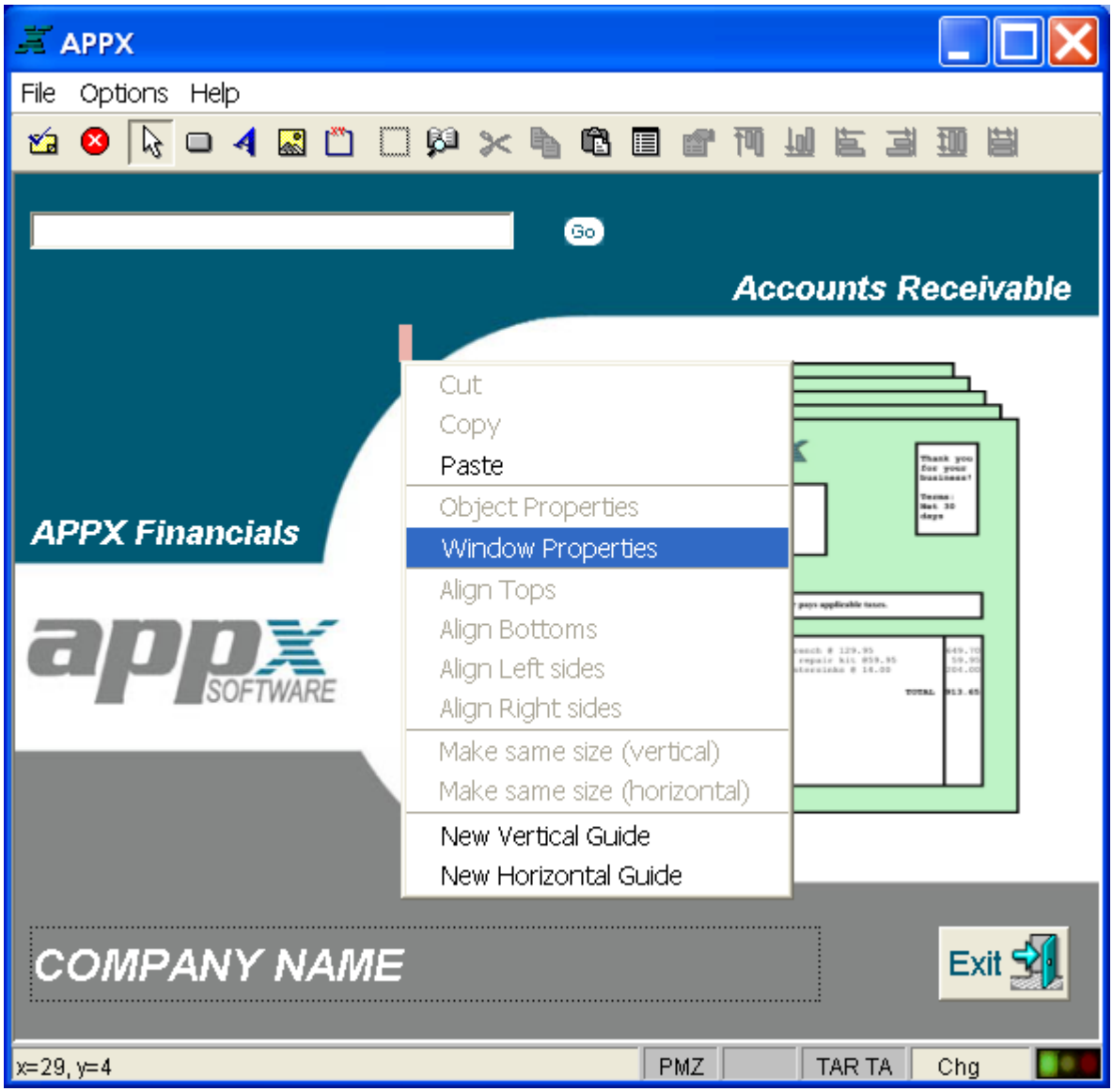
Defining Graphical Attributes for Images

Graphical attributes for images can be defined by selecting the window properties option from the Image Editor Right-Click Menu. In an input, output, or inquiry process, these attributes can be defined at the frame or the image level by selecting Global Window Properties or Window Properties, respectively, from the subsequent overlay. If the attributes are defined globally, the defined elements will apply to all images within the current frame. If the frame consists of multiple images, each with unique graphical attribute requirements, then the graphical attributes must be defined for each image at the image level. Should a frame and an image within the frame each have graphical attributes defined, the graphical attributes defined at the image level will override those defined at the frame level.

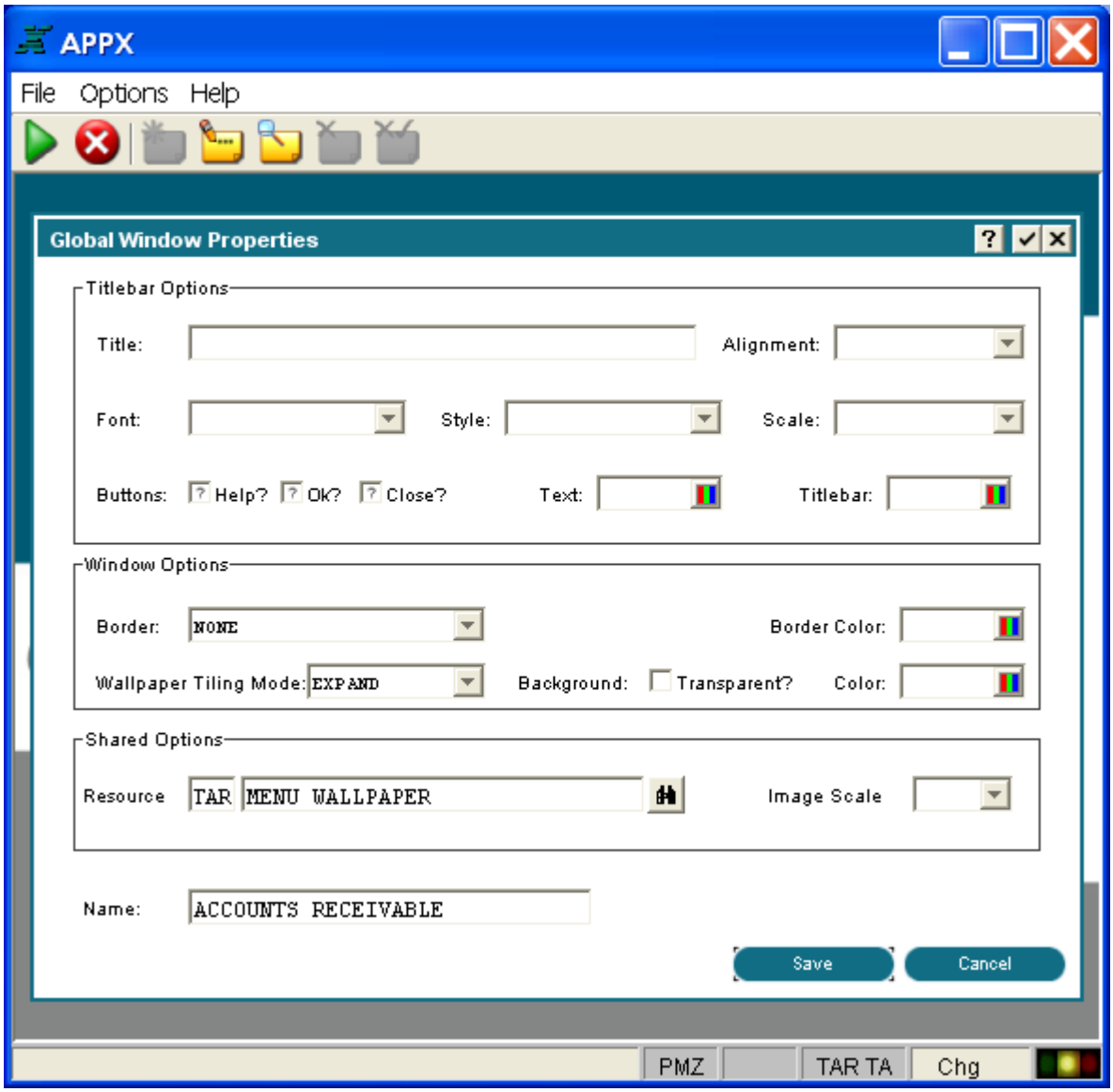
The following image shows a menu with a wallpaper background and pull-down menus. The wallpaper was defined by selecting the Window Properties option on the Right-Click Menu, from the Accounts Receivable menu image. Selecting this option displays the *Window Properties* overlay. The attributes defined in this example produced the wallpaper. Note that there is no title bar defined for this menu and that the title bar that does appear is the standard APPX session title bar.



Accounts Receivable Menu Defined with Graphical Attributes

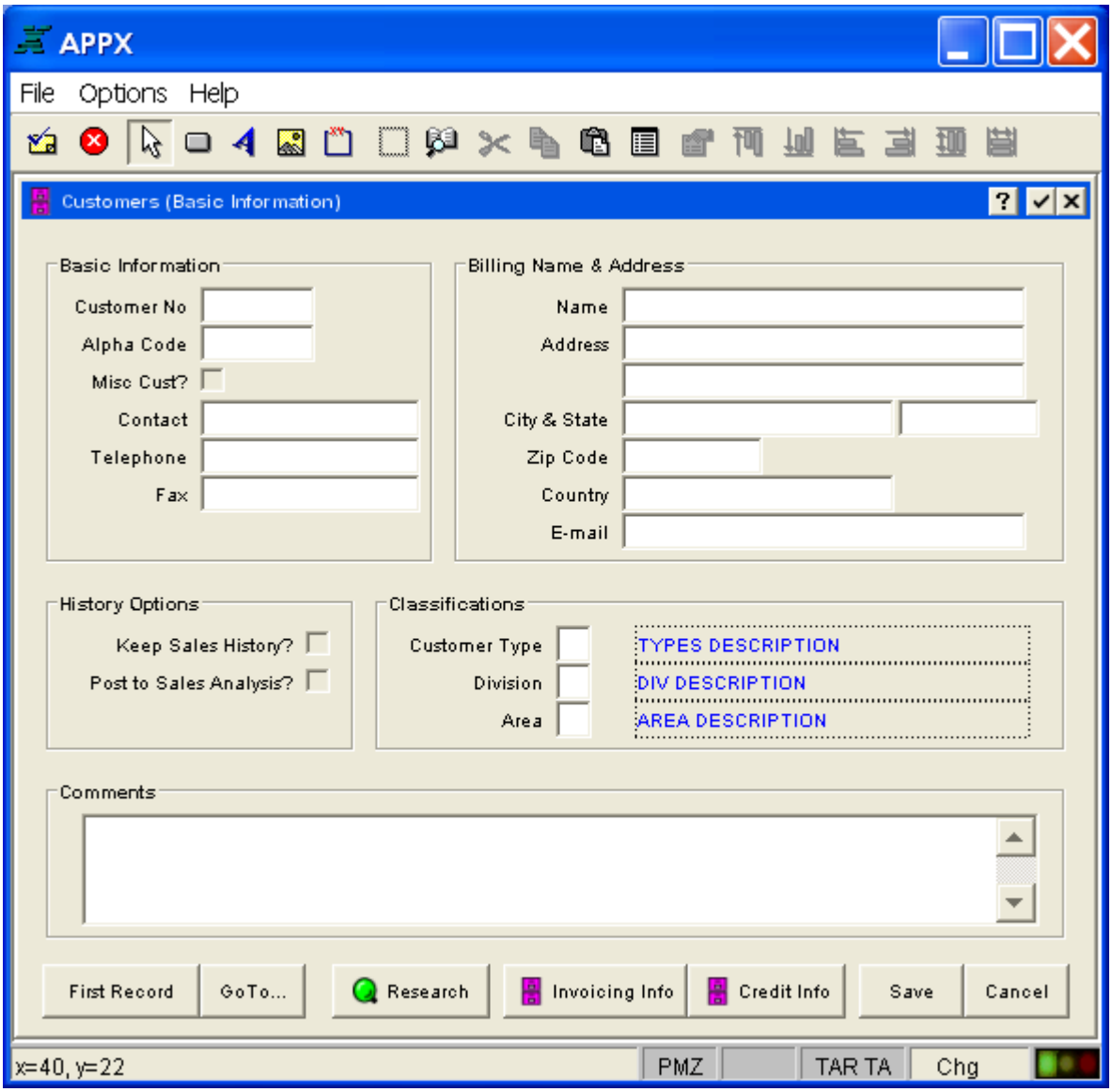


Right-Click Menu Overlay from Accounts Receivable Menu Image

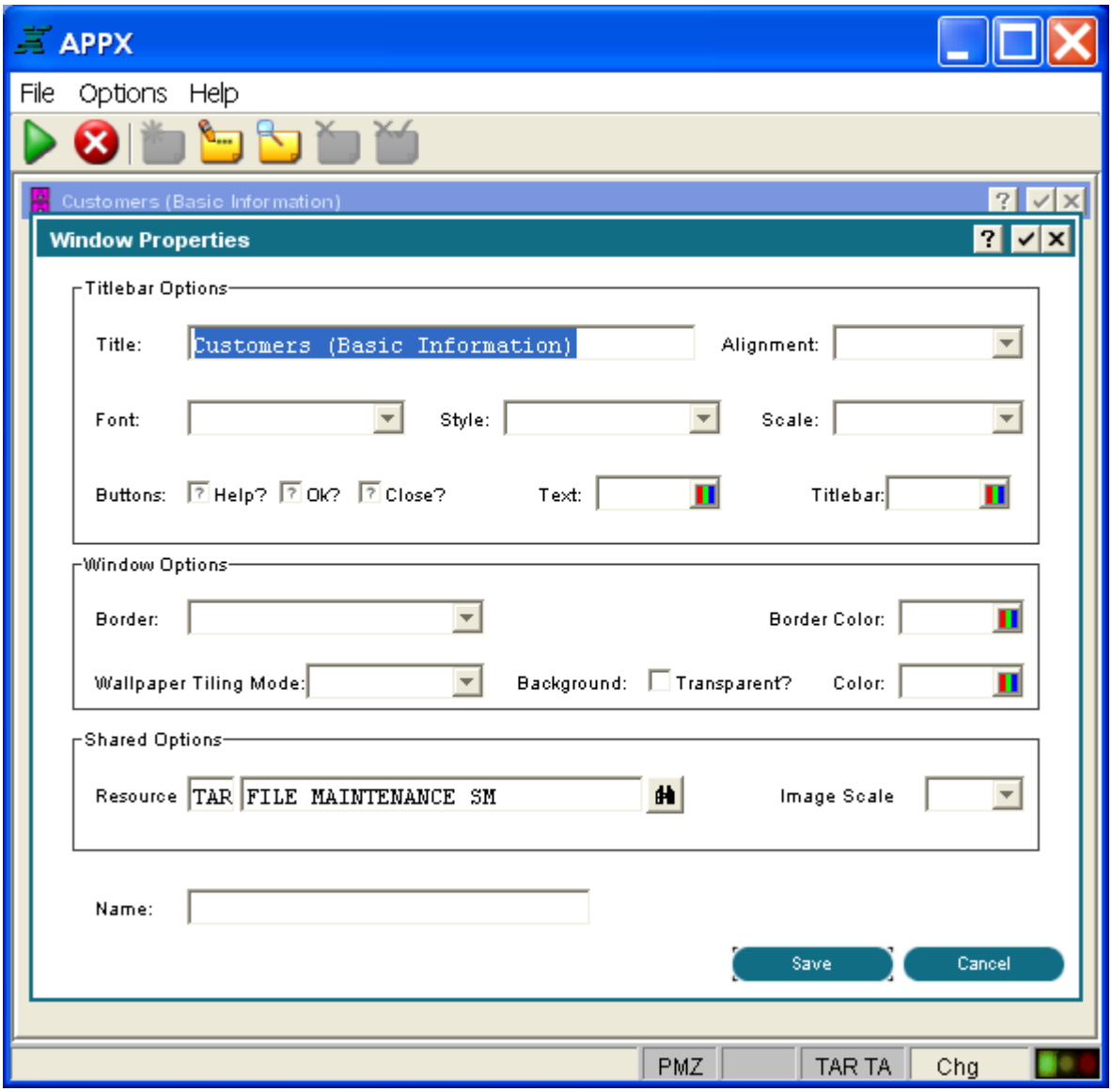


Window Properties Overlay Specifying Wallpaper

The following image provides an example of an input with a title bar. The *GUI Attributes* overlay details how this title bar was defined. This overlay can be used to define either wallpaper or a title bar, or both.



Input Image with a Title Bar



Window Properties Overlay Specifying Title Bar

The overlays contain many options that can be utilized when designing your image appearance including:

Titlebar Options - See the Titlebar Options section for details. These options only apply to menus and inputs.

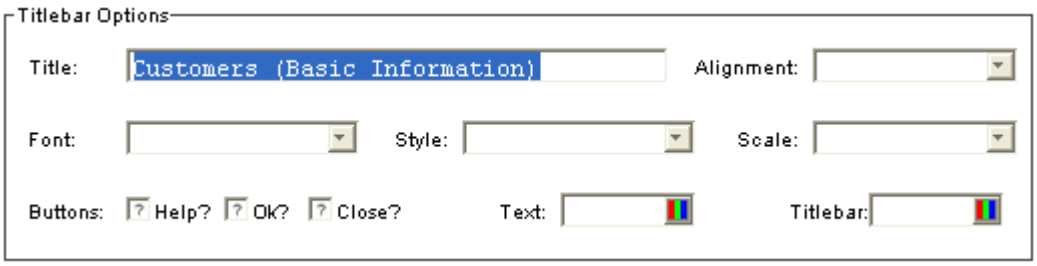
Window Options - See the Window Options section for details.

Shared Options - See the Shared Options and Name section for details.

Name - See the Shared Options and Name section for details.

These options are defined in the following sections. When you have finished defining the graphical attributes for this image, you must save or cancel the attributes by selecting either the Save or Cancel options located in the bottom right of the screen.

Titlebar Options



Titlebar Options

Titlebar options only apply to menu and input images and contain the following items:

Title is the menu or input process title that is displayed in the titlebar.

Alignment indicates whether the title should be left or right justified, or centered within the title bar. Click the list button to select your choice.

Font identifies the font (Courier, Arial, etc.) to be used for the title. Click the list button to select your choice. If left blank, the system default determined by your system administrator is used.

Style identifies the font style (bold, italic, etc.) to be used for the title. Click the list button to select your choice. If left blank, a regular font style is used.

Scale indicates a percentage by which to scale the default size of this font (50%, 150%, etc.). Click the list button to select your choice. If left blank, a default of 100% is used.

Show Help Button? Specifies whether the Help button will be shown in the right end of the titlebar.

Show OK Button? Specifies whether the Enter button will be shown in the right end of the titlebar.

Show Close Button? Specifies whether the End button will be shown in the right end of the titlebar.

Text Color indicates the color of the title bar text. You can enter a specific color name or click the color selection icon to make the color selection. See the Making Color Selections section at the end of this chapter for more details.

Titlebar Color indicates the color of the title bar background. You can enter a specific color name or click the color selection icon to make the color selection. See the Making Color Selections section at the end of this chapter for more details.

Window Options

Window Options

Window Options apply to all images and contain the following items:

Border identifies the border style for the frame or image. Click the list button to view a list of choices.

Border Color indicates the color of the border. You can enter a specific color name or click the color selection icon to make the color selection. See the *Making Color Selections* section for more details.

Wallpaper Tiling Mode indicates where on the screen the wallpaper should be placed when it overlays another image. Click the list button to select from a list of choices that include:

TILE to tile the wallpaper graphic to fill the menu or input image.

EXPAND to expand or shrink the wallpaper graphic to fit the menu or input image.

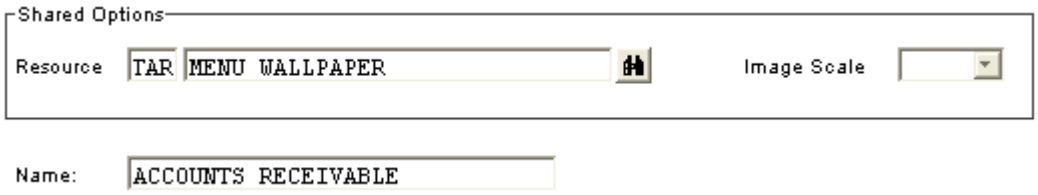
CENTER to center the wallpaper graphic within the menu or input image.

TOP, RIGHT, BOTTOM, LEFT, UPPER RIGHT, UPPER LEFT, LOWER RIGHT, and **LOWER LEFT** position the wallpaper graphic at the specified point on the menu or input image.

Background Transparent? Indicates whether or not the background should be transparent when displayed. Click the checkbox to toggle between 'yes' and 'no' .

Background Color indicates the color of the background and is only applicable if you do not define a wallpaper in the Resource Field. If you define both a wallpaper and a background color, the wallpaper will hide the background color selected. The wallpaper overlays the background color so, if the wallpaper does not totally fill the image, then the background color will appear around the wallpaper. You can enter a specific color name or click the Color Selection icon to make the color selection. See the *Making Color Selections* section for more details.

Shared Options and Name



Shared Options

Shared Options and Name apply to all images and contain the following items:

Name is the name assigned to this GUI Attribute. The name is used for controlling the GUI object with ILF code so that, for example, certain image selections could be disabled by user id.

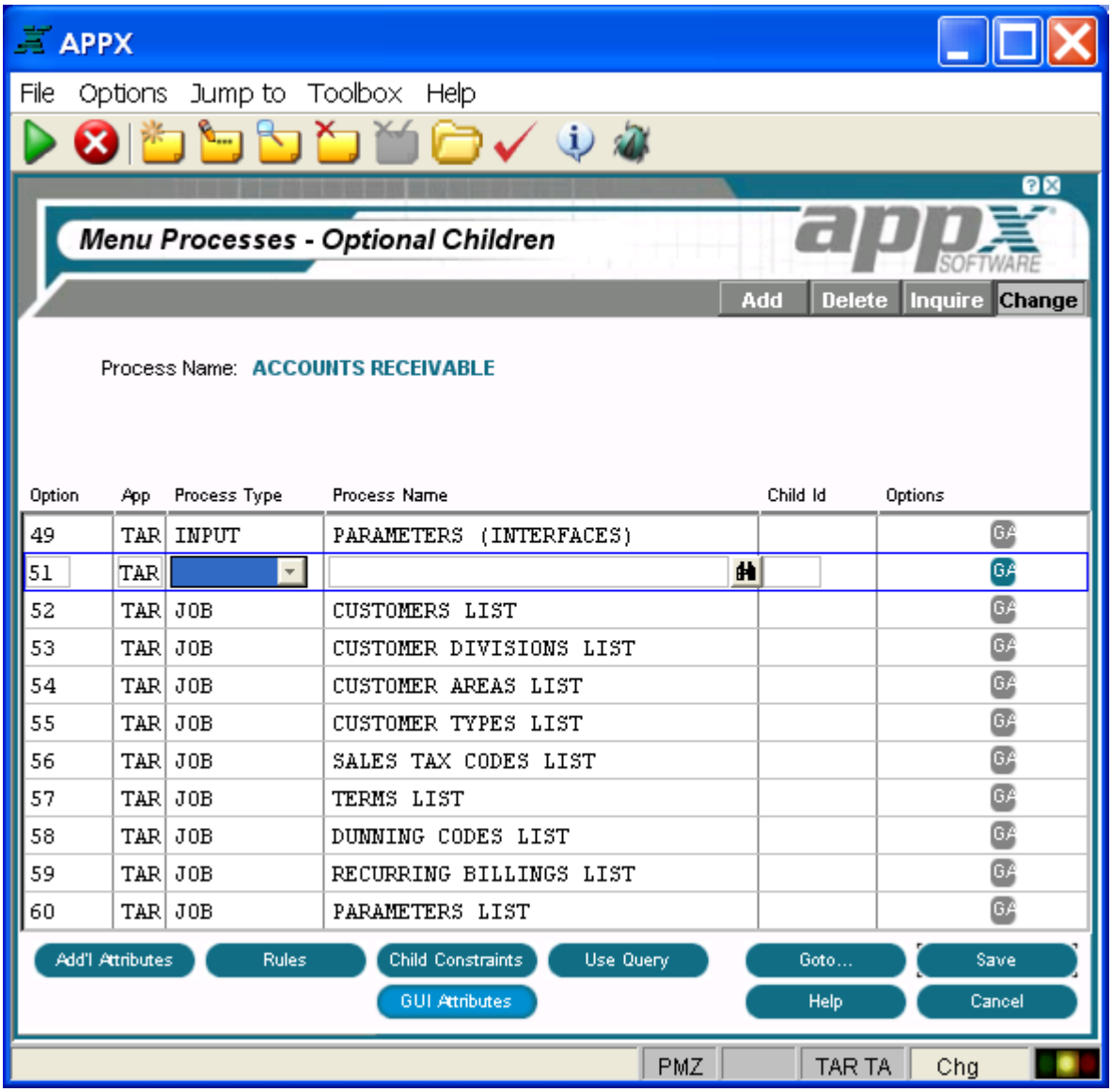
Access to the GUI attributes at runtime with ILF code is done via the --- WIDGET file. The WIDGET

records from the process are copied into this file and are available in the *Pre-Display* event point. WIDGET NAME is a key to this file. You can read and rewrite records in this file to affect the GUI attributes at runtime.

Resource specifies the application and name of a resource defined in Named Resources which links to one or more graphics files. Different graphics can apply depending upon resource state (disabled, enabled, rollover, pressed, etc).

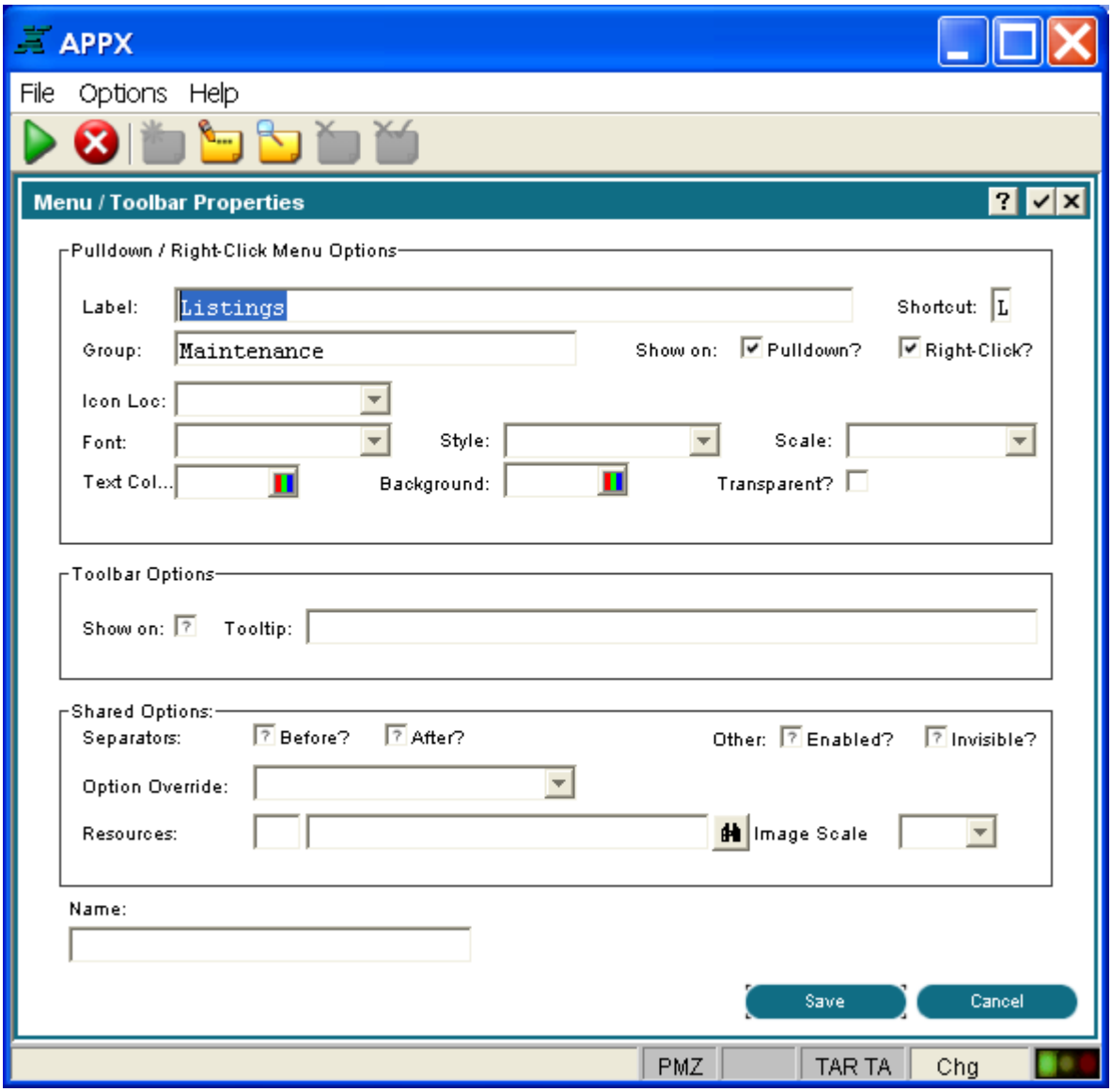
Defining Graphical Attributes for Optional Children

Because *Optional Children* can appear in one or more places (pulldown menu, right-click context menu, etc.), graphical attributes can be defined to control how and where available optional child processes are listed on menu or input images. The GUI Attributes overlay for Optional Child Processes is accessed from the Optional Children overlay shown below. Graphical Attributes must be defined individually for each Optional Child process you define. They cannot be defined globally for all optional processes defined for a process.



Optional Children Overlay for a Menu Process

When selecting the GUI attributes option from either a menu process or input process image, the Graphical Attributes overlay appears.



Optional Child Graphical Attributes Overlay

The Optional Child Graphical Attributes overlay contains the following items:

Pulldown/Right-Click Menu Options

Label is the descriptive text which appears on the menu or input image. If left blank, the descriptive name of the process invoked is used.

Shortcut is a single key on the keyboard that when pressed in conjunction with the Alt key, invokes this optional child process. The first occurrence of this key in the *Label* text will be underlined to tell the user what the *shortcut* key is. For example, if the *Label* is *Customers* and the *Shortcut* is *C*, then the *Label* will display as Customers.

Group refers to either the top-level name which appears on the pull-down menu or the *Label* of a previously defined child so that a cascading menu can be defined.

Show on Pull Down Menu? indicates if this optional child process should be displayed as a pull down menu. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Show on Right-Click Menu? indicates if this optional child process should be displayed as a right-click, context menu. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Icon Location indicates where the icon should be placed in relation to the *Label*. Click the list button to select from either LEADING or TRAILING.

Font identifies the font (Courier, Arial, etc.) to be used for the title. Click the list button to select your choice. If left blank, the system default determined by your system administrator is used.

Style identifies the font style (bold, italic, etc.) to be used for the title. Click the list button to select your choice. If left blank, a regular font style is used.

Scale indicates a percentage by which to scale the default size of this font (50%, 150%, etc.). Click the list button to select your choice. If left blank, a default of 100% is used.

Text Color indicates the color of the label text. You can enter a specific color name or click the Color selection icon to make the color selection. See the Making Color Selections section for more details.

Background Color indicates the color of the label background. You can enter a specific color name or click the Color selection icon to make the color selection. See the Making Color Selections section for more details.

Transparent? indicates whether or not the background should be opaque or transparent.

Toolbar Options

Show On indicates if this optional child will appear graphically on the tool bar. Note that if you define a graphical representation for this item (an icon, for example), then a resource with an enabled state icon must be specified in order for this child to appear on the tool bar.

Tooltip is 60 characters of help text that you can enter. The tooltip is displayed to users as a "hover over" when the mouse pointer is passed over the respective icon.

Shared Options

Separator Before? indicates if a separator line should be placed before this optional process label to better segregate labels into logical groups. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Separator After? indicates if a separator line should be placed after this optional process label to segregate labels into logical groups. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Enabled? Indicates if this icon or button should initially be enabled and available for use by the user. The icon or button can also be enabled or disabled through the use of ILF code that references the *Name* field. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Invisible? indicates whether this icon or button should initially be invisible to the user. The icon or button can also be made visible or invisible through the use of ILF code that references the *Name* field. Click the checkbox to toggle between 'yes' ☑ and 'no' ☐.

Option Override? allows the current option to be overridden at runtime with the option specified here. Click the list ▼ button to make your choice.

Resource specifies< the application and name of a resource defined in Named Resources which links to one or more graphics files. Different graphics can apply depending upon resource state (disabled, enabled, rollover, pressed, etc).

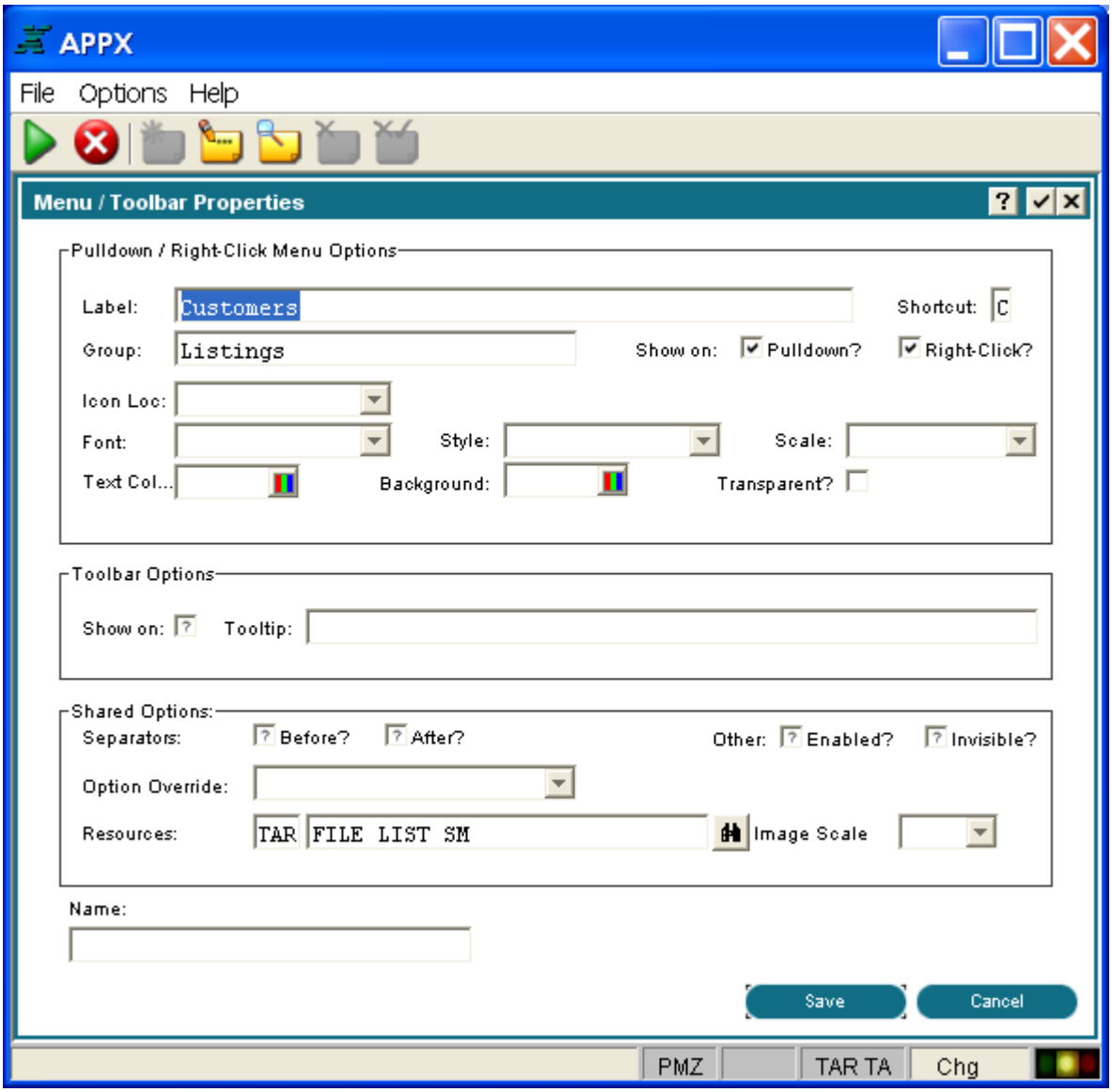
Image Scale defines the size of the graphic as a percentage of the runtime font size. Click the list ▼ button to make your choice.

Name is the name assigned to this GUI Attribute. The name is used for controlling the GUI object with ILF code so that, for example, certain selections could be disabled by user id.

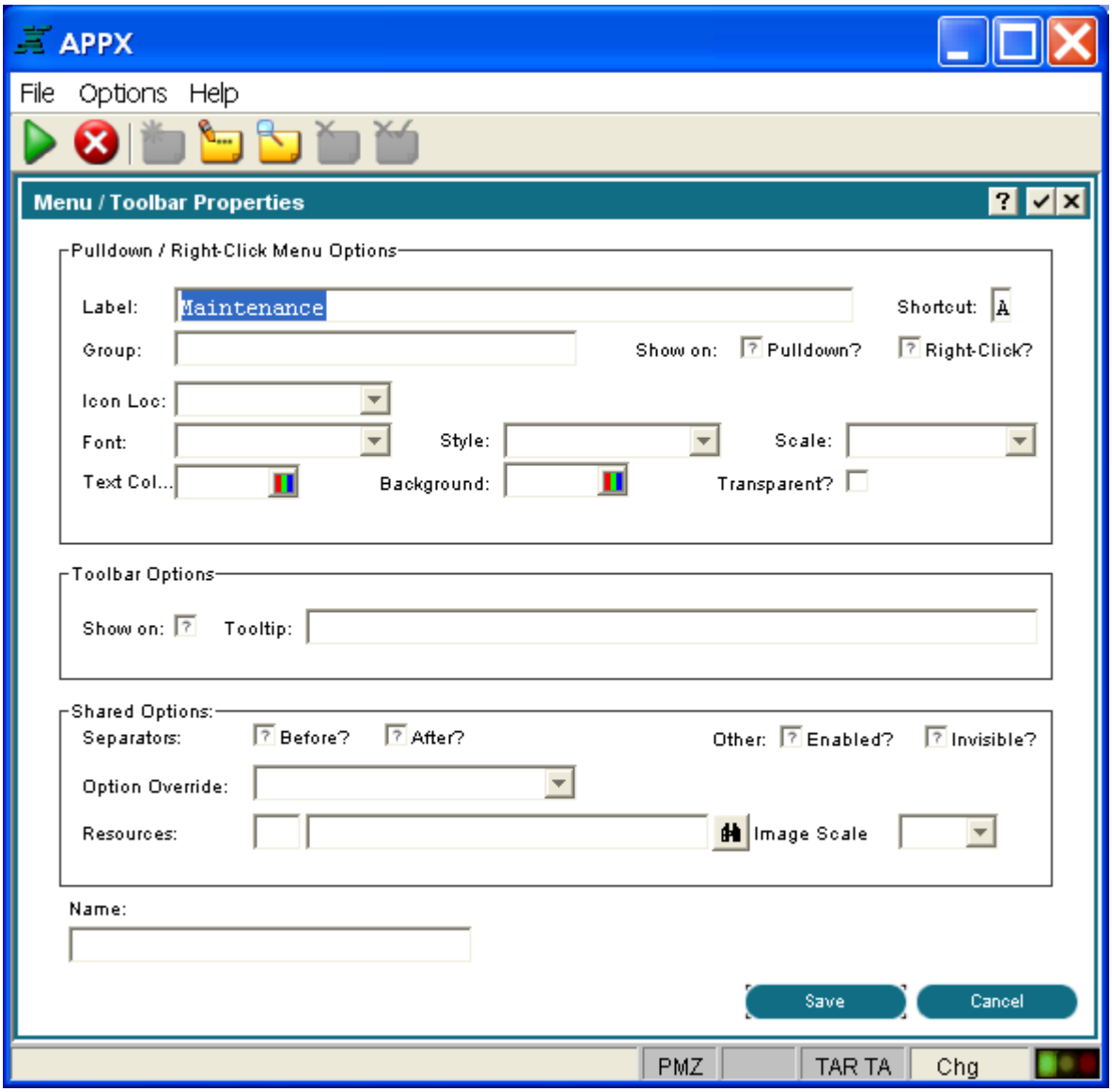
Access to the GUI attributes at runtime with ILF code is done via the --- WIDGET file. The WIDGET records from the process are copied into this file and are available in the Pre-Display event point. WIDGET NAME is a key to this file. You can read and rewrite records in this file to affect the GUI attributes at runtime for the current frame only.

When you have finished defining the graphical attributes for this image, you must save or cancel the attributes by selecting either the Save or Cancel options located in the bottom right of the screen.

Other examples of pulldown menu specifications are provided in the figures below:



Final Level of a Cascading Pull-Down Menu



First Level of a Cascading Pull-Down Menu

Defining Graphical Attributes for Image Fields

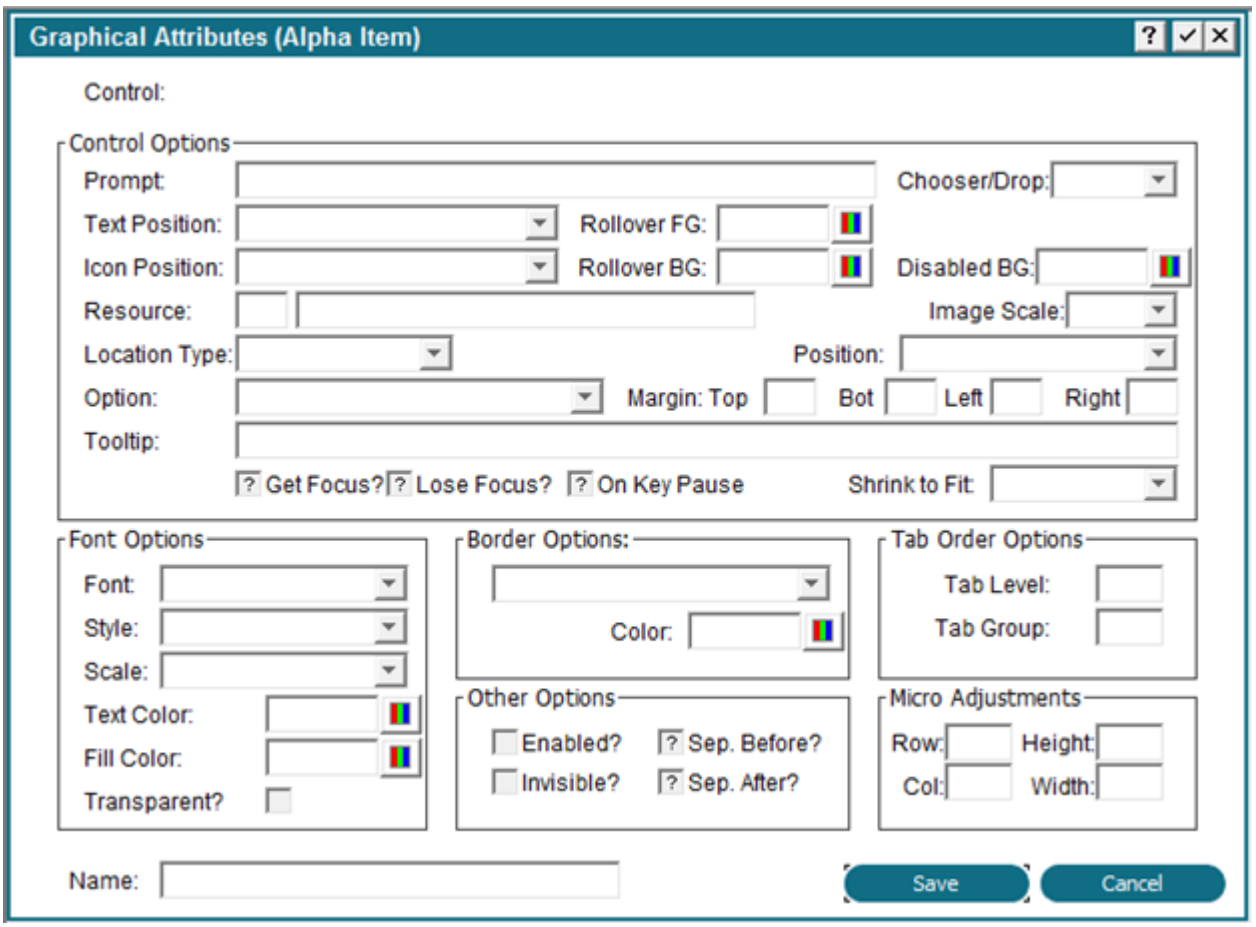
Image fields can also be displayed with a variety of graphical attributes. You can use a variety of *Widgets* to represent certain field types. You can also display the contents of a field using different fonts, font styles, colors, and other attributes.

From the Edit Item overlay, you select the GUI Attributes option to display the *GUI Attributes* overlay used to define the GUI Attributes. There are several different overlays, one for each field type defined in the data dictionary. Common to each is the Control field. The type of Control which can be selected is

directly associated with the type of field that was placed on the image. Once a Control is selected, the appropriate fields will open for further refinement. Most of these attribute settings can be set dynamically using ILF coding techniques and the --- WIDGET file.

Alpha Item:

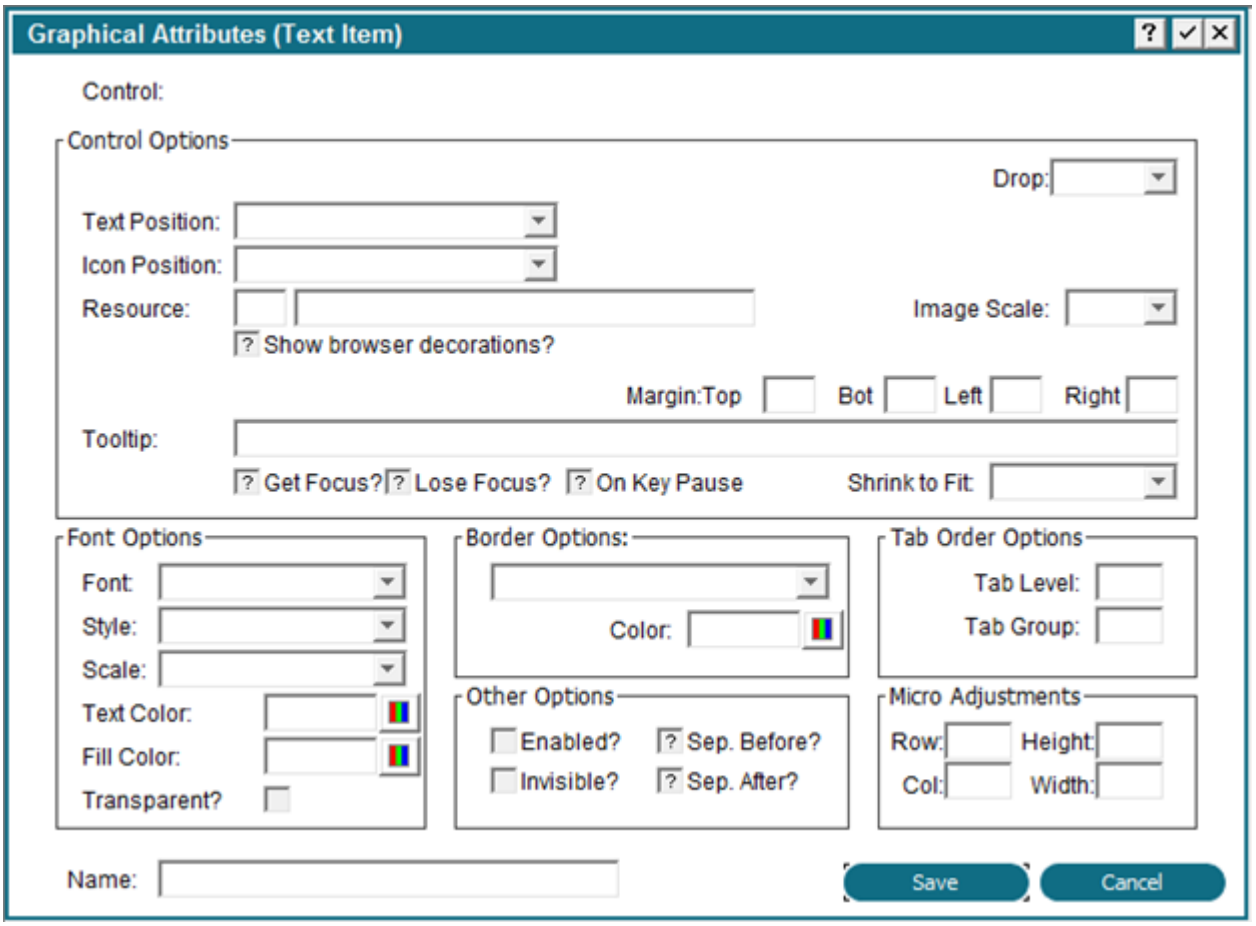
Contol Type can be BUTTON, LABEL, PICTURE, RAW TEXT, LISTBOX, PASSWORD, FILE CHOOSER, or COLOR CHOOSER.



Graphical Attributes Overlay For Alpha Item

Text Item:

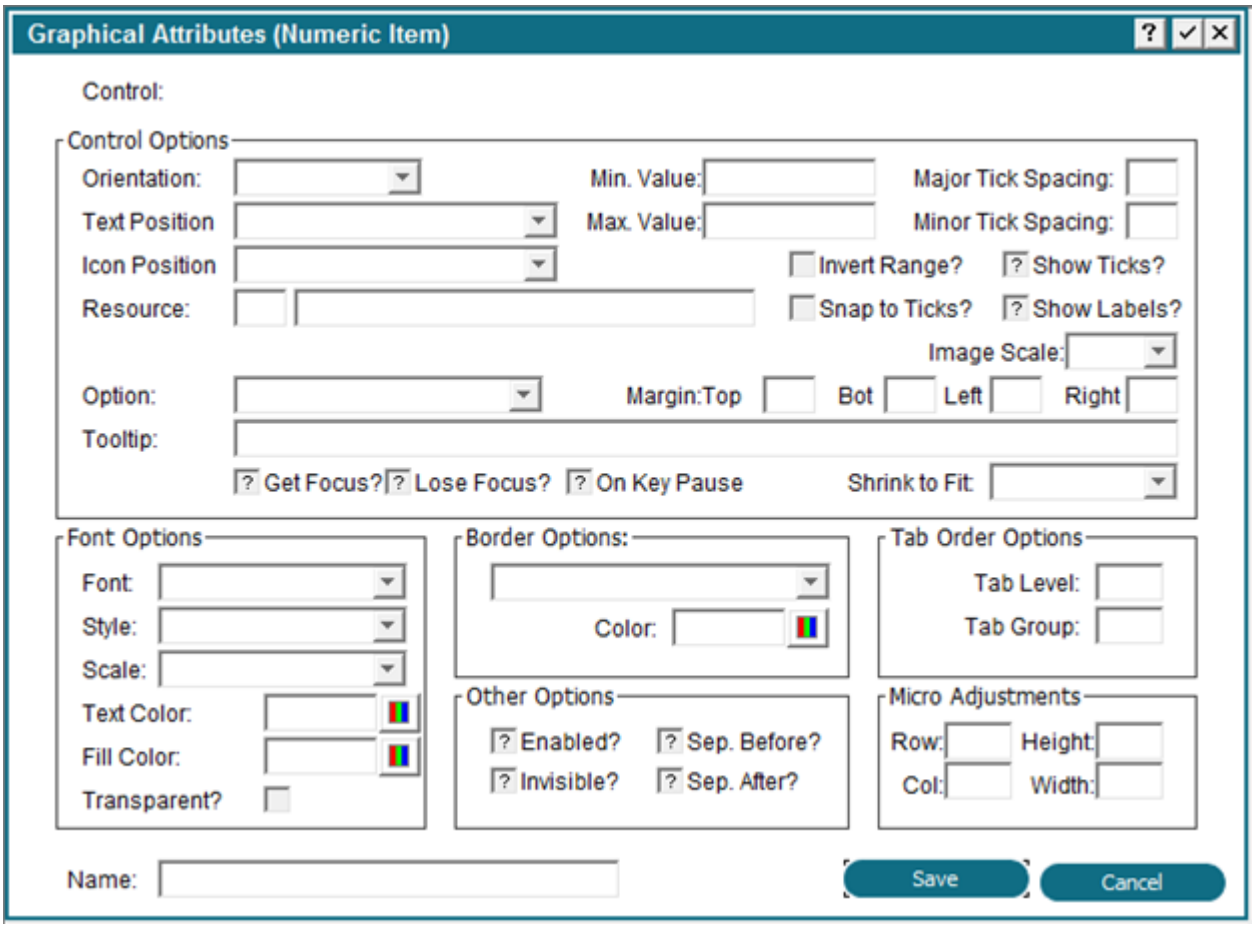
Contol Type can be LABEL, RAW TEXT,TEXT AREA, HTML VIEWER, RTF VIEWER, CODE VIEWER, HTML EDITOR, FLASH PLAYER, MEDIA PLAYER, or WEB BROWSER.



Graphical Attributes Overlay For Text Items

Numeric Item:

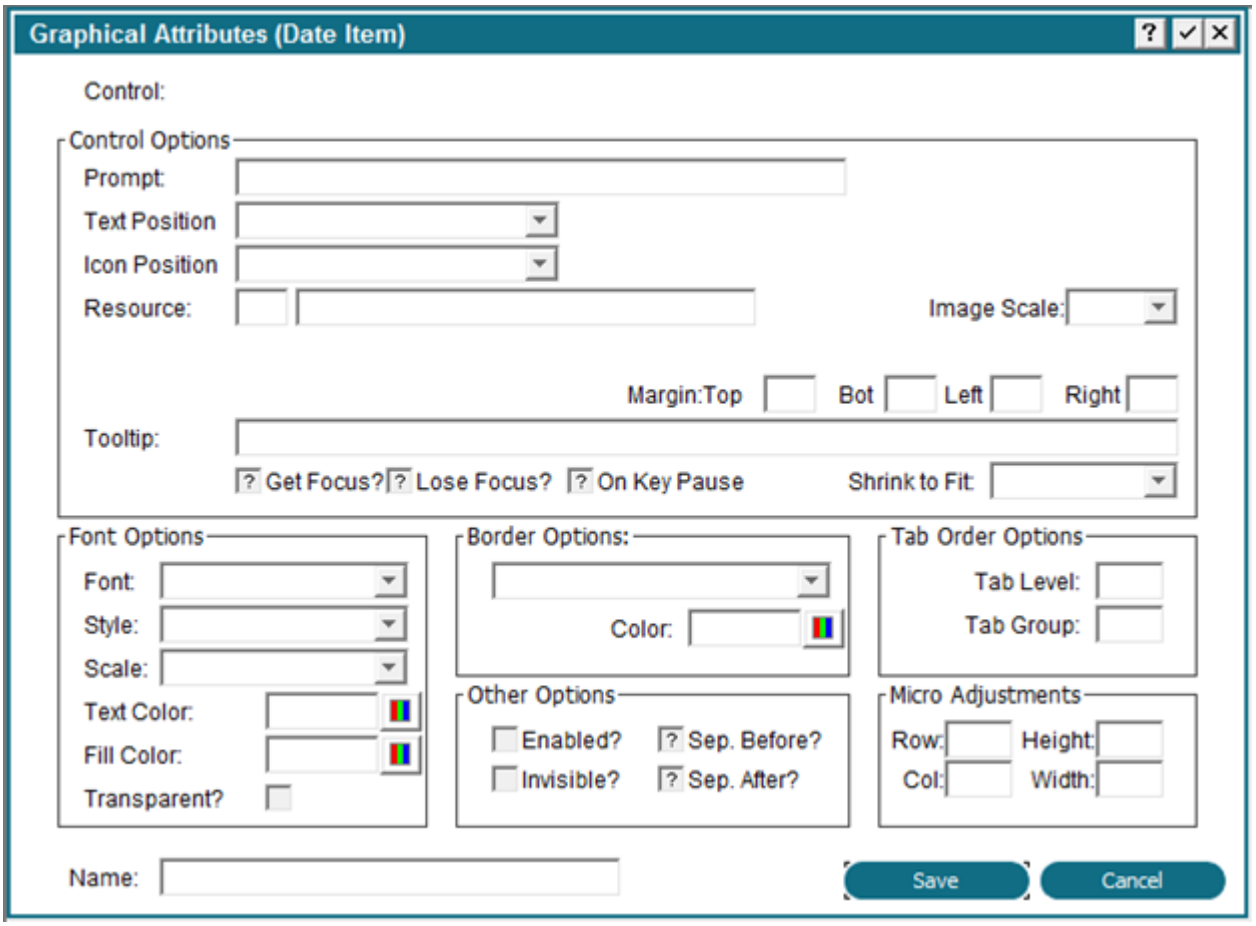
Contol Type can be LABEL, RAW TEXT, SLIDER, or PROGRESS BAR.



Graphical Attributes Overlay For Numeric Items

Date Item:

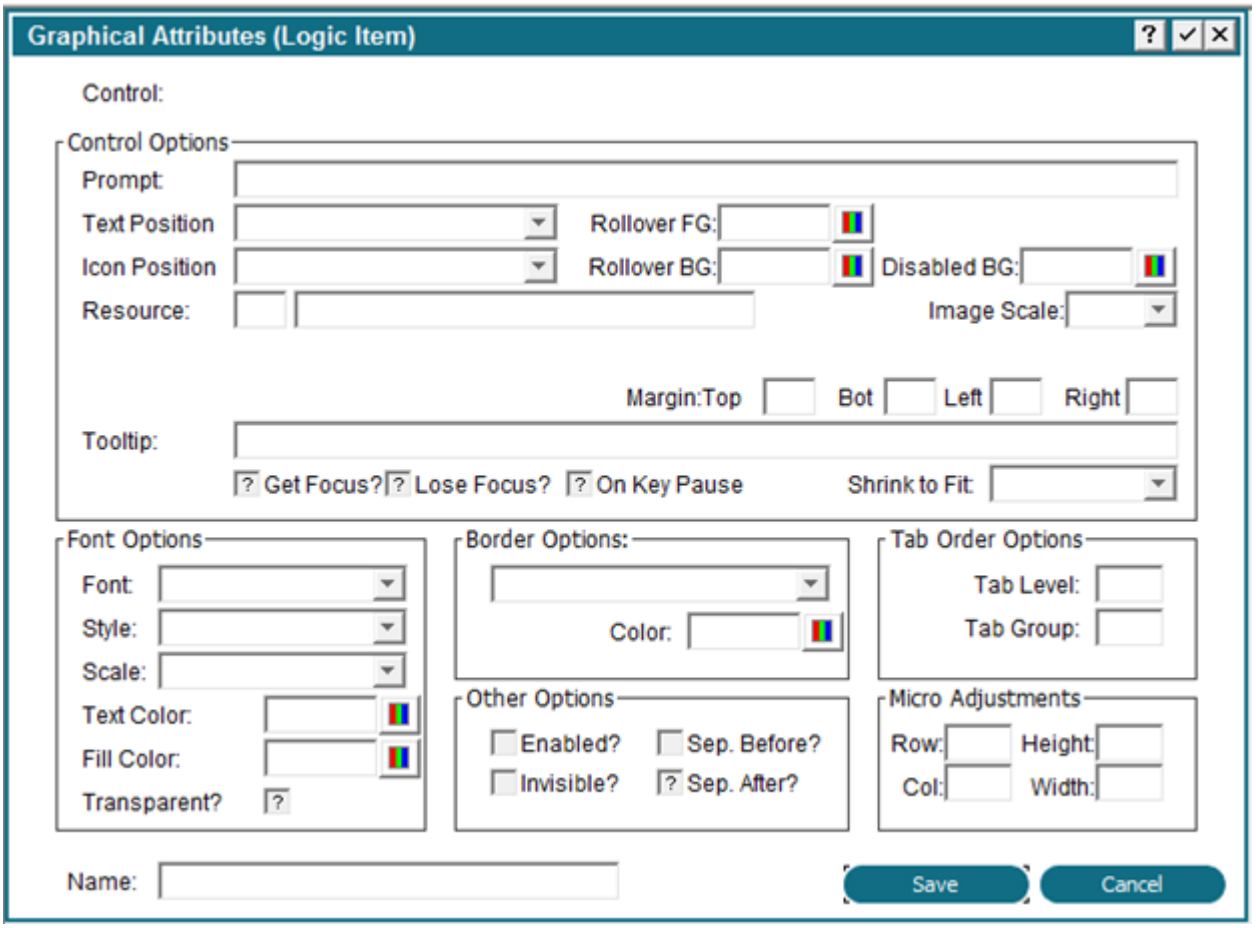
Contol Type can be LABEL, RAW TEXT, or CALENDAR/CLOCK.



Graphical Attributes Overlay For Date Items

Logic Item:

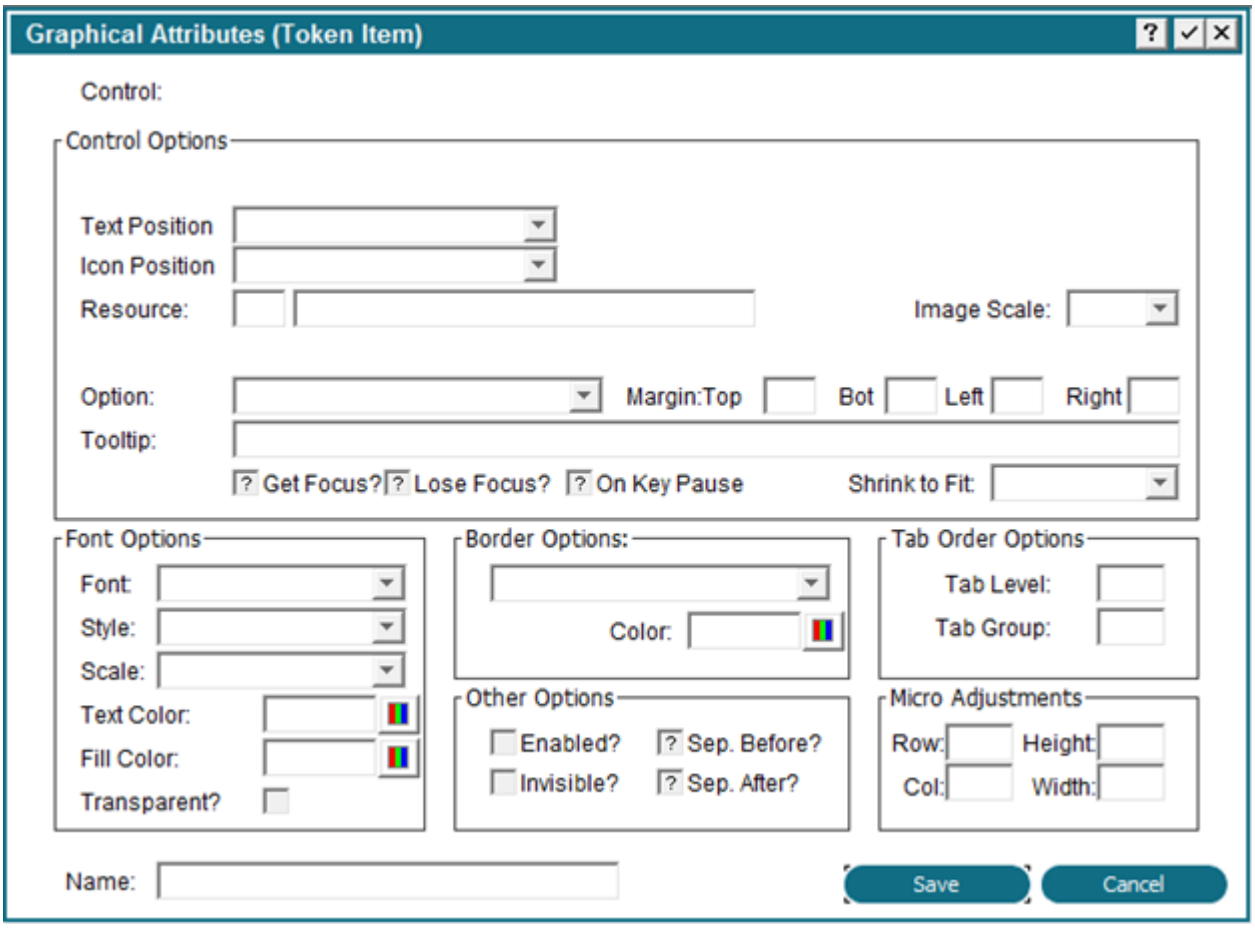
Contol Type can be LABEL, RAW TEXT, CHECK BOX, or TOGGLE BUTTON.



Graphical Attributes Overlay For Logic Items

Token Item:

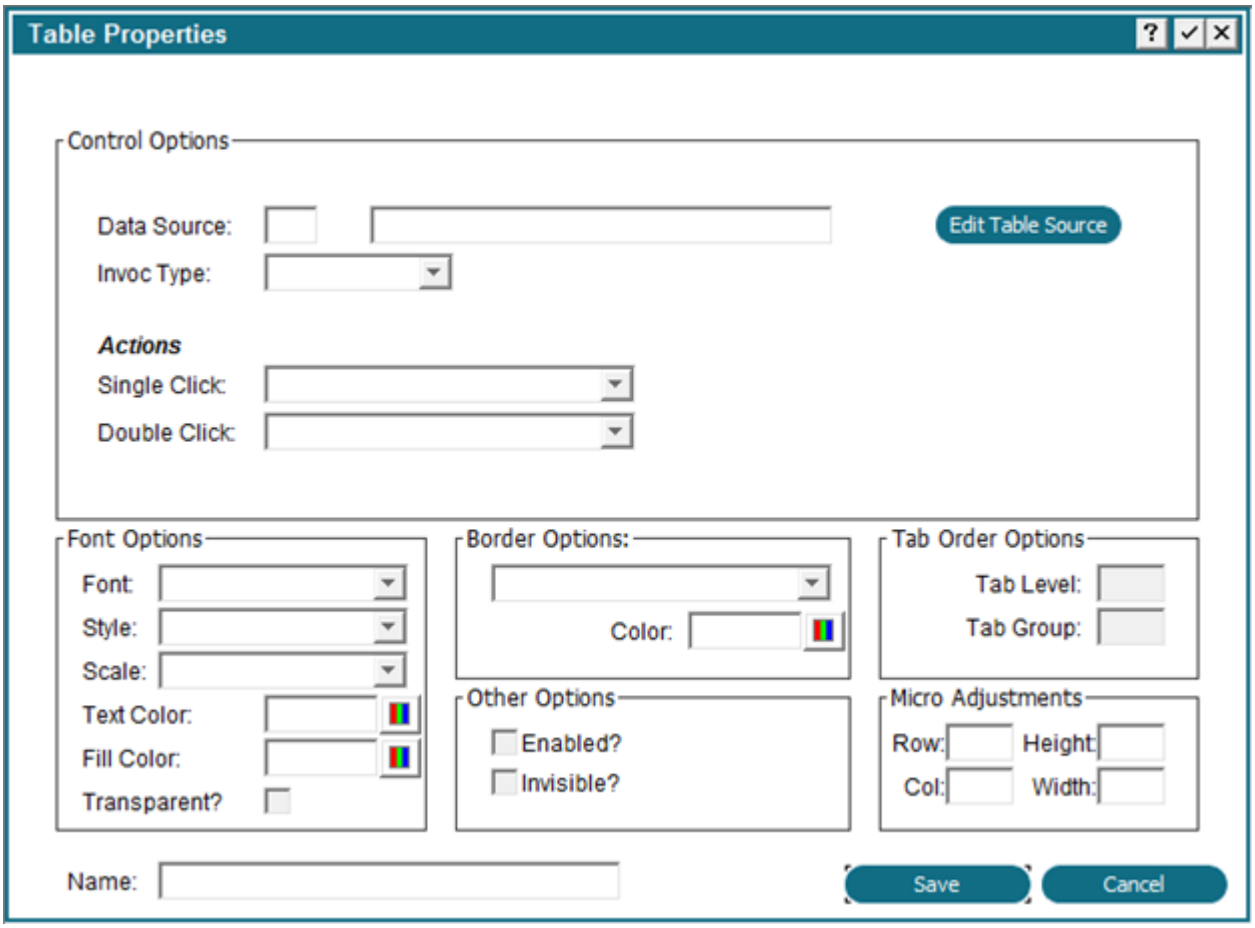
Contol Type can be LABEL, RAW TEXT, or LIST BOX.



Graphical Attributes Overlay For Token Items

Table Item:

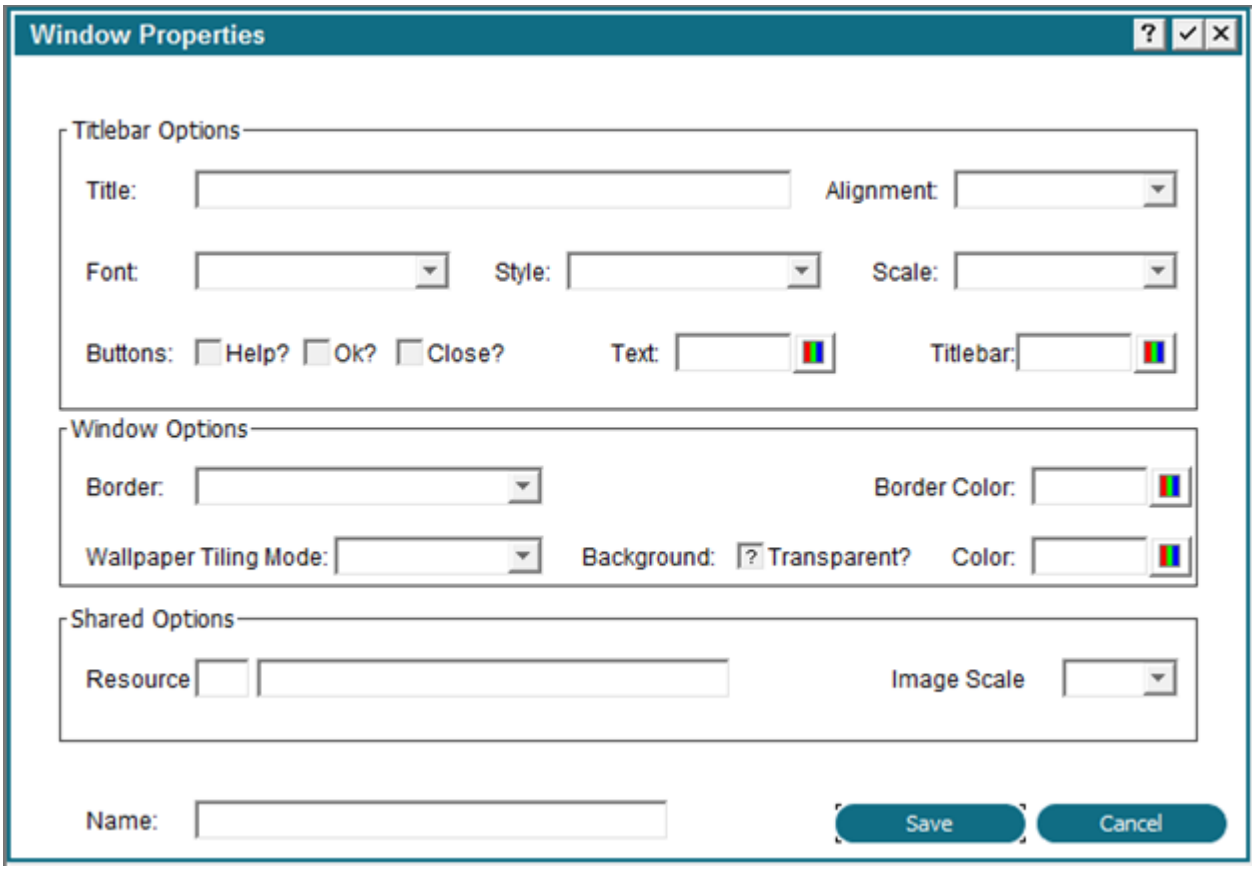
There are no Contol Types currently associated with the Table Widget.



Graphical Attributes Overlay For Table Items

Window Properties:

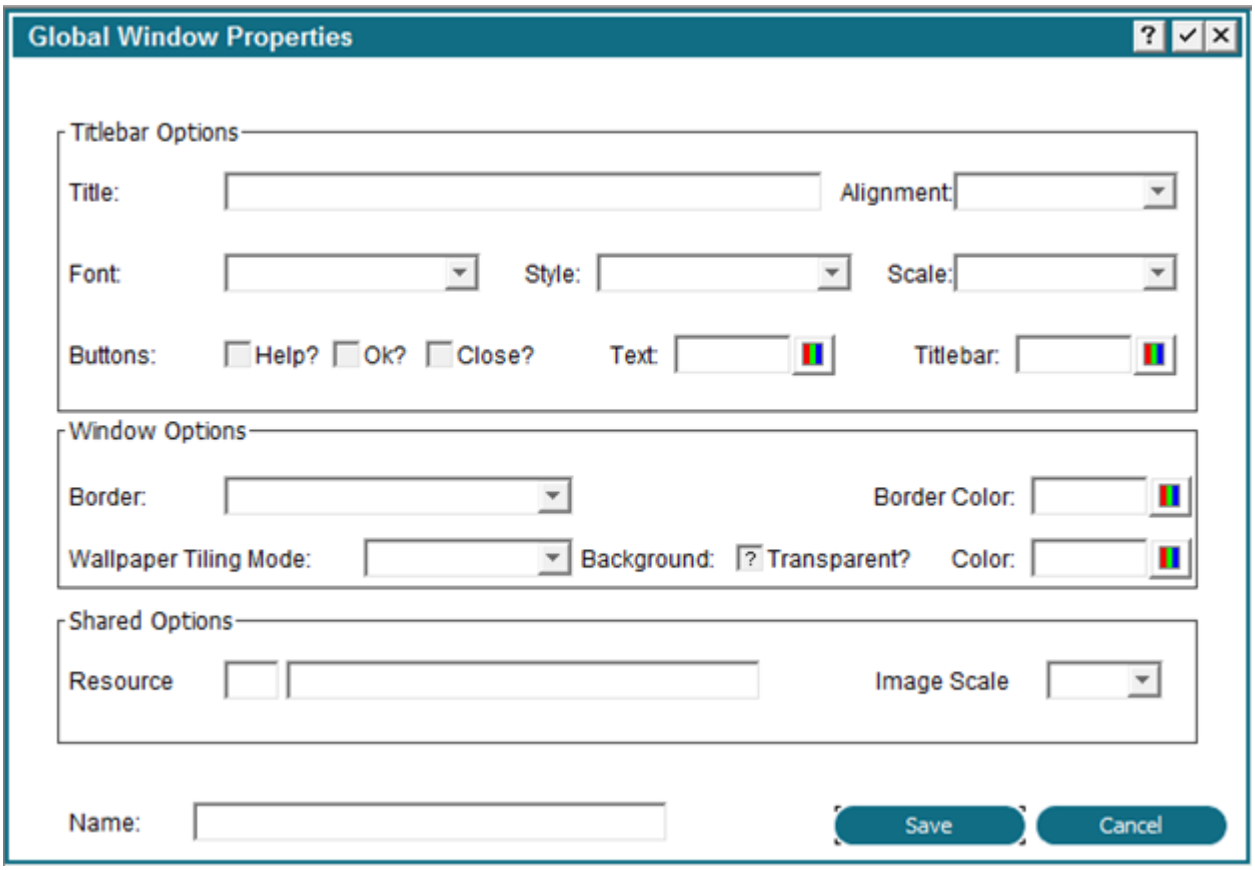
There are no Contol Types currently associated with Window Properties.



Graphical Attributes Overlay For Window Properties.

Global Window Properties:

There are no Contol Types currently associated with the Global Window Properties.



Graphical Attributes Overlay For Global Window Properties

Some or all of these fields can be defined on the overlay depending on the type of field you are defining attributes for:

Control indicates the graphical representation of this field. Choices vary by field type but can include:

Button to display an option button on the screen.

Label to display descriptive information.

Picture to display images.

Raw Text to indicate no graphical representation.

Calendar/Clock to allow the user to select a date from a calendar.

List Box to list allowable value for the field.

Password to display redacted characters as they are typed.

File Chooser to display the desktop file system allowing the user to select a previous stored file.

Color Chooser to select colors from the desktop pallet.

Slider to display a slider bar for setting a variable.

Progress Bar to show the user the progress of running a process.

Text Area to provide a two dimensional box to enter text with word wrapping.

Check Box to display logic fields as a checkbox that toggles from 'yes' to 'no' and, optionally, to "unknown" (if entry is not required), (Y, N or blank using Character Mode).

Toggle Button to display logic fields as a button that toggles from 'yes' to 'no' "unknown" is treated as a 'no').

HTML Viewer to display text fields in a scrolling edit box.

RTF Viewer to display text fields in a scrolling edit box.

CODE VIEWER can be used to display various types of source code (javascript, PHP, etc.) with syntax highlighting.

HTML EDITOR allows HTML text to be edited and saved in a TEXT field using a WYSIWYG editor (CKEDITOR).

FLASH PLAYER This control can be used to play a Flash file.

MEDIA PLAYER can be used to play a media file.

WEB BROWSER is a full-featured web browser.

Control Options are described in the Image Field Control Options section.

Font Options are described in the Image Field Font Options section.

Border Options are described in the Image Field Border Options section.

Other Options are described in the Image Field Other Options section.

Tab Order Options are described in the Image Field Tab Order Options section.

Micro Adjustments -- Row, Col, Height and Width are entered as a percentage of an image cell (1 row x 1 column) and must be less than or equal to 100. These fields can be used to make slight adjustments to the size and position of the data object.

Name is the name assigned to the GUI Attributes for this item and can be used to access the attributes at runtime as described below. You can then control the GUI object with ILF code so that, for example, certain selections could be disabled by user ID.

Access to the GUI attributes at runtime with ILF code is done via the --- WIDGET file. The WIDGET records from the process are copied into this file and are available in the Pre-Display event point. WIDGET NAME is a key to this file and can be set to the value specified in *Name*. You can read and rewrite records in this file to affect the GUI attributes at runtime.

Image Field Control Options

> Note that available options differ depending on the control type selected.

Prompt indicates the text to appear as the label appropriate for this design control type. For example, at the frame level this would be titlebar text. At the button level, it would be button label text. For an optional child, it is the text that appears on the menu but if left blank, the processes' descriptive name is used.

Text Position indicates where the text should appear inside the button. Click the list button for a drop-down list of selections that include: CENTER, TOP, RIGHT, BOTTOM, LEFT, UPPER RIGHT, UPPER LEFT, LOWER RIGHT and LOWER LEFT.

Resource specifies the application and name of a resource defined in Named Resources which links to one or more graphics files. Different graphics can apply depending upon resource state (disabled, enabled, rollover, pressed, etc). Select the scan icon for a list of available resources.

Icon Position indicates where the defined icon (if any) should be placed in relation to the field contents. Click the list button for a drop-down list of selections that include BEHIND TEXT, ABOVE TEXT, TRAILING TEXT, BELOW TEXT, LEADING TEXT, ABOVE & TRAILING, ABOVE & LEADING, BELOW & TRAILING, BELOW & LEADING, EXPAND TO FILL, and EXPAND PROP'L.

Picture Loc indicates the location of the graphic to be used. Click the list button for a list of available locations that include: CLIENT URL, CLIENT FILE, DIRECT, SERVER URL, SERVER FILE, and DESIGN FILE.

Transparent Background? indicates whether or not this field should have a transparent background. Select 'yes' or 'no' .

Option indicates the option number, if any, to be sent to the server by the client whenever the contents of this field are changed. This is useful in situations where you want other changes made to the screen based on the contents of this field. Click the list button for a list of available options.

Tooltip is 60 characters of help text that you can enter. The tooltip is displayed to users as a "hover over" when the mouse pointer is passed over the respective icon.

Tab In --- OPTION will be set to TAB IN and --- CURSOR AT FIELD will contain the name of the field the user tabbed into.

Tab Out --- OPTION will be set to TAB OUT and --- CURSOR AT FIELD will be set to the field they tabbed out of. If the field value changed, then --- OPTION will be set to VALUE CHANGED and ---- CURSOR AT FIELD will contain the name of the field that was changed.

The Value Changed event will be triggered under 2 circumstances:

if the user changes the field and Tabs out (either manually or via auto tab). If the field also has Tab Out checked, then 2 events will fire, first the VALUE CHANGED event will fire, then the TAB OUT event will fire. If the next field has Tab In checked, then a third event will fire, TAB IN for the next field.
if the user changes the field but does not leave the field before valueChangedTimer (in Client Preferences) has expired. For example, if valueChangedTimer is set to 300 ms and the user changes the value in the field, but does not exit the field before 300 ms have passed since they started typing in the field, the VALUE CHANGED event will fire. The timer will reset and will fire again if the user continues to change the field but does not exit before the valueChangedTimer has expired again. If the user does not make any further changes since the last time VALUE CHANGED fired and simply tabs out of the field, the event will not fire again, as they did not change the field since the last time the event fired.

If you have Tab Out set on one field and Tab In set on the next field, then the Option Intercept Event Point will fire twice, once when they tab out of the first field (with OPTION set to TAB OUT and CURSOR AT FIELD set to the first field, then immediately afterwards with OPTION set to TAB IN and CURSOR AT FIELD set to next field).

Since these attributes use --- CURSOR AT FIELD to tell you which field was affected, you can only set these attributes where there is an actual underlying data field. For example, buttons, labels, boxes, etc, do not have these event types.

Image Field Font Options

Font identifies the font (Courier, Arial, etc.) to be used for the label. Click the list button to select your choice.

Style identifies the font style (bold, italic, etc.) to be used for the label. Click the list button to select your choice.

Scale indicates a percentage by which to scale the default size of this font (50%, 150%, etc.). Click the list button to select your choice.

Text Color indicates the color of the label text. You can enter a specific color name or click the Color Selection icon to make the color selection. See the Making Color Selections section for more details.

Background Color indicates the fill color of the label background. You can enter a specific color name or click the Color Selection icon to make the color selection. See the Making Color Selections section for more details.

Image Field Border Options

Border Style indicates the style for the border around an object (Simple Line, Simple Line Wider, Etched Sunken, etc.). Click the list button to select your choice.

Color indicates the color of the default border. You can enter a specific color name or click the Color Selection icon to make the color selection. See the Making Color Selections section for more details.

Image Field Other Options

Enabled? indicates if this optional icon should initially be enabled and available for use by the user. The icon can also be enabled or disabled through the use of ILF code that references the *Name* field. Click the checkbox to toggle between "yes" ☑ and "no" ☐.

Invisible? indicates whether this optional icon should initially be invisible to the user. The icon can also be made visible or invisible through the use of ILF code that references the *Name* field. Click the checkbox to toggle between "yes" ☑ and "no" ☐.

Separator Before? indicates, for a data object on a scrolling image, if a separator line should be placed before this object to better segregate objects into logical groups. Click the checkbox to toggle between "yes" ☑ and "no" ☐.

Separator After? indicates, for a data object on a scrolling image, if a separator line should be placed after this object to better segregate objects into logical groups. Click the checkbox to toggle between "yes" ☑ and "no" ☐.

Image Field Tab Order Options

Tab Level defines the physical pass over the whole screen with respect to tab order. If left blank, the data object is considered to be in tab level 0. APPX will tab from top-left to bottom-right for all data objects in tab level 0. Then it repeats the sequence for all button objects in tab level 0. The cycle is repeated as necessary for each successive tab level. This behavior can be altered by the specification of Tab Groups.

Tab Group is used to mark related data objects and buttons so that they are grouped together as part of a tab order. When making a pass over the screen for a particular "Tab Level", if a data object is encountered that has a non-null "Tab Group", then the tab order proceeds to all the data objects and buttons that are part of that Tab Level/Tap Group. After reaching the last data object or button in the group, the order will continue where it left off prior to encountering the group. Note that for "Tab Groups", data objects and buttons are consolidated into the same top-left to bottom-right pass.

Making Color Selections

You can make color selections for graphical attributes by using one of three methods:

Swatch to select a specific color from a collection of color swatches (see below). Click on the desired swatch to select the color.

HSB to define a color based on a combination of hue, saturation and brightness . To select each of the three color components, click the appropriate radio button and use the slider to increase or decrease the component?s factor.

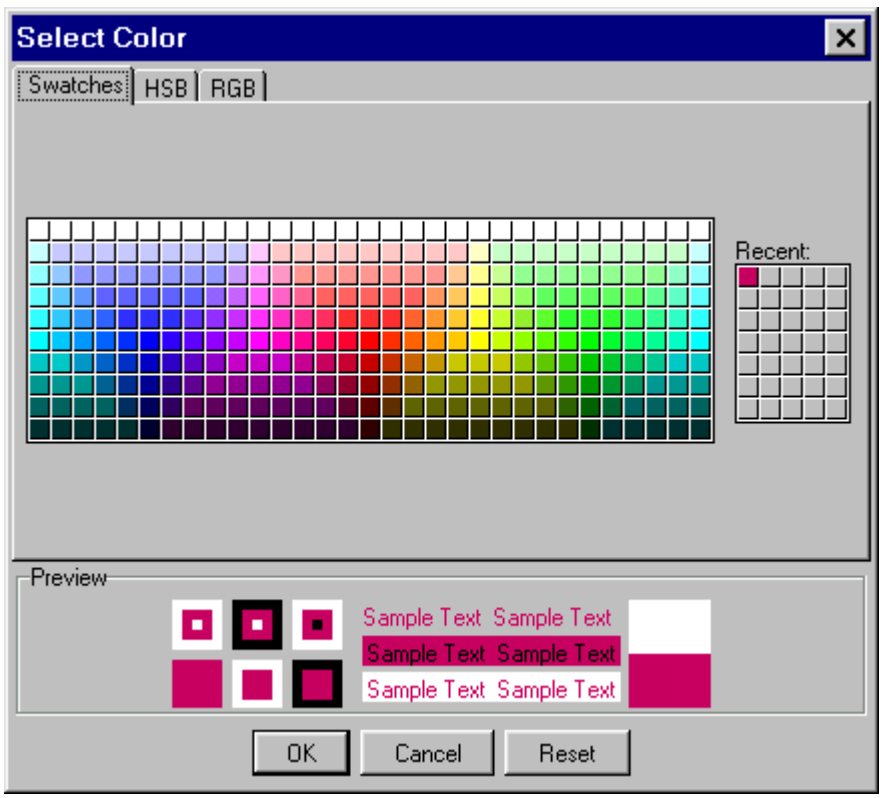
Hue is the actual color on a scale that starts and ends at red (0 and 359). Yellow is 60, green is 120, etc.

Saturation is the purity of the color, measured in percent from 0 to 100. At 0% saturation, hue is meaningless.

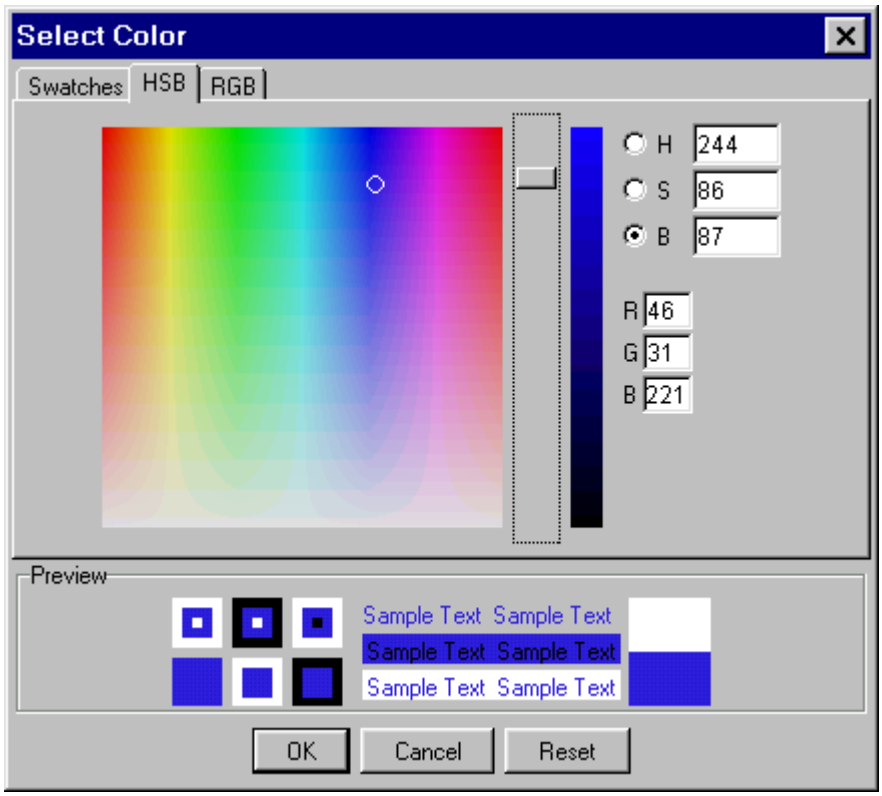
Brightness is measured in percent from black (0) to white (100). At 0% brightness, both hue and saturation are meaningless.

RGB to mix a color by selecting the quantity of red, blue and green from the three respective sliding scales that range from 0 to 255.

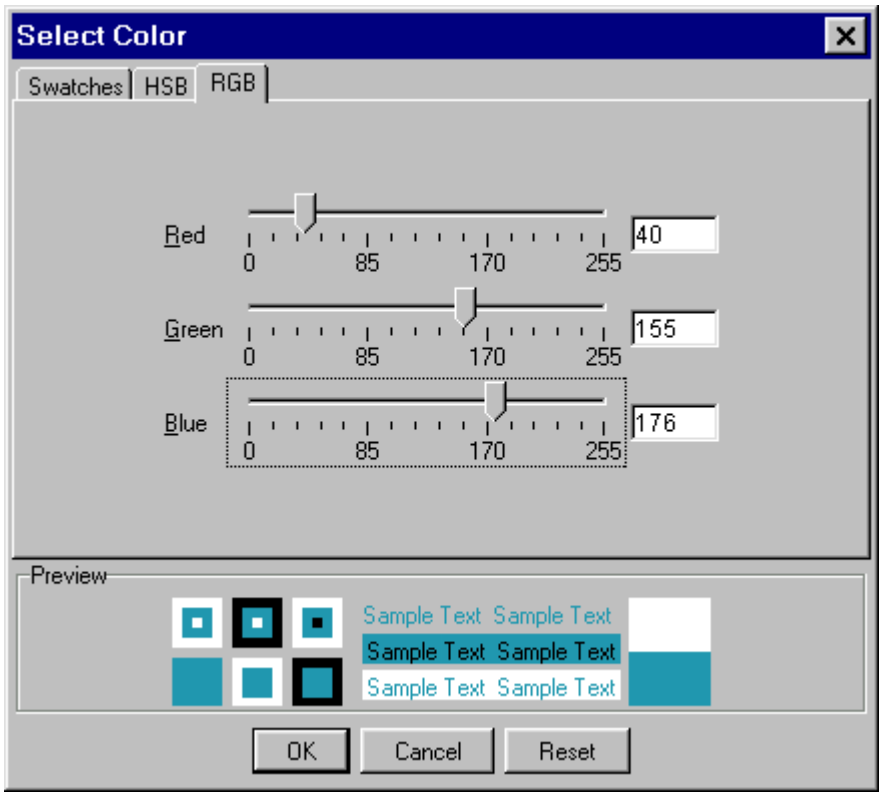
To use one of the three methods, click on the appropriate tab (swatches, hsb or rGB) at the top of the *Select Color* overlay. The swatch method is the default method.



Swatch Method of Color Selection



Hue, Saturation and Brightness (HSB) Method of Color Selection



Red, Green, and Blue (RGB) Method of Color Selection

After selecting the desired color, each of the three color selection method overlays provide three options:

Ok to apply the selected color.

Cancel to cancel the color selection process and return to the *Additional Attributes* overlay, restoring the original color selection.

Reset to restore the original color selection and make a different selection using the same or alternate color selection method.

Assigning Widgets to Layers

Overview:

All screen widgets now support the concept of layers. If you have a complex screen and things aren't layering properly where they overlap, you can adjust the layering.

This option is specified as an @ macro entered into the Label or Tooltip widget fields.

Usage:

@ Macro Specification:

* Set Layer Number - @SLN=# Assigns the Widget to that layer. Layer numbers can be any integer value. Lower numbered layers are closer to the front of the screen. Higher layer numbers push widget farther into the background. All widgets are assigned a default layer as follows:

30 - Box Widgets
20 - Labels, Pictures, and Lines
10 - All other widgets

Drop Shadows

Overview:

All widget types now support a drop-shadow effect. You have full control over the color, distance, angle, size, and opacity of the shadow.

This option is specified as an @ macro entered into the Label or Tooltip widget fields.

Usage:

@ Macro Specification:

* Set Drop Shadow - @SDS={visible},{distance},{size},{angle},{opacity},{color}

All of these parameters are not required and all have default values. You only need to provide parameters up to the last parameter you want to override. If you have parameters in the middle of the list you do not care to override you can just put the comma with no value for that position. Here are the default values for each parameter.

Visible - Boolean - T or F, Default is T
Distance - Integer - default is 25
Size - Integer - Default is value of Distance
Angle - Integer between 0 and 360 - Default is 45
Opacity - Integer between 0(transparent) and 100(opaque) - Default is 50
Color - #COLOR value - Default is #000000

Examples:

Setting Opacity to 75%

@SDS=,,,,75

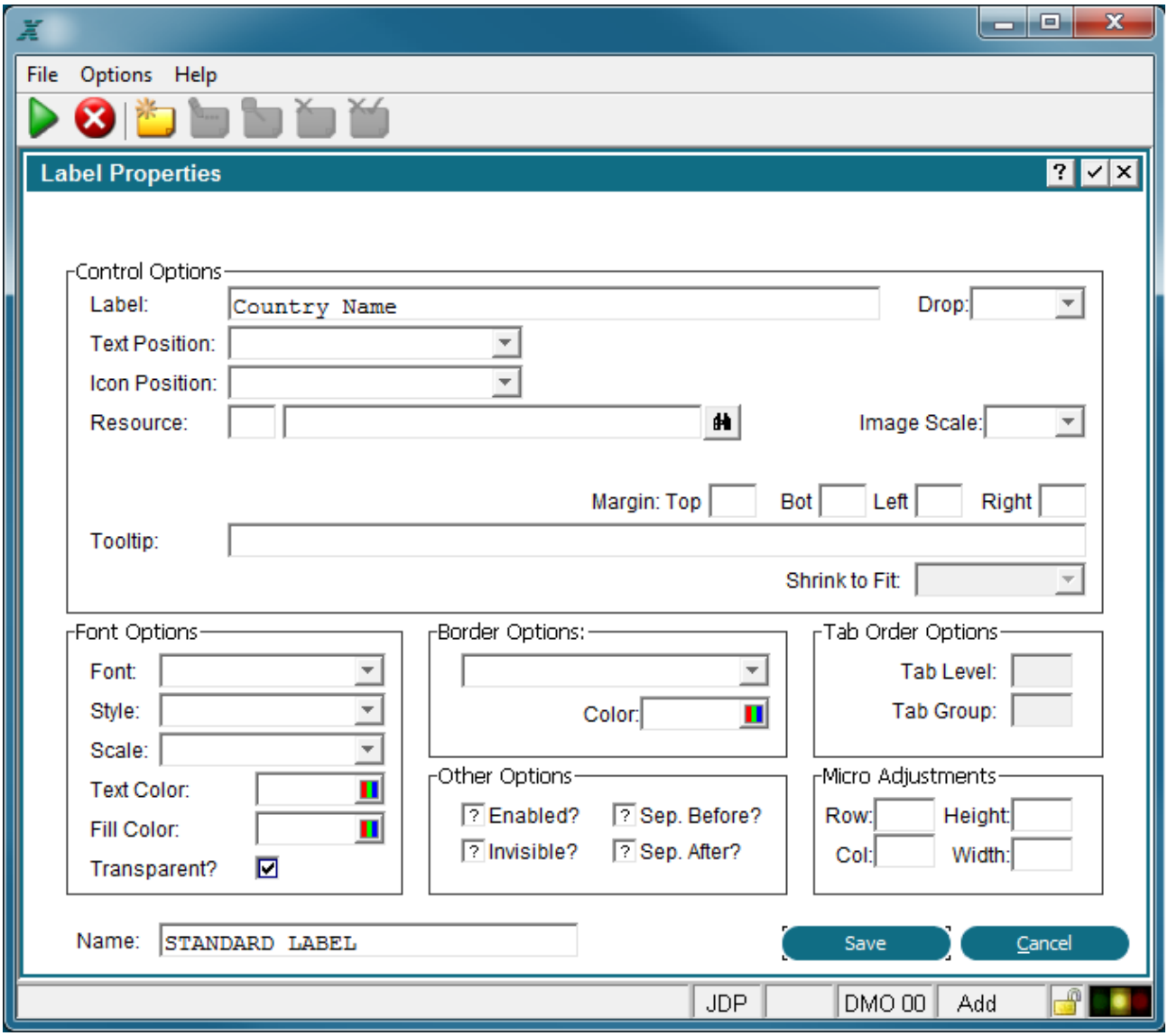
Setting Opacity to 75% and color to Red

@SDS=,,,,75,#FF0000

The WIDGET File/Record

The WIDGET file contains records for storing each GUI element in your design. A WIDGET record will contain the fields found on the GUI Attribute screens for each of those elements. When you are adding fields, buttons, labels, etc, and modifying the GUI Attribute in your process, Appx is maintaining the WIDGET file for you. The WIDGET file can also be read and modified at run time by coding statements in your process. The ability to modify the WIDGET record at run time provides the ability to customize the look of the application based on variable conditions.

Nearly every element of an image can have GUI attributes. The Widget file therefore will have many records for each image. Access to individual records within the WIDGET file is accomplished by setting the --- WIDGET NAME alternate key field and then READ'ing the WIDGET file. The file must be read with HOLD=1 in order to save the changes with a REWRITE statement. The WIDGET NAME field is entered on the GUI attribute screen. The WIDGET NAME is not unique. You can design your process to have the same name for a set of widgets. For example; all Label elements could have a name of STANDARD LABEL.



You can then set up a read loop in the Pre-Display Event Point to read all the WIDGET NAME record that match STANDARD LABEL and set individual GUI attributes as illustrated in the following example.

```
      SET      --- WIDGET NAME                =      STANDARD LABEL
      BEG AT   --- WIDGET   IN --- WIDGET NAME
      END AT   --- WIDGET   IN --- WIDGET NAME
      BEG READ --- WIDGET                 HOLD 1 KEY IS  WIDGET NAME
T     SET      --- WIDGET COLOR EN FG R       =      0
T     SET      --- WIDGET COLOR EN FG G       =      0
T     SET      --- WIDGET COLOR EN FG B       =      255
T     SET      --- WIDGET COLOR EN FG NL      =      1
T     SET      --- WIDGET FONT                =      ARIAL
T     SET      --- WIDGET FONT SCALE          =      80%
T     REWRITE  --- WIDGET                 FAIL 0
TF    CANCEL   Unexpected Error on WIDGET Rewrite
      END READ --- WIDGET
```

The above example would read all the WIDGET records by the alternate key WIDGET NAME containing the value STANDARD LABEL. When a record is found the Text Color (forground color) is set to blue (255), the font is set to Arial, and the font scale is set to 80%. Changing the color requires setting the RGB hex values and the NL flag to 1. The NL flag tells Appx to change the color. Refer to Making Color Selections, to determine color hex values.

To determine the --- WIDGET field name while in the ILF editor you can scan the --- WIDGET to see all the fields available. Note that all possible WIDGET fields are listed when scanning the file and not all will pertain to your currently selected widget. With release 5.2.5 of Appx there is a new online tool available to assist you in determining the actual Widget File field name(s) on any particular GUI Attribute screen. Refer to the Appx wiki (wiki.appx.com) for a link to this tool, . This tool also distinguishes individual attributes that are addressable when your application is using a GUI Theme.

There are a new tools available on the Appx Wiki, wiki.appx.com, called the Appx Wizards. One of these tools, Widget File Attribute Wizard, will assist you in setting the field values for all the GUI widget overlays. Instructions for using the Wizards are shown within each Wizard.

If you add (create) a Widget Record at run time using ILF, in addition to your GUI attributes you must also complete the fields in the primary key for the Widget Record. Following is a list of the Primary Key for the Widget Record (WIDGET KEY).

WIDGET KEY	GROUP HEADER		
WIDGET STMT KEY	GROUP HEADER		
WIDGET ITEM KEY	GROUP HEADER		
WIDGET CHILD KEY	GROUP HEADER		
WIDGET IMAGE KEY	GROUP HEADER		
WIDGET FRAME KEY	GROUP HEADER		
WIDGET PROC KEY	GROUP HEADER		
WIDGET PARAM KEY	GROUP HEADER		
WIDGET PRNT TYPE	DOMAIN		X(10), Tbl
WIDGET PARAM KEY END	GROUP TRAILER		
WIDGET PROC TYPE	DOMAIN		X(10), Tbl
WIDGET PROC NAM	DOMAIN		X(30)
WIDGET PROC KEY END	GROUP TRAILER		
WIDGET FRM CLASS	DOMAIN		X(15), Tbl
WIDGET FRM SNO	DOMAIN		9(7)
WIDGET FRAME KEY END	GROUP TRAILER		
WIDGET ALT IMG NO	DOMAIN		9(3)
WIDGET IMAGE KEY END	GROUP TRAILER		
WIDGET OPT NO	DOMAIN		9(3)
WIDGET ALIGN 1	DOMAIN		X(2)
WIDGET SNO	DOMAIN		9(7)
WIDGET CHILD KEY END	GROUP TRAILER		
WIDGET POS ROW	DOMAIN		S9(7)
WIDGET POS COL	DOMAIN		S9(7)
WIDGET ITEM KEY END	GROUP TRAILER		
WIDGET STMT EP	DOMAIN		9(3)
WIDGET ALIGN 2	DOMAIN		X(3)
WIDGET STMT SNO	DOMAIN		9(7)
WIDGET STMT KEY END	GROUP TRAILER		
WIDGET KEY END	GROUP TRAILER		

RAW Text Widgets

A widget defined as RAW TEXT will not honor html tags, whereas one defined as a LABEL or TEXT AREA will do so. RAW TEXT may be used on ALPHA and TEXT fields. RAW TEXT indicates that the data should be printed as stored with no formatting applied by APPX.

When used with either an ALPHA field or a TEXT field RAW TEXT will not apply any html formatting. Data will not word-wrap, and instead will break on a character with a default position of the top and left of the widget area. Underscores for required spaces and APPX paragraph characters will print as data. Widget attributes will be honored. If no widget attributes are set the result of a RAW TEXT widget should be the same as an ALPHA field printed with no widget.

The table below summarizes the behaviors of various output process widget types for ALPHA and TEXT fields as of Release 5.0.0:

Field Type / Widget Type	No Widget	RAW TEXT	LABEL	TEXT AREA
ALPHA	No change to prior behavior: Does not format embedded html Does not word-wrap text Wraps characters at end of each row of field Truncates characters at end of last row of field Prints underscores and APPX end-of-paragraph characters as data	New behavior: Does not format embedded html Does not word-wrap text Wraps characters at end of each row of field Prints underscore characters and APPX end-of-paragraph characters as data Default text position is left top of widget area Honors widget attributes If no widget attributes are specified for a RAW TEXT widget, the result is the same as if no widget type was specified.	No change to prior behavior: Applies html formating. Does not word-wrap text. Prints elipses when truncating text that will not fit within the field. Prints underscore and APPX end-of-paragraph characters as data Default text position is left center All spaces treated as required spaces	No change to prior behavior Applies html formating. Word-wraps text based on field width. Prints underscore and APPX end-of-paragraph characters as data Default text position is left top All spaces treated as required spaces

Field Type / Widget Type	No Widget	RAW TEXT	LABEL	TEXT AREA
TEXT	No change to prior behavior:	New behavior: (same as ALPHA field)	No change to prior behavior	No change to prior behavior
	Does not format embedded html	Does not format embedded html	Same as TEXT AREA widget except that the default text position is left center.	Applies html formating.
	Word-wraps text based on row length of field	Does not word-wrap text (wraps characters)		Word-wraps text based on field width.
	Truncates words at end of last row of field	Prints underscore characters and APPX end-of-paragraph characters as data		Honors APPX end-of-paragraph characters.
	Honors APPX end-of-paragraph characters	Default text position is left top of widget area Honors widget attributes		Substitutes required spaces for underscore characters.
	Substitutes spaces for underscore characters	If no widget attributes are specified for a RAW TEXT widget, the result is the same as if the TEXT field was an ALPHA field with no widget type specified.		Default text position is left top

Local List

Overview:

Dropdown List widgets now support a special macro to alter their contents at runtime. This applies to Token fields and Alpha fields with Validation Lists. The values you put into the listbox still needs to be valid for the field, this is a way to restrict the choices to a subset of what is in the data dictionary.

This option is specified as an @ macro entered into the Label or Tooltip widget fields.

Usage:

@ Macro Specification:

* Set Local List - @SLL={delim}{value}....{delim}{value}

The {delim} is the first character in the list. This allows you to set the delimiter to whatever you need. For example, if a comma occurs in your data you will need to use a different delimiter character. For example, '@SLL=,Ms,Mrs,Miss' would limit the choices to Ms, Mrs and Miss.

File Chooser Widget

Overview:

The Appx File Chooser lets a designer define an Appx data field on the screen that can be populated by the user using a File Chooser. The file chooser can be configured to restrict the user to just selecting Files or Folders. The files shown in the chooser can be filtered by one or more filters defined by the designer. Filters are set as lists of file extensions that are valid. Due to space considerations in the current WIDGET file, the most used appearance options are specified as specifications on the Widget definition screen. The lesser used options are specified as @ macros entered into the Label or Tooltip widget fields.

Usage:

Widget Screen Specifications:

* Chooser Mode - This determines what can be selected by the user. FILE tells the chooser that only Files can be chosen. FOLDER tells the chooser that only Folders can be chosen. ANY tells the chooser that Files or Folders can be chosen.

@ Macro Specification:

* File Filters - @SFF="Filter Description",EXT,EXT,...[|] One or more filters can be defined using a pattern of "description",ext,ext,... where "description" shows up in the dropdown list of filters in the chooser and ext,ext,... is a list of file extensions valid for that filter. You specifiy more than one filter by adding a vertical bar delimiter after the current filter and then define a second filter. So to filter for Images or Documents you might enter a filter of:

@SFF="Images",png,gif,jpg|"Documents",doc,txt,pdf

Code Viewer Widget

Overview:

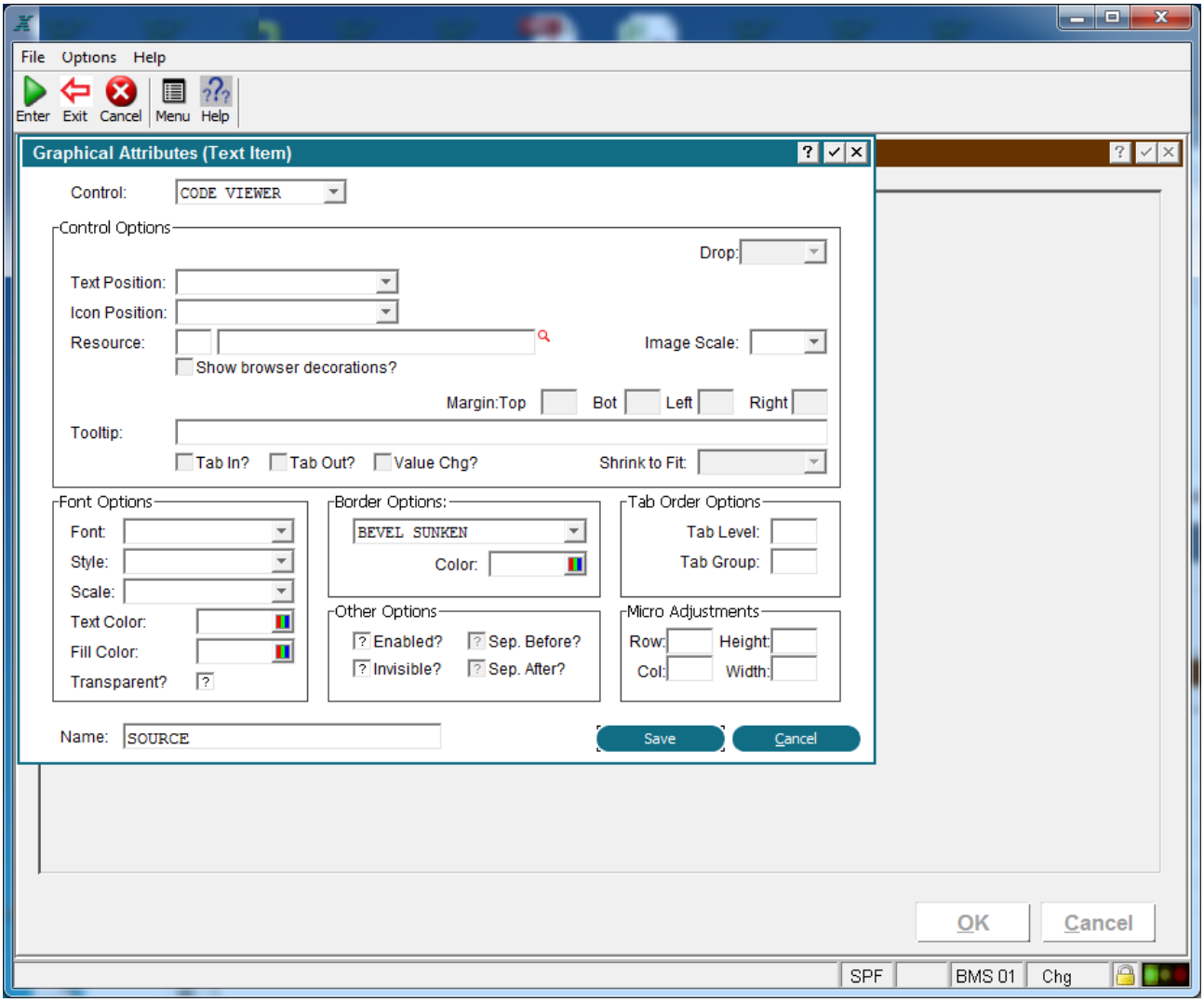
The Code Viewer Widget can be used to display various types of source code in an APPX text field. The text field should contain the source code to display.

Design Usage:

Use the Image Editor to add a text field to your image and resize it to be the size that you would like for your Code Viewer Widget. Then edit the GUI Attributes of the field and select "CODE VIEWER" as the control.

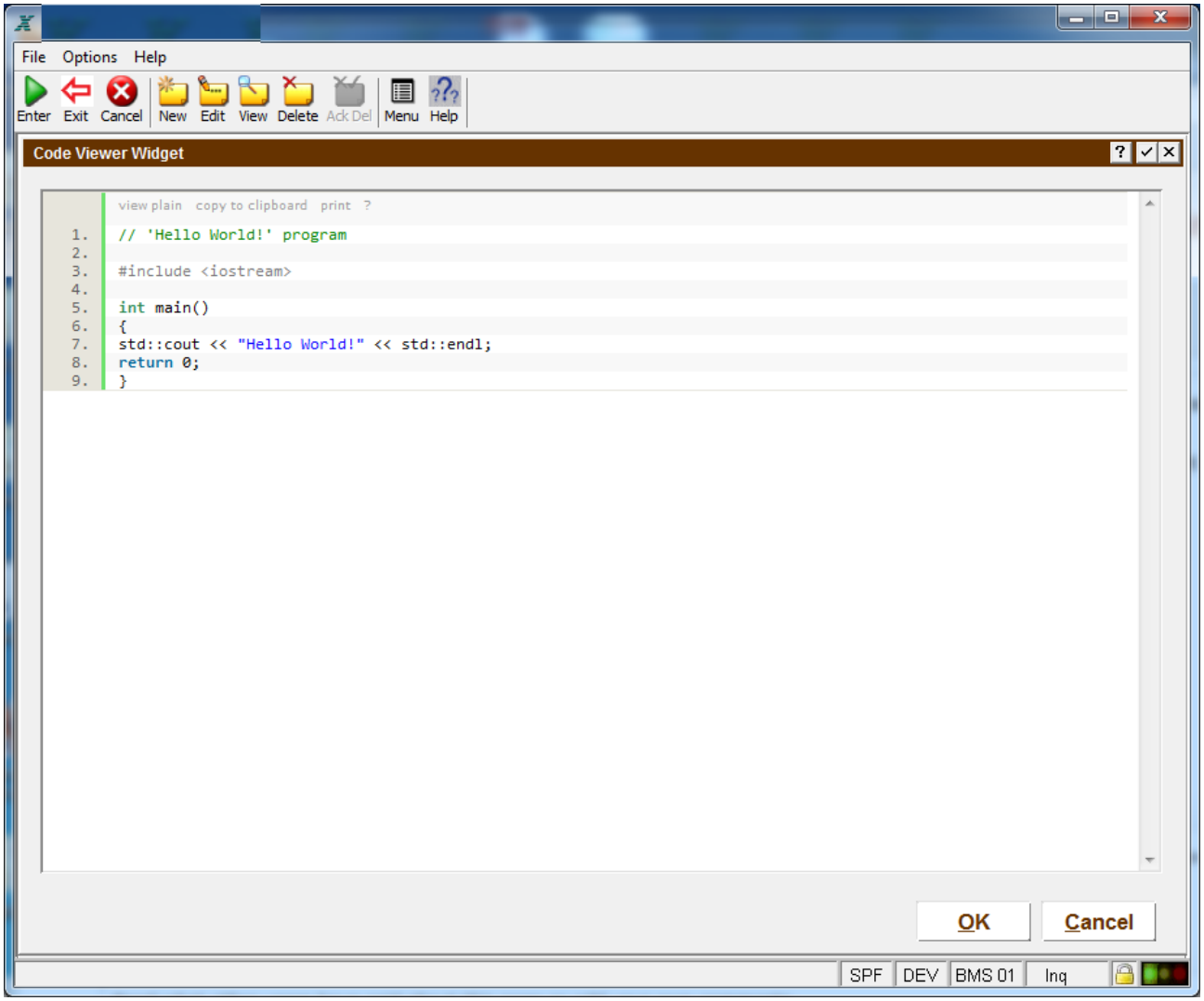
At runtime, you can dynamically set the type of source code which is being displayed by setting the WIDGET CONTENT TYPE field in the WIDGET record to the appropriate value. Supported values are:

CPP
CSHARP
CSS
DELPHI
HTML
JAVA
JSCRIPT
PHP
PYTHON
RUBY
SQL
VB
XML



Runtime Usage:

At runtime, the contents of the field will be displayed as formatted source code with appropriate highlighting. The field is non-modifiable.



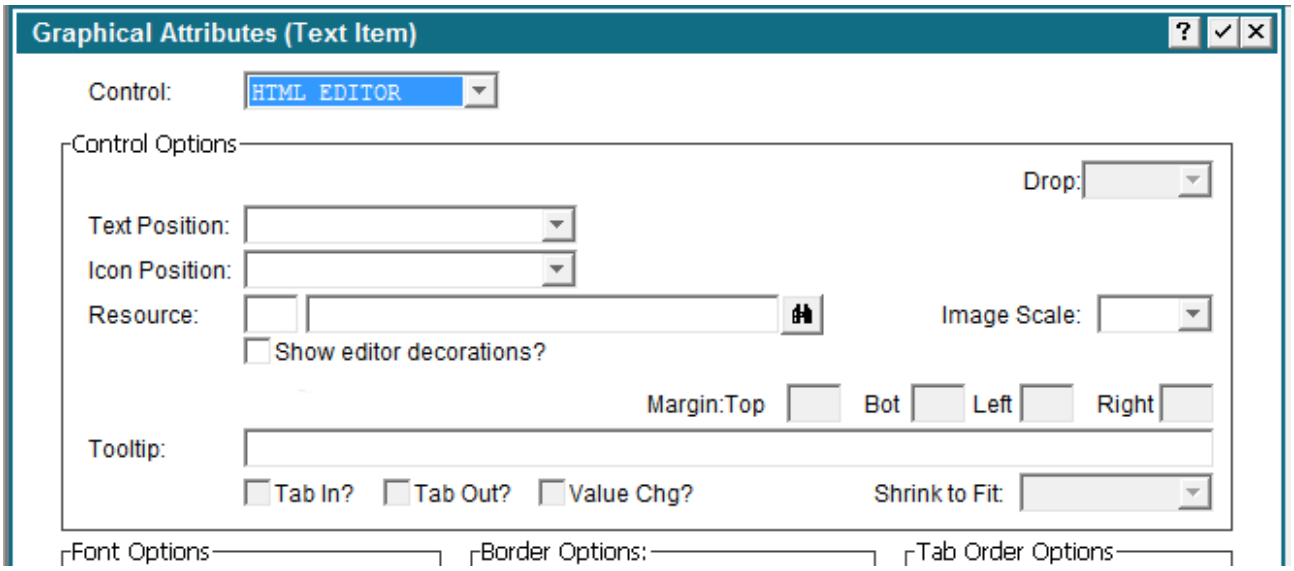
HTML Editor Widget

Overview:

The HTML Editor Widget can be used to enter and edit HTML in an APPX text field. The text field will contain the HTML code after the user has entered it.

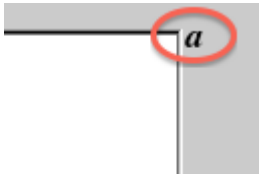
Design Usage:

Use the Image Editor to add a text field to your image and resize it to be the size that you would like for your HTML Editor Widget. Then edit the GUI Attributes of the field and select "HTML EDITOR" as the control.



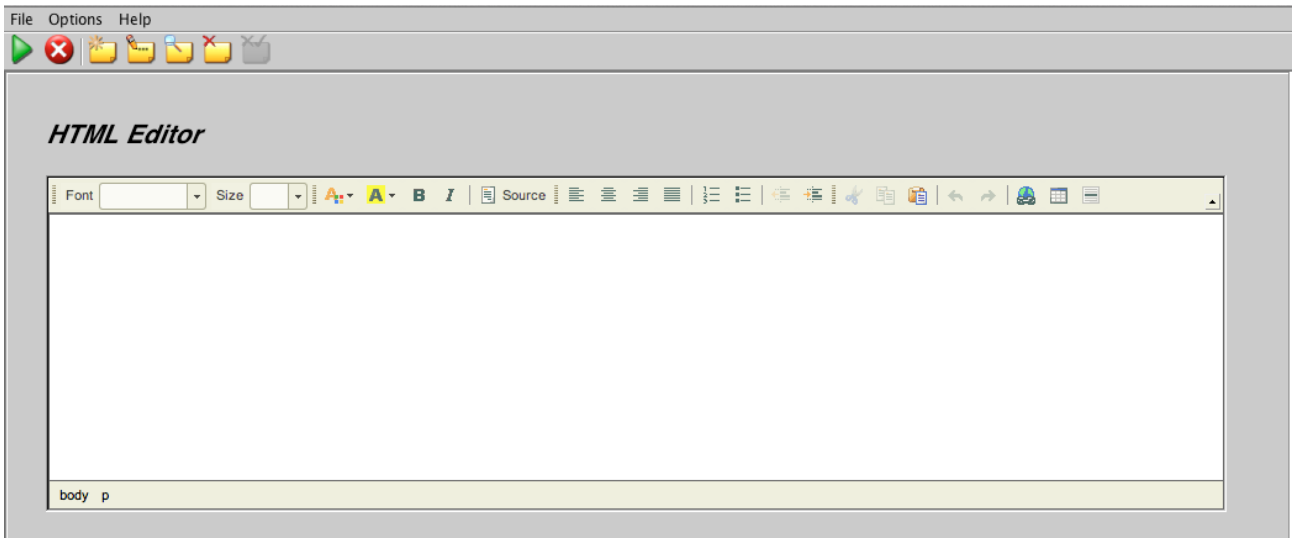
Show editor decorations? A check will always show the HTML editor toolbar/footer in the field. A blank will never show the toolbar/footer and will add an icon to popup a floating editor window instead. A ? lets the client choose which is best (default). In this case the client will look at the spec for "editorFullMinRows" (default 6). If the field is at least this many rows on the screen it will show the full editor with toolbars and footer in the field. If less than that many rows it will switch to no toolbars and footer and will add the popup icon. When the popup window fires it will default to a physical size that is based on two client properties "editorHeight" and "editorWidth" which default to 400 and 600 respectively. Once the popup fires you can move and resize it. All client settings are under [UIDefaults] and can be changed after login via .CLIENT LOAD URL.

The icon for the editor popup will appear to the right of the first row of the field:



Runtime Usage:

At runtime, the user will be able to enter text as if they were using a mini word processor. The saved text can be displayed later using a HTML VIEWER control, if desired.



Customizing the editor

Appx uses the open source editor ckeditor for this widget. You can futher customize the capabilities of the editor (such as adding spell checking) by creating a custom configuration file. Refer to the documentation on the ckeditor website for creating a custom configuration file. Appx uses the 'compiled' format of the configuration file. As of this writing, Appx is using version 3.6.4 of CkEditor for Java.

Once you have created the file, place it in the Resource directory of your application and add a Resource for it. The resource state should be EDITOR CONFIG, location type should be Design File and the Location data should be the config file name (case sensitive on Linux/Unix systems). Finally, add the resource to the HTML editor widget. You may have to log off & on again for the new configuration to take affect.

This sample configuration file re-arranges the toolbar and adds spell checking:

```
{
skin : 'office2003',
autoParagraph : false,
// disableNativeSpellChecker : false,
toolbar :
[ +
['SelectAll','Cut','Copy','Paste','PasteText','PasteFromWord','-', +
'Undo','Redo','Find','Replace','SpellChecker','Scayt'], +
['Font','FontSize','TextColor','BGColor','Bold','Italic','Underline'
], +
['JustifyLeft','JustifyCenter','JustfyRight','JustifyBlock'], +
['Styles','Format'], +
```

```
['Link','Table','HorizontalRule','Source'] +
],
};
```

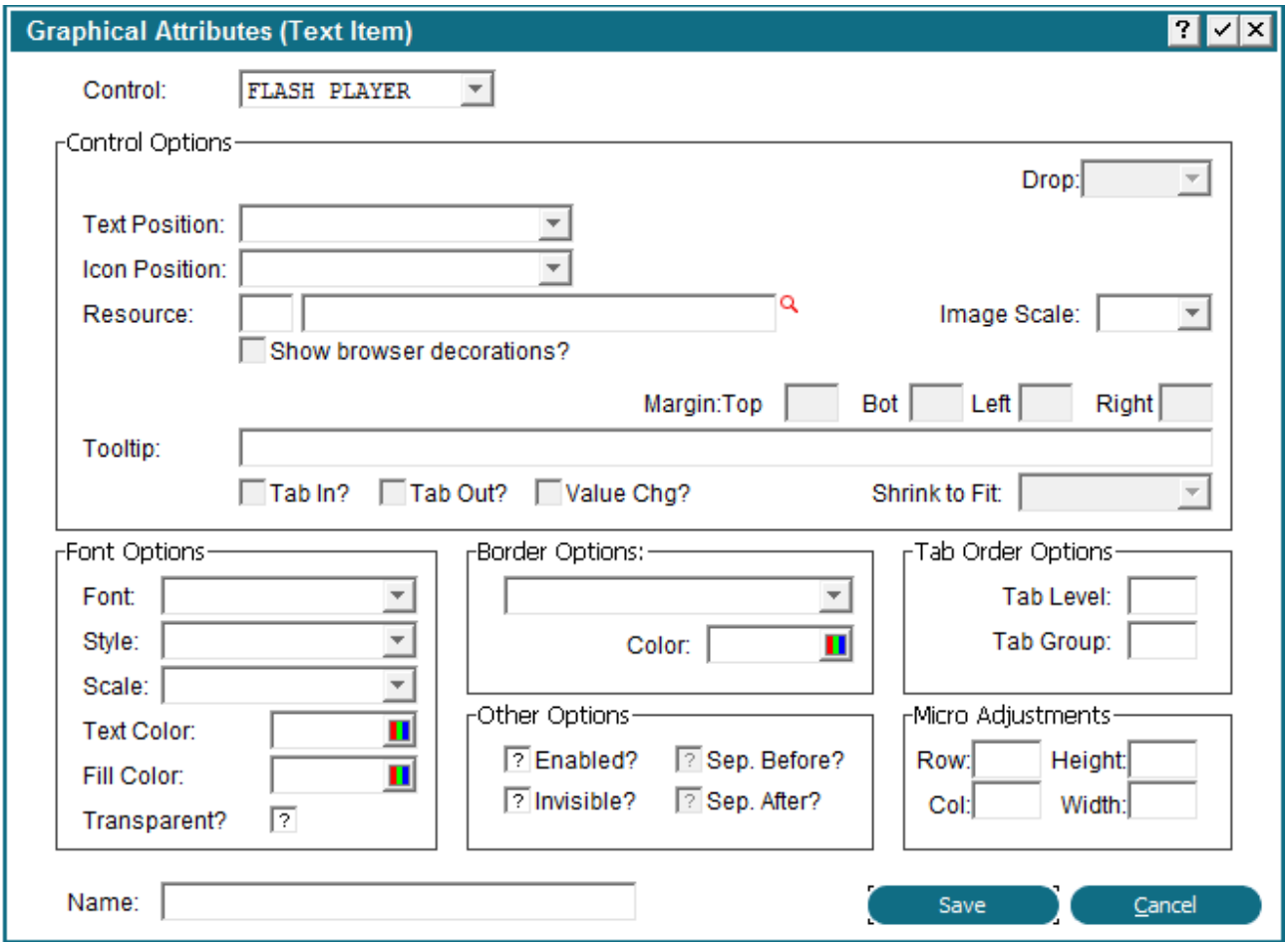
Flash Player Widget

Overview:

The text field should contain the pathname to a flash file (swf). The flash file must be located on the desktop where the APPX Client is running. Flash must be installed on the desktop.

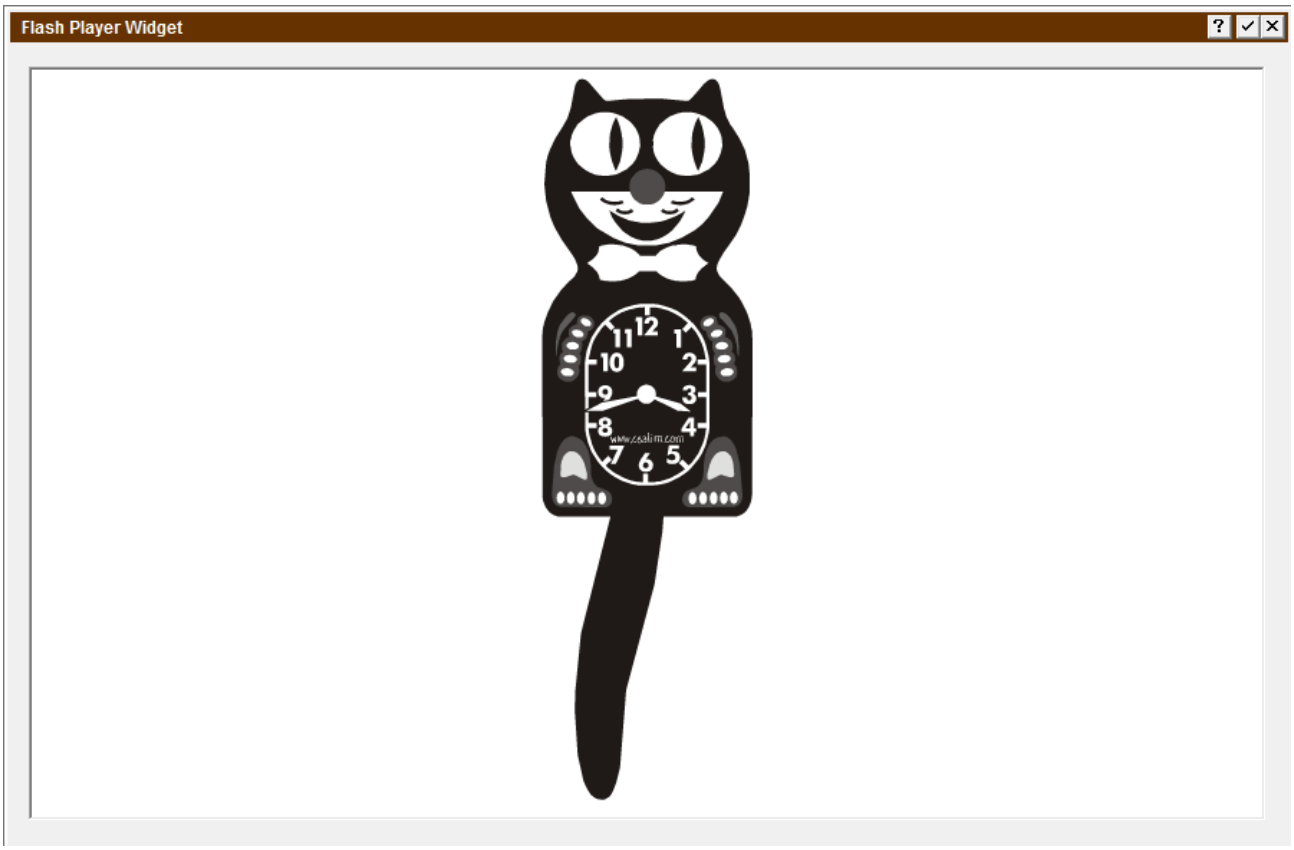
Design Usage:

Use the Image Editor to add a text field to your image and resize it to be the size that you would like for your Flash Player Widget. Then edit the GUI Attributes of the field and select "FLASH PLAYER" as the control.



Runtime Usage:

At runtime, the flash player will automatically run the flash file.



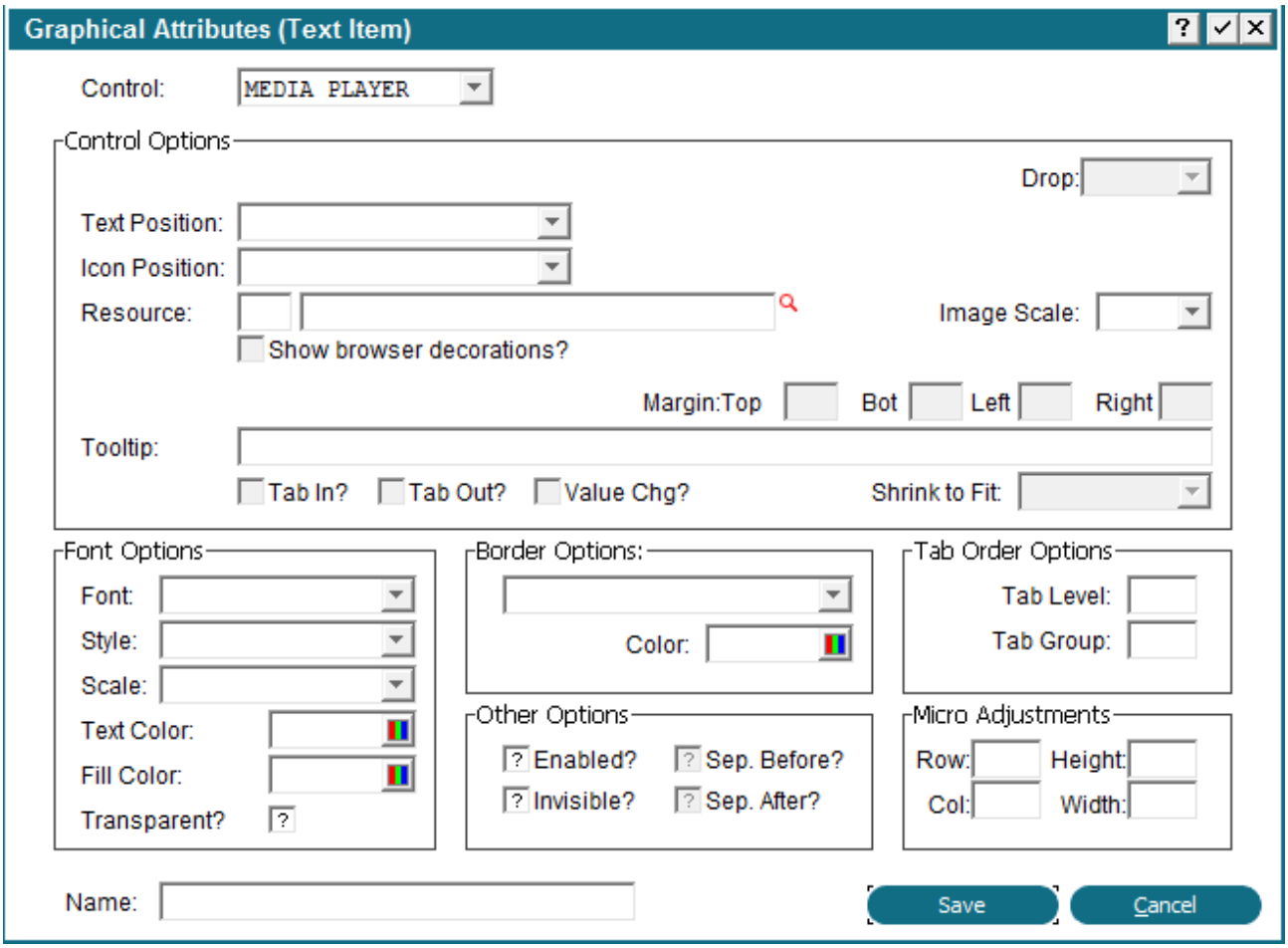
Media Player Widget

Overview:

The text field should contain the pathname to a media file (avi, mp3, mp4, etc). The media file must be located on the desktop where the APPX Client is running. For non Windows clients, you will need the VLC Video player installed on the desktop in order for this option to work. You can download the viewer from http://www.videolan.org/vlc.

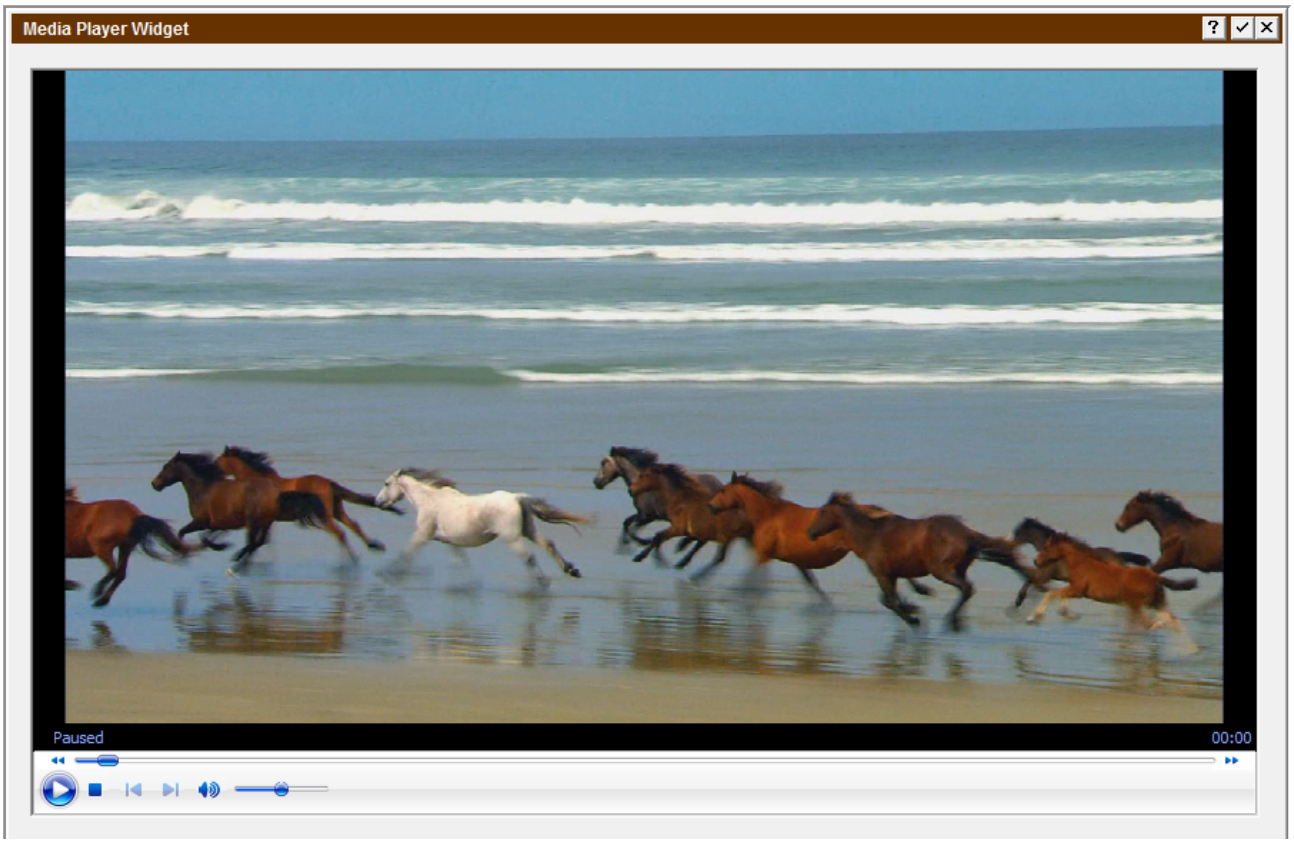
Design Usage:

Use the Image Editor to add a text field to your image and resize it to be the size that you would like for your Media Player Widget. Then edit the GUI Attributes of the field and select "MEDIA PLAYER" as the control.



Runtime Usage:

At runtime, the specified video will automatically run. The bottom of the widget includes playback controls.



Web Browser Widget

Overview:

The Web Browser Widget can be used to display a web page in an APPX text field. The text field should contain the URL of the web page which is to be displayed.

Design Usage:

Use the Image Editor to add a text field to your image and resize it to be the size that you would like for your Web Browser Widget. Then edit the GUI Attributes of the field and select "WEB BROWSER" as the control. If you would like for navigation buttons to be included at runtime and if you would like for the user to be able to enter a URL at runtime , check the box for "Show browser decorations".

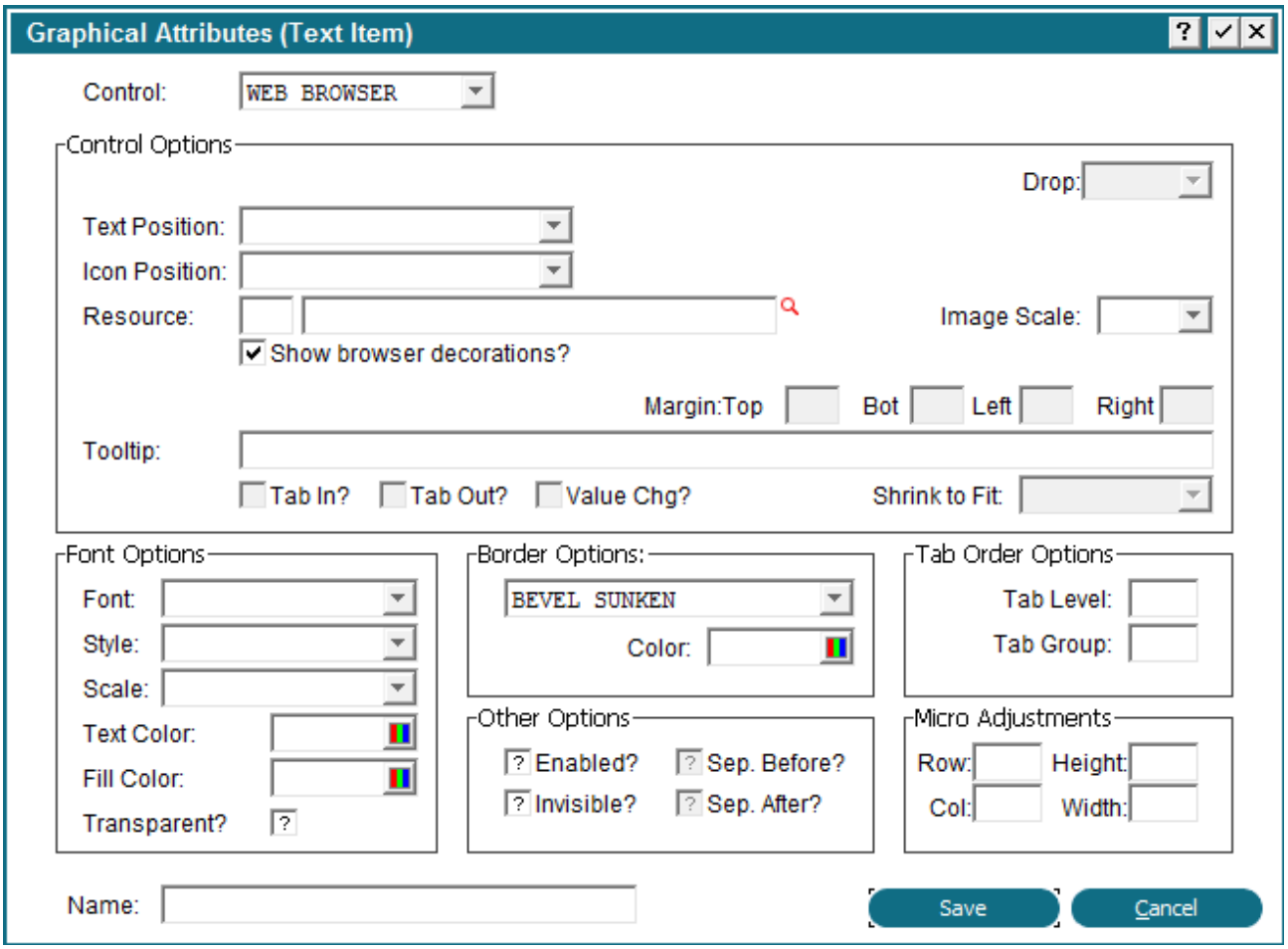
At runtime, you can dynamically control whether or not the navigation buttons and the address field are displayed by setting the WIDGET SHOW DECORATE field in the WIDGET record to Y or N.

The WEB BROWSER widget also supports special hyperlinks which execute APPX optional children. These hyperlinks specify an APPX OPTION value rather than a URL. The syntax is:

Click here to run an APPX Process"

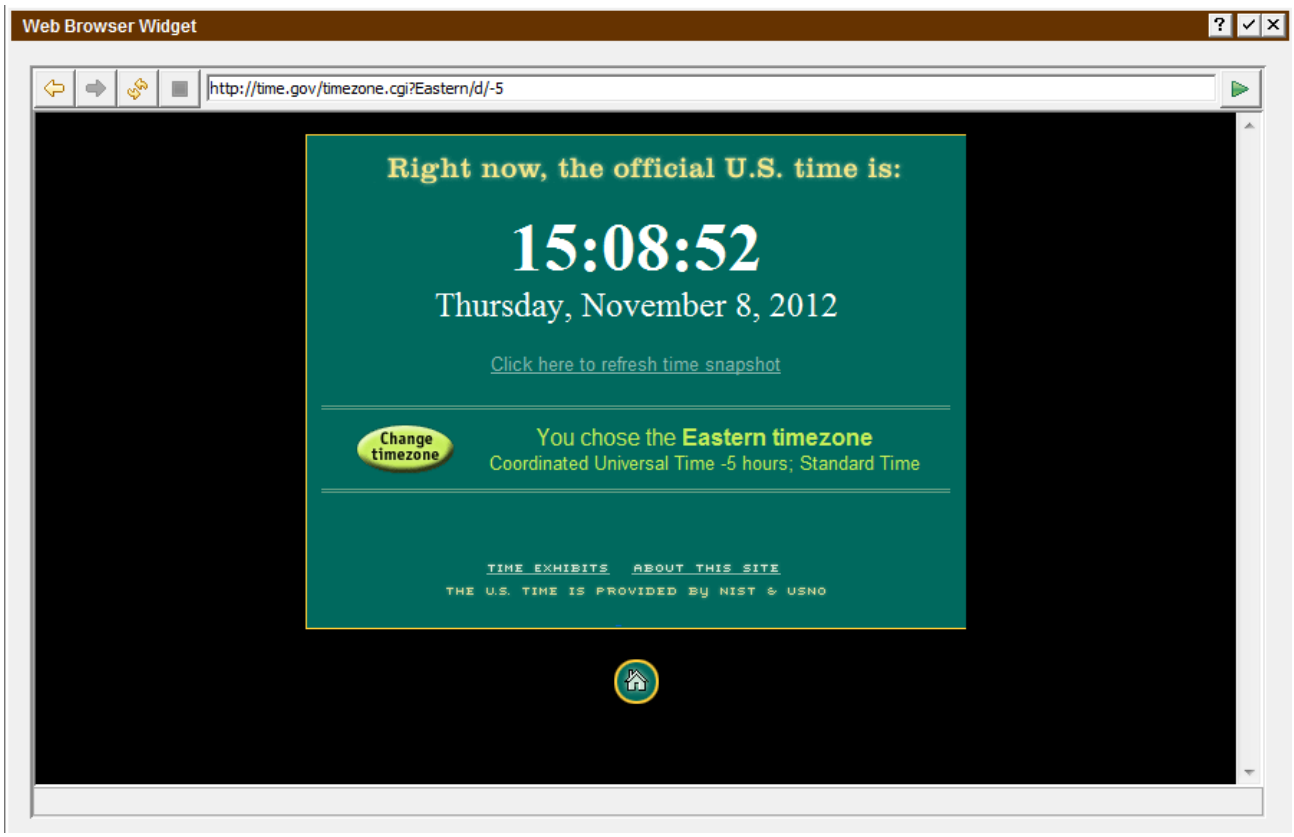
The following example will display a hyperlink for "Customer List" and will execute APPX OPTION "User 1" when clicked:

Print a Customer List



Runtime:

At runtime, the Web Browser widget will display the web page of the URL which is stored in the TEXT field. If you checked the box for "Show browser decorations?", then the user will also be able to enter the URL for any web site.



Drag & Drop With Widgets

Overview:

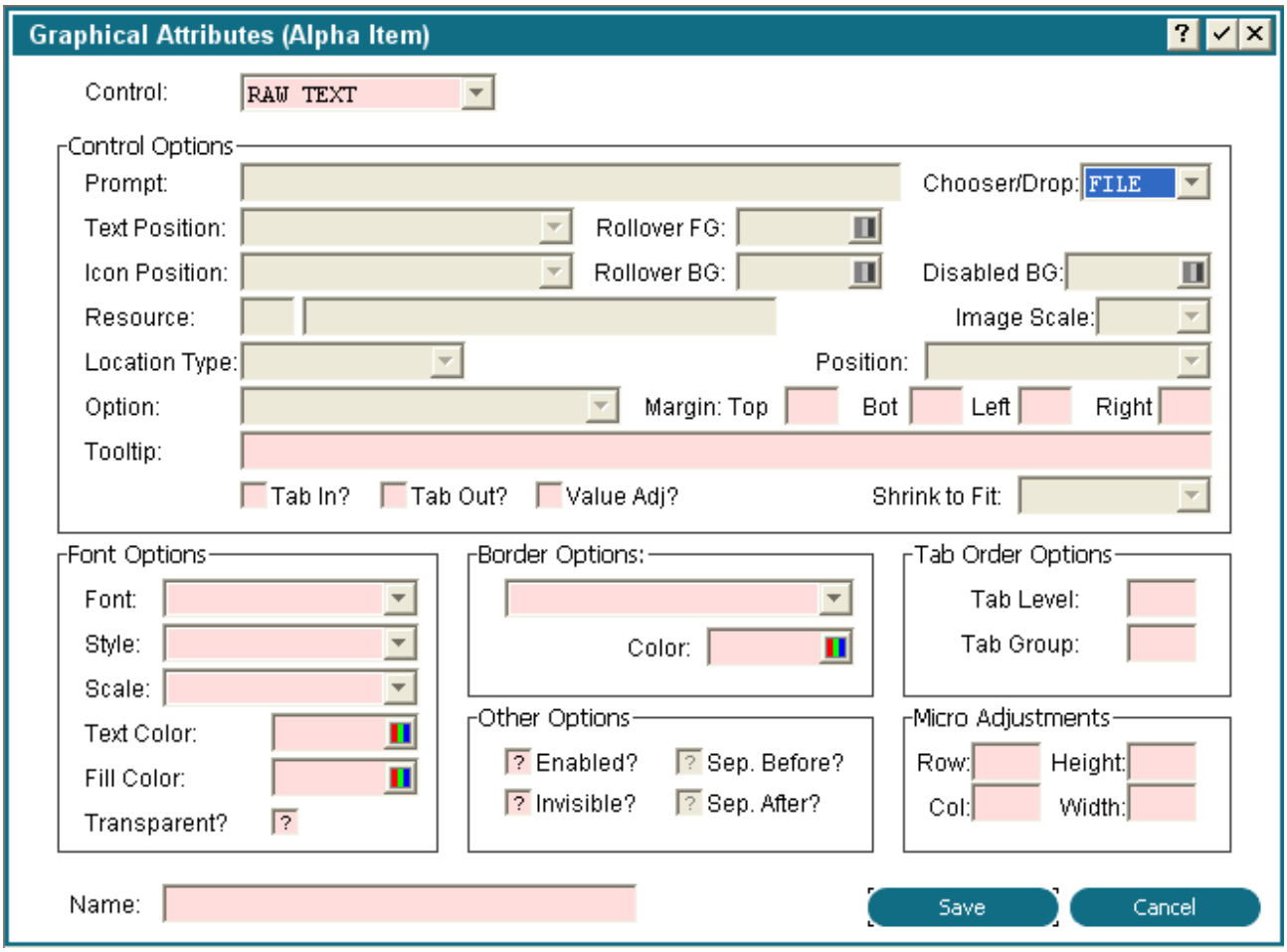
You can now define certain Widget types (Buttons, Labels, etc.) as targets of a drag & drop operation. This means the user can drag a file or other object to an Appx Widget & drop it.

Creating Drop Target

Define a LABEL, BUTTON, or FIELD object on your image. (NOTE: If you use a FIELD, you can select from the various normal control types, but be aware that the field value will not be automatically modified by the drag & drop operation).

On the object Properties screen, set the Chooser Mode to one of the following:

ANY - Accepts a file, folder, or Email message/Attachment.
FILE - Accepts files only.
FOLDER - Accepts Folder names only
TREE - Same as ANY, except if the user drops a folder name, the folder will be parsed and all file names will be returned in the DROPINFO/DROPPROP files.



You can also set --- WIDGET FI CHOOSE MODE via ILF code:

```
      SET      --- WIDGET NAME                =      DROPINFO
      READ     --- WIDGET                 HOLD 1 FT 0 BY WIDGET NAME
T     SET      --- WIDGET FI CHOOSE MODE      =      FILE
T     REWRITE  --- WIDGET                 FAIL 0
```

Drop Target at Runtime

The border of the widget will change to Green when an object is dragged over it. If the object is not of the correct type, then a message 'No valid items dropped' will display in the status area when the user drops it. For example, this will happen if the widget is set for files only and the user tries to drop a folder.

When the user drops an object (file/folder/email message/etc) on the drop target, Appx will populate 2 files and then set --- OPTION to DROP. The files are: --- DROPINFO which will contain one record for every object dropped and --- DROPPROP which will contain multiple records for each object dropped, if there is additional information for the object type. Both of these files are keyed by the --- WIDGET KEY, so if you have more than one drop target on your image, you can differentiate them.
The DROPINFO file

The --- DROPINFO file consists of the following:

DROPINFO PATH contains the full path to the object the user dropped
DROPINFO NAME is the file name portion of the path, including the extension
DROPINFO EXT has the file extension
DROPINFO TYPE shows the item type (file, folder, etc.)
DROPINFO SIZE contains the size of the object

DROPINFO PATHNAME would contain the path to open and read the dropped item. You could also use this to open the file via .CLIENT LOAD URL:

```
SET      --- TEMP 512                    =      "
APPEND   --- TEMP 512                    0  --- DROPINFO PATH
APPEND   --- TEMP 512                    0      "
PASS     --- TEMP 512                    FIELD            SHARE? N
GOSUB    --- .CLIENT LOAD URL
```

(We enclose the name in quotes in case it contains a space.)

The DROPPROP file

The --- DROPPROP file is a child file of --- DROPINFO and contains multiple records for each object, depending on the type of object dropped. The --- DROPPROP KEYWORD identifies a specific property, and --- DROPPROP VALUE contains the value of that property.

For example, an Email message might have the following ---- DROPPROP keywords and values:

Keyword	Value
Categories	Blue Category (controlled by user's Outlook settings)
From	Microsoft Office Outlook (human readable 'from' address)
Received	Tue 12:40 PM
Size	6 KB
Subject	***SPAM*** Microsoft Office Outlook Test Message
command	"C:\Program Files\Microsoft Office\Office12\OUTLOOK.EXE" /f "%1"

> Note that these keywords vary depending on the user's desktop language.

Additional Information

These files are cleared every time the image is displayed to the user, and every time a new object is dropped. If you do not process or save the information each time, the previous data will be lost.

Email messages and attachments are copied to the location specified by 'dropCachePath', and then that path is returned to your program. 'dropCachePath' defaults to $(cachePath)\Drop. It is the designers responsbility to manage files that are copied to this location, ie, the client will not delete them for you.

Example:

This feature allows APPX designers to enhance a File Chooser field to allow a user to either browse to a desired file or drag-and-drop it.

If the target file chooser field is TEMP 256 and the widget name is MY-FILE-CHOOSER, insert this ILF code in Option Intercept:

```
      IF       --- OPTION                    EQ     DROP
T     SET      --- WIDGET KEY                =  --- DROPINFO WIDGET KEY
T     READ     --- WIDGET                 HOLD 0 FT 0 BY WIDGET KEY
TT    IF       --- WIDGET NAME               EQ     MY-FILE-CHOOSER
TTT   SET      --- TEMP 256                  =  --- DROPINFO PATH
TTT   DISPLAY  --- TEMP 256                  (AT APPEARANCE #    )
```

CHAPTER 3-17

Using Event Points

Event Points

APPX *event points* provide opportunities to insert procedural code, or *statements,* from the *Integrated Language Facility (ILF)* into the execution sequence of a process. They are entered through a specialized editor that validates syntax at entry time. Refer to this manual for information on APPX's integrated procedural language.

Event points permit you to respond effectively to unusual or unique application requirements that are not addressed by APPX specifications. Each event point can contain a sequence of statements that execute at a specific, predetermined point within an APPX process. Commonly used groups of statements can be defined once in a subroutine process, and then accessed in an event point or executed as an automatic or optional child.

As indicated event points operate at four levels: process, frame, image, and child invocation. In addition, each type of process varies slightly in the specific event points it includes at each level. This table summarizes the event points that execute for each process type.

The following sections define each event point, including the chronology according to which it executes, in general terms. You should note, however, that event point execution can be affected by a number of factors, including the process type, the mode and interactive phase, the existence of ancestor and descendent processes, and potential interdependencies between statements in other event points.

Because of the variety of ways you can use event points, it is important to step through the execution sequence of your process using the ILF debugger, verifying the placement of ILF routines. Indications that you may have used the wrong event point to perform a desired action include actions that are never performed, conditional actions that are performed in every instance, and an action performed at any time other than that intended.

Process-Level Event Points

Process-level event points include Start of Process/Subroutine/Status, Set Run-Time Defaults, Post PCF Read, Pre-PCF Update , Post PCF Update, Start of Query Execution, Establish PCF Range, Pre-User Selection, Post User Selection, End of Query Execution,and End of Process. File-level event points will also be executed for the process control file, and any file that is accessed with statements at the process level, including the PCF.

Start of Process

The *Start of Process* event point (also referred to as the *Subroutine* event point in a subroutine process or *Status* event point in a status process) executes once for a process, each time the process invokes. This means that, for a child process, the *Start of Process* event point for the child executes once for every record in the parent process. For example, in an order entry application in which an order input process invokes a child line item input process, the *Start of Process* event point in the line item process executes once for each order.

Start of Process executes before APPX determines the mode. As a result, you can include statements to modify the mode default by setting the value in the predefined field DEFAULT MODE.

All processes include the *Start of Process* event point. For a query process, *Start of Process* executes as a part of query setup (not query execution).

Start of Process is often used to:

Read information from related files (a parameters or descriptions file, for example) to make the information available for the rest of a process.

Verify the existence of required applications and files, and inform the user and cancel the execution if required data or files are not available. For example, if an accounts payable invoice post process updates balances in the general ledger application, this event point would check for required general ledger files.

Perform actions that would be redundant if performed anywhere else.

Set Run-Time Defaults

The *Set Run-Time Defaults* event point executes for input processes only. It executes before Start of Frame for the first frame of a process in the data addition or key entry interactive phases. In the data addition interactive phase, it executes before a record is entered. In the data deletion, data inquiry, or data modification interactive phases, it executes before a key is entered on the first image.

Immediately before executing this event point, APPX restores the default record into the current record area that is in memory. (The default record is automatically maintained for any fields that are painted on any image including, but not limited to, fields in the process PCF.)

Set Run-Time Defaults is used when you wish to supply a user with a particular value, or in some other fashion to anticipate a user's requirements. It can be used to:

Explicitly modify values in the default record, in data addition interactive phase. For example, you could use this event point to set a transaction date equal to the current date, establish a transaction number based upon a parameterized value, or supply report setup values in input processes that precede output processes. While APPX can automatically establish a static default value based on data

dictionary specifications, defaults are often dynamic, based upon variable information that is maintained elsewhere in the system. It is for these dynamic defaults that the *Set Run-Time Defaults* event point is used.

Establish values for items that are used later in a process. For example, in a transaction entry input function, you might use this event point to set control group or batch information such as the operator ID or the batch number.

Default portions of a key field before a user enters the key in delete, inquire, or change modes during key entry interactive phase.

Post PCF Read

The *Post PCF Read* event point executes immediately after APPX reads or rereads a record from the process control file.

APPX reads PCF records after the key entry interactive phase completes and APPX switches to the data modification, data deletion, or data inquiry interactive phase (depending upon the selected mode). It is not executed in the data addition interactive phase.

APPX rereads a record when a user reverse-navigates, using the *Previous Image* option from an automatic child process, back to a parent process (for example, moving from order line items back to the order header). It also rereads a record when it executes an additional frame for a process after executing an automatic child process (for example, entering order 'Footer' information after processing the final line item record for an order).

By implication, execution of this event point is dependent upon the existence of a PCF. If there is no PCF, or if the PCF is a 'pseudo' file, this event point is not executed. It is found in input, output, and inquiry processes only.

Post PCF Read can be used to:

Save the values of fields before modification by a user. You can then compare the saved values with any new values during Pre-PCF Update or Post PCF Update, and perform any necessary processing as a result. For example, you might save the quantity on a line item and, in Post PCF Update, compare the current quantity with the original quantity. If the quantity changes, you might execute statements to update committed inventory.

Pre-PCF Update

The *Pre-PCF Update* event point executes when a record is changed, added, or deleted. As a result, its execution is dependent upon the existence of a PCF. If no PCF file is designated, this event point does not execute. It also does not execute in inquire mode, or in change mode if the record is not modified in any manner by the user or event point code.

Pre-PCF Update is found exclusively in input processes, and executes only in the data addition, data modification, and data deletion interactive phases. It executes immediately before the PCF record is saved, and is followed by Post PCF Update immediately after the record is saved.

Because the event point only executes when a record is being saved or deleted, you can use this event point to perform actions on the PCF record you are saving. It is generally restricted to performing actions in the PCF record itself because the operating system has a hold on the PCF record. Normally, you should separate manipulation of PCF records from manipulation of records in other files. Use this event point to perform any required manipulation of the PCF record. Use *Post PCF Update* to manipulate records in other files.

Post PCF Update

The *Post PCF Update* event point is triggered by a change to a record. As a result, its execution is dependent upon the existence of a PCF. If the PCF is not stored, APPX still senses the change and executes the event point.

Post PCF Update is found exclusively in input processes, and executes only in the data addition, data modification, and data deletion interactive phases. It executes immediately after the PCF record is saved.

Post PCF Update is generally used to perform manipulation of records in files other than the PCF. Remember that Pre-PCF Update is used to perform actions on the PCF when the operating system has a hold on the PCF record. By the time APPX executes *Post PCF Update*, the system has saved and relinquished control of the PCF record. If you wish to manipulate a PCF record in this event point, you must reread and hold it.

Because the event point only executes when a PCF record has just been saved, you can use this event point to perform actions on non-PCF records that depend upon the PCF record you saved. Examples include resetting a journal printed flag to *N* whenever a user changes transaction information related to the journal, and updating a committed quantity field that is in an inventory application that is based upon changes to a sales order in an order entry application.

Query Process Event Points

The following five event points execute only during query execution. They execute at the same time as the first process that uses the queried records. They do not, however, share record areas or record pointers with the process that uses the queried records.

Start of Query Execution

The *Start of Query Execution* event point is to query execution what the Start of Process event point is to query setup. It executes once, at the start of query execution.

Immediately before this event point, APPX restores the copy of all record areas in memory that was saved immediately subsequent to executing the End of Process event point in query setup (see *End of Process* below). However, positions within files are not restored. For example, if you performed a READ on customer 10 before the *End of Process*, a READNEXT in *Start of Query Execution* accesses customer 1, not customer 11. To access customer 11 with READNEXT, you must first READ customer 10 in *Start of Query Execution*.

Establish PCF Range

This event point can be used to constrain the number of records that pass through a query. It is executed once, immediately after the Start of Query Execution event point. You can set range limitations either on the primary key or on alternate keys of the process control file, depending on the access path you choose. You can constrain the full key or a partial key. If this event point contains no statements, APPX will construct a range based upon the child constraints specified in the query's parent process. If no child constraints are specified in the parent, APPX uses the designer and end user selection criteria to establish the PCF range.

If this event point contains statements, even just comments, APPX assumes the designer wants control over the constraints and does not attempt to create its own constraints or use any child constraints specified in the parent. For example, if code exists in the event point to constrain records but this code is bypassed or disabled, no records will be selected.

If statements are entered in this event point, at minimum the range should be set by BEG AT and END AT statements, which should be followed by a BEG READ statement, then a GOSUB --- PROCESS QUERY RECORD statement that passes the record to the query, then an END READ statement. The predefined subroutine PROCESS QUERY RECORD calls the Pre-User Selection event point, evaluates the designer and end user selection criteria, and then calls the Post User Selection event point.

You may assign multiple constraints in this event point, and gather data from multiple files to establish your constraints. If the constraints overlap and produce a duplicate record situation, APPX will sense that and retain only one copy of the duplicate.

Pre-User Selection

The *Pre-User Selection* event point executes after a PCF record is read and before APPX applies the selection criteria. It executes once for every record in the PCF that satisfies the constraints of the Establish PCF Range event point, or whatever APPX constructs in the absence of statements in that event point.

This event point is used to select records that cannot be included or excluded through the normal record selection specifications; their selection may be dependent upon a highly complex combination of selection criteria, for example. *Pre-User Selection* routines become part of the selection criteria for the query.

The INCLUDE RECORD predefined field determines whether or not a record is selected for the query. INCLUDE RECORD is reset to blank immediately before the *Pre-User Selection* event point executes. To exclude the record, regardless of the selection criteria, set INCLUDE RECORD to *0* or *N* (no) in the event point. To include the record, regardless of the selection criteria, set INCLUDE RECORD to *1* or *Y* (yes) in the event point. If INCLUDE RECORD is left blank, the record is included or excluded based on the selection criteria.

MENU, INPUT, OUTPUT, INQUIRY, JOB, STATUS, UPDATE, and QUERY statements should not be entered in the *Pre-User Selection* event point. Additionally, display control statements such as DISPLAY, BLINK, NO INPUT, OK INPUT, etc. should not be entered here. APPX will ignore all such statements at runtime.

Be aware that performance can be significantly affected based on the location of event point statements. Remember that statements in *Pre-User Selection* are executed with every PCF record accessed while those in *Post User Selection* are only executed after a record has been selected. For example, if statements are required to read auxiliary files and access fields evaluated in the *selection* of records, place the statements here. However, if the statements access files to get field values used to determine the *sort pattern* for selected records, place the statements in *Post User Selection.*

Post User Selection

The *Post User Selection* event point executes after a PCF record is read and satisfies the constraints imposed by the Establish PCF Range event point, and after APPX applies the selection criteria, and only if the record satisfies all selection criteria. This means that this event point only executes for a specific subset of records in the PCF.

This event point can be used to read other files to make values available for sorts, because it only executes for records that satisfy the selection criteria. For example, you might want to sort information in a transaction file that contains a customer number, based upon a customer alpha field that is

maintained in a customer file. If you place the routine to retrieve the customer information in this event point, APPX only retrieves the information for transaction records that satisfy the selection criteria, and not for every transaction record in the file.

APPX cannot, however, guarantee that the sort will complete by the time the process that uses the queried records begins. Therefore, you should not use this or any query event point for performing file updates or accumulating file totals.

MENU, INPUT, OUTPUT, INQUIRY, JOB, STATUS, UPDATE, and QUERY statements should not be entered in the *Post User Selection* event point, and if present they will be ignored at runtime. This is also true for display control statements such as DISPLAY, BLINK, BLANK, NO INPUT, and so forth.

End of Query Execution

The *End of Query Execution* event point is to query execution what the End of Process event point is to query setup. It executes once, at the end of query execution.

End of Process

End of Process statements execute once, immediately before the data files close and the process ends. All processes, with the exception of subroutine and status processes, include this event point. If a process is cancelled for any reason, APPX executes *End of Process* before canceling. The predefined field OPTION can be interrogated to determine if the process is ending normally or if it was cancelled.

For a query process, this event point executes as a part of query setup. Query processes are unique in that the *End of Process* ends before the process completes execution; the query itself has not yet executed. This means that *End of Process* executes before the query event points Start of Query Execution, Establish PCF Range, Pre-User Selection, Post User Selection, and End of Query Execution. Immediately following *End of Process* for a query process (completion of query setup), APPX automatically saves a copy of the contents of all record areas in memory. Query execution restores the copy of memory immediately before the *Start of Query Execution* event point.

End of Process is often used to:

Determine how a process ends (END, CANCEL, or PREV IMAGE) by interrogating the predefined field OPTION, and then perform any required action.

Perform processing that is dependent upon process completion, such as storing a control or hash total, setting a report printed flag for an output process, or checking for errors or warnings to advise the user of an error log.

Perform any final updating of files.

Write data to a file that is read in the *Start of Process* event point of the next process in the family.

Frame-Level Event Points

Frame-level event points include Start of Frame, Select Image, Global Pre-Display, Global Option Intercept, and End of Frame. File-level event points will also be executed for any file that is accessed with statements at the frame level, including the PCF.

Start of Frame

The *Start of Frame* event point executes once for a frame, each time the frame invokes.

Select Image

The *Select Image* event point executes for input, inquiry, and output processes only. For a repeating frame, this event point executes for each repetition. Immediately after it executes, APPX initializes the value in the OPTION predefined field and determines which alternate image to execute by interrogating the predefined field ALTERNATE IMAGE NUMBER.

Select Image is generally used to modify the value in the ALTERNATE IMAGE NUMBER predefined field to identify a specific image or bypass an image (for repeating and optional frames).

Select Image executes before the image-level event points Pre-Display and Pre-Display/Verify. As a result, it can be used for routines that should execute regardless of which alternate image is selected, so you do not have to repeat such a routine for every image in the frame.

Global Pre-Display

The *Global Pre-Display* event point executes immediately before the actual appearance of the selected alternate image to a user. It executes only for input and output processes, and only if the frame includes an image. If the frame is a repeating frame, this event point executes once for each repetition. It also executes once for each entry level (up to nine) in the data addition interactive phase.

Global Pre-Display executes after the image-level event points Pre-Display and Pre-Display/Verify.

After this event point executes, APPX reinterrogates the OPTION predefined field to determine whether or not the content of the field was set with statements. If so, APPX responds as if the user had selected this option.

Global Option Intercept

The *Global Option Intercept* event point executes immediately after the image-level event point Option Intercept. As a result, it can be used for routines that should execute regardless of which alternate image is selected, so you do not have to repeat such a routine for every image in the frame. *Global Option Intercept* executes only for input processes, and the *Key Entry* frame of inquiry processes, and only if the frame includes an image.

Immediately following this event point, APPX interrogates the value in the OPTION predefined field to determine which option the user selected. The OPTION predefined field can be modified by statements in this event point. You can choose to include ERROR statements in the event point to prohibit the selection of a specific option, but ERROR statements in this event point are ignored in inquire mode.

End of Frame

The *End of Frame* event point executes once for a frame, immediately after the final execution of the image-level event points, before the invocation of any automatic child processes and before the frame ends. It executes for input, output and inquiry processes only.

End of Frame is often used to determine how a frame ends (END, CANCEL, PREVIOUS IMAGE, RETURN, NEXT RECORD, or ACKNOWLEDGE DELETE, for example) by interrogating the predefined field OPTION, and then performing any required action.

Immediately after *End of Frame* completes, APPX interrogates the INCLUDE CHILDREN predefined field to determine whether or not to skip the automatic children that are associated with the frame. If the INCLUDE CHILDREN predefined field has been preset with a value of *N* or *0* (no), then the associated automatic children are not executed. This field is defaulted to *Y* or *1* (yes) and these values are retained unless specifically changed by the designer.

Effect of Optional Frames on Event Point Chronology

If the ALTERNATE IMAGE NUMBER predefined field is set to *0* before Select Image completes, APPX immediately executes End of Frame. It does not execute the Global Pre-Display or event points, or any of the image-related event points

Effect of Repeating Frames on Event Point Chronology

If the ALTERNATE IMAGE NUMBER predefined field is not set to *0* before Select Image completes, APPX executes a repeating frame in the normal (non-repeating) sequence. However, instead of executing End of Frame, APPX re-executes Select Image. In each repetition, a different alternate image can be selected.

This cycle repeats until the ALTERNATE IMAGE NUMBER predefined field is set to *0* before *Select Image* completes, in which case, APPX immediately executes *End of Frame*; it does not execute the Global Pre-Display or Global Option Intercept event points, or any of the image-related event points.

Option Intercept event points, or any of the image-related event points.

Effect of Scrolling Frames on Event Point Chronology

In change, delete, or inquire modes, APPX attempts to fill a frame with images before displaying it to a user. (In add mode, APPX adds a single image at a time.) As a result, APPX does not display a screen after executing the Global Pre-Display event point, but instead interrupts the normal sequence and executes End of Frame. It then reads the next record, and repeats the same sequence. This process continues until the frame is completely filled or until APPX runs out of records. During this process, the interactive phase is set to data scroll.

When the frame is filled, APPX rereads the first record on the screen and executes all of the event points for this first record.

Image-Level Event Points

Image-level event points include Pre-Display, Pre-Display/Verify, Option Intercept, and Verify. File-level event points will also be executed for any file that is accessed with statements at the image level, including the PCF.

For a very simple input process in change mode, the order of frame- and image-level event points before displaying an image is: frame-level Select Image, image-level Pre-Display/Verify, image-level Pre-Display, and frame-level Global Pre-Display. After an image displays, the order is: image-level Option Intercept, frame-level Global Option Intercept, image-level Verify, and image-level Pre-Display/Verify. The sequence of event point execution changes depending on the mode or interactive phase, and is easily complicated by the addition of multiple frames or optional or automatic child processes.

Image-related statements, such as BLINK and NO INPUT, can only execute in image-level event points. They are ignored in all other event points.

Pre-Display

In change, delete, and inquire modes the *Pre-Display* event point executes once, after the Pre-Display/Verify event point and before Global Pre-Display. During data addition *Pre-Display/Verify* is not executed prior to displaying the image. Instead, *Pre-Display* is executed once for each entry level (up to 9 times).

Because *Pre-Display* is an image-level event point, it is used for image-specific routines. Recall that the frame-level event points Select Image and Global Pre-Display can be used for routines that apply to all alternate images.

Pre-Display is found only in menu, input, inquiry, and output processes. It is often used to:

Prohibit a user from entering a field by using a NO INPUT statement.

Set the value of the predefined field OPTION to perform automatic operations, such as automatically ending an input process.

Bypass a record. For example, in an accounts payable invoice maintenance process, you might choose to display only those invoice records that were created in accounts payable, bypassing those that were entered through a purchase orders application. You can do so by conditionally executing the NEXT RECORD option in this event point.

Establish various control totals or other computed values for display on an input process image.

Display fields with DISPLAY statements.

Pre-Display/Verify

The *Pre-Display/Verify* event point executes before Pre-Display and again after Verify, except during data addition, when it is not executed prior to displaying the image. After displaying the image, *Pre-Display/Verify* executes the same number of times as *Verify* because it always executes after *Verify*, and never unless *Verify* has executed.

The primary reason *Pre-Display/Verify* executes twice is for data that is retrieved from files, and then manipulated and displayed to the screen. It does not execute before *Pre-Display* during data addition because the data has not yet been entered and stored.

This event point is found only in input processes and the *Key Entry* image of inquiry processes. It is often used for:

Validating the interrelationships between fields on the screen that a user entered. While APPX automatically validates individual items of information that are stored in a database, it is up to the designer to validate their interrelationships.

Building keys and accessing information that cannot be accessed automatically with a data lookup. For example, you may have to perform calculations or look up data to determine the key of the record to be read.

Flagging error or warning conditions using ERROR, WARNING, and BLINK statements.

Performing computations and accumulations.

Option Intercept

The *Option Intercept* event point executes after an image is presented and the user selects an option (including Enter). It is followed by the frame-level event point Global Option Intercept.

Because *Option Intercept* is an image-level event point, it is used for image-specific routines. Recall that the frame-level event point *Global Option Intercept* can be used for routines that apply to all alternate images.

Option Intercept is found only in menu and input processes. It is used, for example, to:

Interrogate the predefined field OPTION to determine which option the user selected. OPTION can be modified during this event point. You can also include ERROR statements to prohibit the selection of a specific option, but ERROR statements are ignored in inquire mode.

Create auxiliary records. For example, you might include statements to create invoice records from information that is stored on a purchase order record when the user selects a specific option key.

Verify

The *Verify* event point executes after Global Option Intercept in the data addition or data modification interactive phases. It does not execute in the key entry interactive phase, because records are not changed in this phase. This event point is found only in input processes and the *Key Entry* image of inquiry processes.

APPX performs automatic data lookups immediately before executing the *Verify* event point.

Child-Level Event Points

Child-level event points include both Pre-Invocation and Post Invocation. They are found in menu, job, input, output, update, and inquiry processes. File-level event points will also be executed for any file that is accessed with statements at the child level, including the PCF.

Pre-Invocation

Pre-Invocation event points execute before a child process is invoked.

This event point is most useful for executing PASS statements to send information to a child process. (A corresponding RECEIVE statement can be placed anywhere in the child process, but is generally located in Start of Process.) Since the Pre-Invocation event point can be executed multiple times you should consider using the --- .UTIL CLEAR PASS LIST routine to ensure only the variables you wish are included.

Post Invocation

Post Invocation event points execute once for a parent process, immediately after a child completes execution. The predefined field OPTION can be interrogated to determine if the child ended normally or was cancelled.

The predefined field INCLUDE CHILDREN can be used to control whether or not one or more child processes execute. To skip execution, INCLUDE CHILDREN must be set to *0* or *N* (no). Its effect depends on the event point it is set in, as follows:

If set to *0* or *N* in End of Frame, all child processes are skipped. (Recall that *End of Frame* executes before any children are invoked.)

If set to *0* or *N* in Pre-Invocation, that single child process is skipped.

If set to *0* or *N* in *Post Invocation,* all remaining child processes are skipped.

Using the Predefined Field NEXT CHILD ID

The predefined field NEXT CHILD ID can be used to alter the sequence of child process invocation. Normally, child processes are invoked in sequence number order. However, if NEXT CHILD ID is set, the first child process with a CHILD ID that matches the value in NEXT CHILD ID is invoked.

NEXT CHILD ID is also used to manage forward and backward navigation through the images in input processes. As a user moves 'forward' through the entry screens, NEXT CHILD ID is set by APPX to +. If a user moves 'backward' through the entry screens by selecting *Previous Activity*, NEXT CHILD ID is set by APPX to *?,* in which case APPX navigates backward through the child processes.

If this field is set in the End of Frame event point on a frame that has automatic child processes, the first child process defined with a CHILD ID that matches NEXT CHILD ID will be invoked. Once that child is completed, processing continues normally.

If this field is set in the Pre-Invocation event point, processing will immediately skip to the first child encountered that has a matching CHILD ID.

If this field is set in the Post Invocation event point, the next child process that is invoked will be the first child process encountered where CHILD ID matches NEXT CHILD ID.

File Level Event Points

File-level event points are executed every time a specific action is performed on the designated file. These event points are accessed by the use of the Rules Option on the Files/Fields screen from the Application Design menu. They are used to perform standard operations in lieu of duplicating identical rules in certain event points of multiple processes or repeatedly calling the same subroutine. File-level event points are executed by the File Manager module of APPX and are independent of any other event

points. The only data shared with the calling process is the record buffer. PASS and RECEIVE statements are ignored in file-level event points. However, work fields set in one file-level event point can be interrogated in another file-level event point (for the same file), without being corrupted by any intervening process or by the file-level event points for another file.

File-level event points include the following as described in the corresponding sections:

File Open

Post Read

Pre Update

Post Update

File Close

File Open

The *File Open* file-level event point is executed every time the designated file is opened by an APPX process. It is the equivalent of adding such statements to the Start of Process event point of each and every process accessing the designated file (except for how data is shared).

See the Files Rules Option and File-Level Event Points sections for more information

Post Read

The *Post Read* file-level event point is executed immediately after a record is read in the designated file in any manner under APPX control. It is the equivalent of adding such statements to the Post PCF Read event point of each and every process whose PCF is the designated file (except for how data is shared). In addition, *Post Read* code is executed immediately following the execution of any read statement (READ, READNEXT, or BEG READ) affecting the designated file.

See the Files Rules Option and File-Level Event Points sections for more information.

Pre-Update

The *Pre Update* file-level event point is executed immediately prior to updating (adding, modifying, or deleting) a record in the designated file in any manner under APPX control. It is the equivalent of adding such statements to the Pre-PCF Update event point of each and every process whose PCF is the designated file (except for how data is shared). In addition, *Pre Update* code is executed immediately prior to the execution of any update statement (WRITE, REWRITE, or DELETE) affecting the designated file.

See the Files Rules Option and File-Level Event Points sections for more information.

Post Update

The *Post Update* file-level event point is executed immediately after updating (adding, modifying, or deleting) a record in the designated file in any manner under APPX control. It is the equivalent of adding statements to the Post PCF Update event point of each and every process whose PCF is the designated file (except for how data is shared). In addition, *Post Update* code is executed immediately after the execution of any update statement (WRITE, REWRITE, or DELETE) affecting the designated file.

See the Files Rules Option and File-Level Event Points sections for more information.

File Close

The *File Close* file-level event point is invoked every time the designated file is closed by an APPX process. It is the equivalent of adding such statements to the End of Process event point of each and every process accessing the designated file (except for how data is shared).

See the Files Rules Option and File-Level Event Points sections for more information.

CHAPTER 4-1

ILF Integration

Using ILF Routines

An application consists of a number of related components, including the data dictionary specifications and various processes, such as menus, inputs, and outputs. You can develop an entire application in APPX using the specification method, traversing through the APPX application design menus and providing responses to predefined questions and choices. You support these specifications with appropriate screen and report image definitions.

Complex applications may require more specific control over the editing or processing criteria. For example, you may want to check the relationship between two different field values for consistency. In an order processing application, you could use ILF (Integrated Language Facility) statements to verify that the cost of a new order cannot exceed a customer's credit limit. If the order value exceeds the credit limit, you can display an error message and prevent any subsequent processing.

You implement this type of edit checking by including an ILF routine within the context of the input process that checks a user's entries and displays an appropriate message. This is a simple example where a few lines of ILF code achieve the desired results. In many applications, you may want to perform significantly more complex condition testing and logic operations.

You also use the ILF as the link between APPX and program routines written in other languages, such as COBOL and 'C', and to invoke other programs like word processing or command editors. To execute a non-APPX program, you invoke either a CALL or RUN statement (each of which is described in detail in ILF Keyword Reference).

An Example of a Statement

Like traditional programming languages, the ILF has its own set of rules and syntax that you follow when developing routines. For example, the following set of statements sets a work field value to the constant 10 and checks to see if a second field is equal to or greater than 10. Based on the result, the routine either calculates a revised total or ends without further action. Note, examples of ILF coding in this manual are shown as if in Change Mode. This is so you can see the various operands for each instruction.

```
        SET     TAP WORK COUNT          =       10
        IF      1EX MONTH               GE      10
T       COMPUTE 1EX WORK TOTAL AMOUNT   +   TAP WORK COUNT
F       END
```

This statement series contains four different keywords (SET, IF, COMPUTE, and END). Although each statement has its own format, there are common patterns among all of them. For example, the keyword always starts in the same character position and is no longer than eight characters long. Many keywords require you to specify a field name, and some (such as IF) require a second field name or a constant to identify the two things that are being compared. The *T* and *F* at the beginning of the COMPUTE and END statements provide a condition-testing facility that allows you to dynamically control whether or not a statement executes at runtime.

The Components of a Statement

The previous example demonstrates a few of the statements. The following are some common items of information that you specify when you define a statement:

True/false indicators

A keyword (SET, COMPUTE, IF, etc.)

Field names (always associated with a specific application and, if appropriate, occurrence and appearance numbers)

File names

Constant values

Relationals (such as EQ and GT)

Arithmetic operators (such as + and -)

The Statements Included in the ILF

Each ILF statement is identified by a unique keyword (such as IF, READ, and SET) that indicates to the system what actions to perform. The ILF statements can be grouped into seven functional categories as follows:

Field-related statements modify and compute values for fields within an application.

Date/time statements calculate and compare dates and elapsed time periods.

Control statements allow you to exercise control over the processing flow in an ILF routine, and to invoke non-APPX programs.

Condition-testing statements include IF, AND, and OR statements that perform logic tests.

Image-related statements allow you to override the 'visual' aspects of a screen or report, such as whether an item should be highlighted or allow user input.

File-related statements control file management operations, such as creation, deletion, and updates.

Text-related statements allow you to provide free-form text messages to users or to insert comments within a routine.

Table 4-1-1 below contains a list of the keywords in their respective categories. Each of these statements is described in detail in ILF Keyword Reference.

Table 4-1-1. Statement Keywords by Category

Field	Date/ Time	Control	Condition	Image	File	Text
APPEND	DATE ADD	BEG LOOP	AND	AT FIELD	BEG AT	* (Comment)
CALC	DATE BTW	CALL	IF	BLANK	BEG READ	** (Comment)
CNV BIN	SET DATE	COPY	OR	BLINK	CLOSE	CANCEL
CNV PORT	SET DAY	END		BOLD	COMMIT	ERROR
CNV TEXT	SET MNTH	END LOOP		BRIGHT	CREATE	MESSAGE
COMPUTE		END PROC		COLOR	DELETE	WARNING
IF DIFF		EXIT		DIM	END AT	
LOCAL		GOSUB		DISABLE	END READ	
PASS		GOTO		DISPLAY	IF EXIST	
RECEIVE		INPUT		ENABLE	MARK TRX [reference unavailable in the source]	
RESTORE		INQUIRY		FONT	OPEN	
SCAN		JOB		INVERSE	READ	
SET		LABEL		NO BOLD	READNEXT	
SET TEMP		LOGOUT		NO INPUT	RELEASE [reference unavailable in the source]	
SET TOT		MENU		NO ULINE	REWRITE	
STATIC [reference unavailable in the source]		OUTPUT		NORMAL	ROLLBACK	
STORE		OVERFLOW		OK INPUT	SAVEPNT	
TOTAL		QUERY		PICTURE	SCRATCH	
VERIFY		RETURN		POSITION	WRITE	
		RUN		REFRESH		

Field	Date/ Time	Control	Condition	Image	File	Text
		STATUS		ULINE		
		SUBR				
		TIMEOUT				
		TRAP				
		UPDATE				
		USE CC				

When to Invoke ILF Routines: Event Points

One important consideration when developing an ILF routine is to designate the exact point during the process when the routine will execute. You control the timing of when ILF routines execute by using appropriate *event points*. An event point is a predefined chronological point during the execution of a process when an ILF routine can be executed.

There are several different types of processes (menus, inputs, etc.) and several process components (frames, images, etc.). Each process component has its own specific set of event points. You can develop and execute an ILF routine at any one of these predefined event points, depending on the unique requirements of your application.

As an example, any process that invokes a child process has both a Pre-Invocation and a Post Invocation event point. You can select either of these event points (as options when you are defining a child invocation) and develop an ILF routine. A pre-invocation ILF routine executes immediately before the child process is invoked, while a post invocation ILF routine executes immediately after the child process completes.

You may want the application to test certain conditions and, based upon the results, perform a specified set of actions at a precise point or points in time. It is the event points that accommodate this requirement to control the timing of executing an ILF routine.

Event Point Definition and Description

Event points are defined to correspond to the nature of a process or process component. For example, an image has a Pre-Display event point, while a frame has a corresponding Start of Frame event point. Input processes also have a Post PCF Update event point, although a menu process does not because a menu does not update a process control file. As a result, while each process type/component has a unique set of event points, there is a consistent pattern throughout the system.

Another item to note is that some event points may not occur in certain instances, depending on what you specified the process to do. For example, a frame may or may not have an image associated with it. If the frame produces an image, it has a *Pre-Display* event point; if no image is produced, the *Pre-Display* event point is not available. As a result, the applicable set of event points for a process is dependent upon the context in which you specify it.

Refer to *Using Event Points* for details on event point timing and usage.

The Steps in Using the ILF

There are three steps involved in defining and using ILF routines:

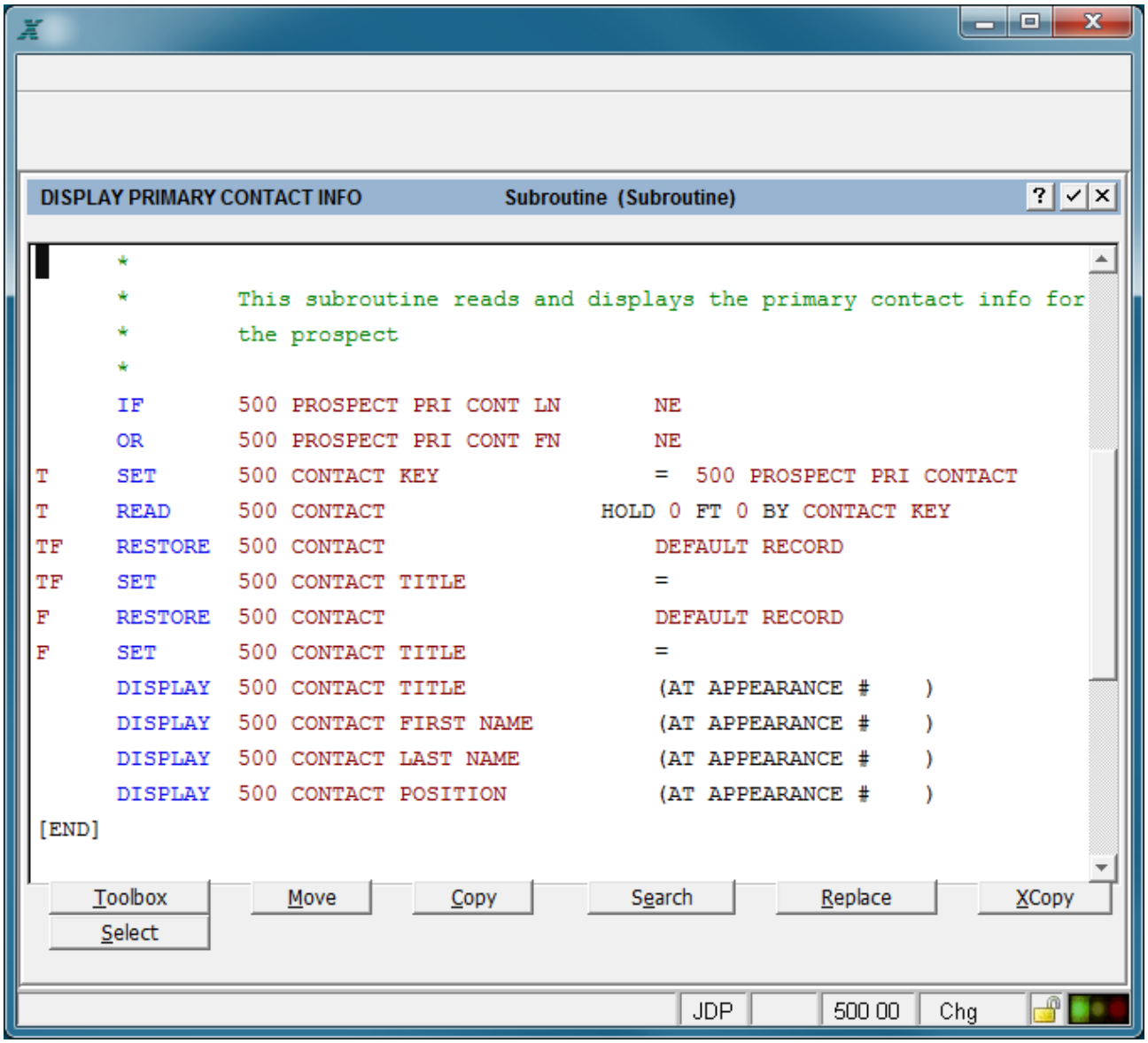
Entering and editing individual ILF statements.

Executing processes that include ILF routines, and resolving compilation and runtime errors.

Testing and resolving logic errors in routines with the ILF debugger.

The ILF Editor

The ILF editor is an integrated facility within APPX that allows you to enter and modify ILF statements. You invoke the editor by selecting the appropriate event point option from the process component screen. The editor provides specialized entry options that allow you to develop and customize ILF routines. The editor checks each statement to ensure that you have followed the proper syntax rules, and prevents you from entering certain types of invalid data. The ILF editor is fully integrated with the data dictionary so all fields entered in statements are verified against the dictionary.



The ILF Editor

The Compilation Step

When you define an ILF routine, it becomes an integral part of the associated APPX process. To achieve this integration, the ILF routines are compiled along with all the other process specifications that you entered. The APPX process compiler is invoked automatically at process runtime. The compiler pulls together all the parts of the application, including any ILF routines that you defined. As a designer, you do not have to be concerned about the compilation step other than to understand that, if any errors are encountered, you will receive an appropriate compilation error message (refer to the next section).

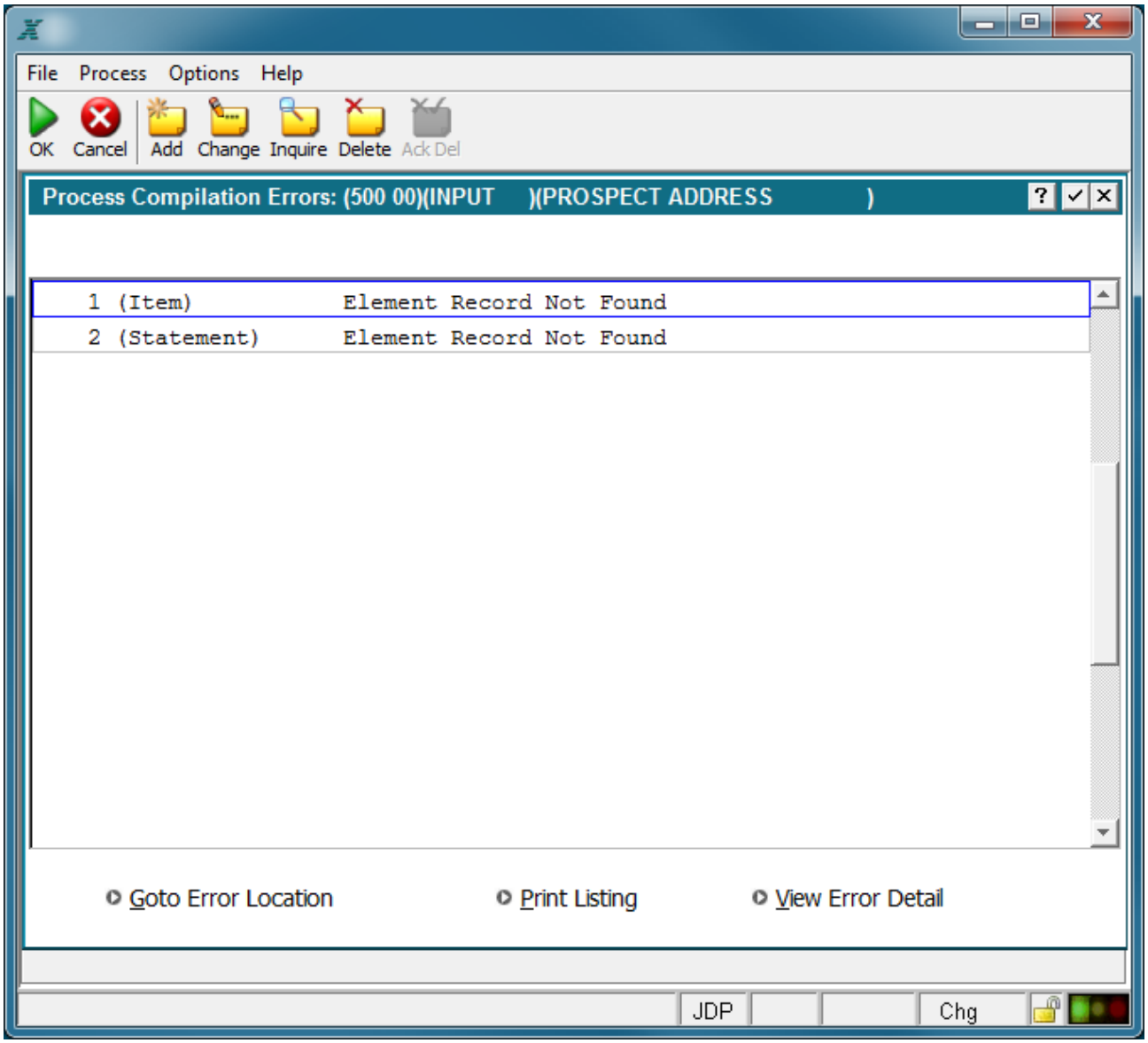
The system automatically invokes compilation at runtime when it is required, either when a process is first developed or if changes were made. The system checks to see if there were any changes since the last compilation and, if there were, a recompilation is automatically initiated. Note that the verification and compilation is done when an end user executes a process, not when the designer applies changes or makes additions to the process specifications. As a result, the start-up time for an end user is longer when a compilation is required. Once compiled, subsequent start-up time is much faster because the system uses the compiled version (called an *executable module or EM*).

You may also force a process to compile while using Application Design. Simply position your cursor on the selected process and select syntax check from the *Toolbox* menu (or simply select Option 97).

Resolving Compilation Errors

When a process compiles, some compiler-generated errors may result. The system notifies the user (or the designer, if the designer executed the process) of each of the errors encountered during compilation by displaying and highlighting the erroneous statements, and by providing an error message describing the nature of each error.

At the end of compilation, if any errors occurred, an error listing (labeled Process Compilation Errors) is displayed on your screen as shown below. In this example a work field that was used in the process was deleted from the Data Dictionary.



A Process Compilation Errors Screen

From this screen, there are three options available to you. Two of the options provide methods for correcting compilation errors:

Goto Error Location. You can position the cursor to a specific error and select goto error location to go directly to the ILF Editor and the offending item via a hypertext link. Make the appropriate modifications to the ILF code. When you are finished, you can force the process to compile again by selecting END until you return to the original error display. Repeat these steps until all errors have been corrected, then select END from the Process Compilations Error screen to start the recompile.

Print Listing. You can print the error listing by selecting the print listing option. Using the printed listing, return to the process that the ILF routine is associated with and invoke the editor by selecting the appropriate event point option. Use the editor functions (refer to *The IFL Editor*) to make appropriate modifications to the ILF routine and then re-execute the process. This is an iterative process that you may repeat as many times as required until compilation is successful.

The third option is:

View Error Detail. By positioning the cursor on a specific error and selecting this option, APPX provides you with more detail regarding the selected error. After viewing the details, select Enter to return to the Process Compilation Errors Screen.

Resolving Runtime Errors

Even if the compilation step is successful, you may encounter errors that occur during the execution of a process. For example, you may have a calculation that includes a division step. If the divisor has a value of 0, the result is undefined and a processing error occurs. When a runtime error occurs, system processing terminates and an error message displays. There is also an error message indicating the reason for termination. Resolving the problem may require you to modify one or more statements in an ILF routine. If this is the case, you need to exit from the error screen display, invoke the editor, make the required changes, and re-execute the process to determine if the problem is corrected. It may be that the problem resulted from some condition in the system environment other than the ILF routine itself. If so, you need to resolve this condition and then re-execute the process to verify that the problem is corrected.

Using the ILF Debugger

Even after resolving any runtime errors, the routine you developed may still not produce the results that you expected. In this situation, the system does not provide any error or warning messages, so it is up to you to test the routine thoroughly to identify any flaws in the logic. To assist you in locating and resolving these errors, the ILF contains a debugging facility that you invoke within the routine in question. The debugger allows you to insert break points at specified lines within ILF routines so that, as you execute a process, you can follow the execution and watch what happens to certain field values. Refer to The Debugger for details on using the ILF debugging facility.

Generate Subroutines via ILF

Overview:

Four new utilities (API's) have been added to provide the ability to dynamically create a subroutine within your ILF code:

.UTIL SUBR CREATE
.UTIL SUBR WRITE ILF
.UTIL SUBR CLOSE
.UTIL SUBR DELETE

Usage

First call .UTIL SUBR CREATE to create an empty subroutine. Next, call .UTIL SUBR WRITE ILF for each statement you want to add to the subroutine. You must pass all the necessary parameters for each statement. When you have added all the statements, call .UTIL SUBR CLOSE to close the subroutine and compile it. Your subroutine is now ready to run, assuming there weren't any compilation errors.

> Note that the .UTIL SUBR * group of routines share certain internal fields therefore you can only use them in a process family with share class SUBPROCESS. In other words, don't call .UTIL SUBR CREATE in one process, then .UTIL SUBR WRITE ILF in another process that you have invoked Related or Detached.

If you no longer need the subroutine, you can call .UTIL SUBR DELETE to delete it. If you do not delete it, it will remain within your application just like any other subroutine.

CHAPTER 4-2

True/False Status Indicators

How APPX Uses T/F Status Indicators

As a part of the ILF (Integrated Language Facility), APPX incorporates a unique condition testing facility that allows you to perform complex logic checking operations. As the basis of this facility, the system maintains a set of five *internal true/false status indicators*. These indicators provide you with a method to control the logic flow within an ILF routine, depending on the result of conditions encountered at runtime.

ILF statements (except for those with keywords *, **, and LABEL) incorporate within their syntax the ability to enter values for comparison against the current status of the internal true/false status indicators. The first five positions of most statements are reserved for this purpose; hence, these five positions are known as *true/false execution conditions*. From left to right, they correspond to the five true/false status indicators, levels 1 through 5, respectively. Based on the result of the comparison between the execution conditions and the internal status indicators, APPX either executes or bypasses a statement.

For example, the following is an example of a SET statement used to modify the value of the field WORK ALREADY POSTED:

```
TTFTF SET      TAR WORK ALREADY POSTED     =    1
```

As coded, this statement would only be executed if the current status of the five internal indicators is TTFTF, to agree with the execution condition values specified in the statement.

By the same token, several statements set the values of the true/false status indicators. As each of these statements operates, if it finds a *true* or *met* condition, it sets the value of the next true/false status indicator to *T*. If the statement encounters a *false* or *unmet* condition, it sets the next indicator to *F*. For example, consider the following statement:

```
      IF       TAR COUNT                EQ   6
```

If the IF statement determines that the value of the field named COUNT is 6, the first true/false status indicator is set to *T*. If the value of the field is not equal to 6, the indicator is set to *F*.

Both the true/false status indicators and the true/false execution conditions will be discussed more completely further in this chapter.

Setting T/F Status Indicators

As part of learning how to specify true/false execution conditions when you design ILF routines, you need to understand how the system sets the internal true/false status indicators. APPX clears (sets to blanks) all five status indicators at the beginning of each event point. This allows each ILF routine to start with a 'clean slate', and enables APPX to set the values based on statement evaluation at runtime. In addition, when you invoke a subroutine using the keyword GOSUB, APPX temporarily clears out the true/false status indicators at the start of the subroutine so they can be used in the GOSUB routine. When control is returned to the ILF routine that invoked the GOSUB (via the keyword RETURN), the system restores the indicators to the values that existed before the GOSUB was invoked.

Only certain statements have the capability to affect the value of internal true/false status indicators. See Table 4-2-1for a complete list of these statements, and refer to the statement keyword in ILF Keyword Reference for a description of how each one operates.

In general, here is how indicator-setting works:

Only the statements included in Table 4-2-1 affect status indicator values, and each of these statements sets a status indicator when it executes.*

The five true/false status indicators are always set from left to right and are referred to as levels 1 through 5, respectively (corresponding to the execution conditions specified in the first five positions of the statement).

Each statement affecting true/false status indicators sets the next level (as designated by the execution conditions) to either *T* or *F*, depending on the success or failure of an operation*. The status indicator to be set corresponds to the leftmost execution condition which contains a blank value. In addition, any status indicators to the right of the level being set (i.e., with a higher level number) are automatically cleared. For example, an IF statement with blanks in the first five positions would set level 1 and clear levels 2 through 5.

Whereas the first five positions in the statement format are reserved for specifying execution conditions, statements affecting true/false status indicators (other than GOSUB and RETURN) are limited to a maximum of four non-blank execution conditions. This is because there must be one blank value corresponding to the next status indicator to be set. Once a blank value is specified, any execution conditions to the right must also be blank.

*** Exceptions:**

Statements with keywords GOSUB, RETURN, AND, and OR affect status indicator values but behave a little differently.

As described above, GOSUB stores the current value of all status indicators and clears all indicator levels prior to invoking the subroutine. RETURN restores the original values before code following the GOSUB is resumed.

AND and OR modify or preserve the current value of the next indicator level, rather than simply setting it, since this indicator value (as already set by a preceding statement) must be considered in evaluating the AND and OR statements. Note that, for proper execution, AND and OR statements must be subject to the same execution conditions as the statement (normally an IF) which originally sets the shared indicator level.

If execution conditions are specified on a COPY statement, behavior can get a little confusing. This is because, at runtime, the COPY statement's execution conditions become the leftmost execution conditions of every statement copied (that is, they are inserted in front of specified values). It is best to avoid this situation since you may forget about the conditions to be inserted at runtime and thus end up dropping some non-blank execution conditions or status indicators. Worse, instead of getting a runtime error, the routine may simply execute improperly. You can avoid potential grief by using a GOSUB or SUBR statement instead of a COPY if you need to specify execution conditions.

T/F Status Indicator Values

There are three possible values for each of the five internal true/false status indicators:

A **blank** signifies a *cleared* value that is ready to be set to a true or false value.

The letter **T** represents a *true* or *met* condition.

The letter **F** represents a *false* or *unmet* condition.

Statements That Affect T/F Status Indicators

There are a number of statements that affect the value of internal true/false status indicators. Of the seven functional categories of statements, ILF Keyword Reference, only the following affect these indicators:

Two field-related statements set the next status indicator to *T* or *F*: RECEIVE (depending on whether or not there is a matching PASS statement) and VERIFY (depending on whether or not the VERIFY operation is successful).

Two types of control statements:

The ***process-type statements*** (CALL, INPUT, RUN, etc.) alter the flow of processing and invoke a specified process. The specified process is either invoked successfully (sets a value of *T*) or fails (sets a value of *F*)

The ***GOSUB and RETURN statements*** store the current indicator values, clear the values for independent use within the GOSUB subroutine, and then restore the indicators to their original values for continued processing following the RETURN. In addition, when implemented, GOSUB will set the next status indicator to the value indicated in the RETURN statement, if any.

All condition-testing statements (IF, AND, and OR) test the relationship between two values. The result is always either true or false, and the indicator is set or modified accordingly.

Only one image-related statement sets the next status indicator to *T* or *F*: AT FIELD (depending on whether or not the cursor is positioned on the field or fields specified).

Several file-related statements(CREATE, READ, WRITE, etc.) set a value of *T* if successful, or *F* if not.

An Example of T/F Usage

Consider the following series of statements as an example of how T/F status indicators are set and T/F execution conditions are evaluated.

```
      *        Process transaction if USER 1 pressed.
      IF       --- OPTION                  EQ   USER 1
T     SET      JP1 DRUGINV ID              =    JP1 RXFILE DRUG ID
T     READ     JP1 DRUGINV                 HOLD 1 FT 0 BY DRUGINV ID
      *        Check inventory to see if we have enough of this drug on hand.
TT    IF       JP1 DRUGINV QTY IN STOCK    GT   JP1 RXFILE RX QTY
TTF   ERROR    Qty on hand not sufficent for the number ordered.
      *        Update (reduce) quantity in stock by this Rx order.
TTT   COMPUTE  JP1 DRUGINV QTY IN STOCK    -    JP1 RXFILE RX QTY
TTT   REWRITE  JP1 DRUGINV                 FAIL 0
TTTF  CANCEL   failed to update druginv
      *        Create a RECEIPT memory record.
TTTT  SET      JP1 RECEIPT CUSTFILE ID     =    JP1 RXFILE CUSTFILE ID
TTTT  SET      JP1 RECEIPT SEQ             =    JP1 RXFILE SEQ
TTTT  SET      JP1 RECEIPT DRUG ID         =    JP1 RXFILE DRUG ID
TTTT  SET      JP1 RECEIPT RX QTY          =    JP1 RXFILE RX QTY
TTTT  SET      JP1 RECEIPT DATE FILLED     =    JP1 RXFILE DATE FILLED
TTTT  WRITE    JP1 RECEIPT                 FAIL 0
TTTTF ERROR    Did not create a receipt record.
      *        Print the receipt.
TTTTT SET      --- PRINT ON SCREEN         =    Y
TTTTT SET      --- PRINT FORM ID           =    PDF-60P080
TTTTT SET      --- PRINT FORMAT            =    PDF
TTTTT OUTPUT   JP1 PRINT RECEIPT                SUBPROCESS   END? N   FAIL 0
TTTTT END PROC
```

Level 1 will be T if --- OPTION is equal to USER 1, if level 1 is F then the remaining code (shown) will not be executed.

Level 2 will be T if the specified record is successfully read and Level 1 is T.

Level 3 will be T if the quantity on hand is greater than the quantity requested and Levels 1 and 2 are T..

Level 4 will be T if the REWRITE of the updated record is successful and Levels 1, 2, and 3 are T.

Level 5 will be T if the WRITE of the receipt record is successful and Levels 1, 2, 3, and 4 are T.

As you see the T/F indicators cascade downward to include any furtther ILF statements as required for your particualar requirements.

T/F Execution Condition Values

There are five possible values for each of the five true/false execution conditions specified in an ILF statement. (As explained previously, execution conditions are coded in the first five positions of most ILF statements and correspond, from left to right, to the internal true/false status indicators, levels 1 through 5.)

A blank signifies there is no condition. In other words, the current status of the corresponding internal T/F status indicator does not matter in order for the statement to execute. However, if the statement affects internal T/F status indicators (as indicated in Table 4-2-1), the position of the leftmost execution condition with a blank value designates the next status indicator to be set, while clearing all indicators with higher level numbers.

The letter T signifies that the current status of the corresponding internal T/F status indicator must be *True* in order for the statement to execute (i.e., a *true* or *met* condition).

The letter F signifies that the current status of the corresponding internal T/F status indicator must be *False* in order for the statement to execute (i.e., a *false* or *unmet* condition).

The character "-" (hyphen) is similar to a *blank* in that it also signifies no condition,. However, in contrast to a *blank*, it preserves the current status of the corresponding internal T/F status indicator. For more information, see the Using Hyphens as Placeholders section.

The letter C *or the character "*" (asterisk) (in the first position only)* disables execution of the statement. APPX bypasses any statement that has a **C** or * in the first position. You must recode this as one of the four previous values in order for APPX to execute the statement.

Valid/Invalid Execution Conditions

The following are examples of valid and invalid true/false execution conditions as specified in the first five positions of a statement. The *next level* referred to below identifies the internal true/false status indicator to be set assuming the statement affects these indicators (as identified in Table 4-2-1).

Valid T/F Execution Conditions

? ? ? ? ? ..... No execution conditions apply; next level is level 1.

T ? ? ? ? ..... One condition applies; next level is level 2.

T T F T ? .... Four conditions apply, next level is level 5.

F F F T T .... Five conditions apply, next level is invalid.*

* Note: Five conditions are not valid on a statement affecting the internal T/F status indicators (except for GOSUB and RETURN).

Invalid T/F Execution Conditions

? T ? ? ? ..... A non-blank execution condition cannot follow a blank.

T F ? ? T .... A non-blank execution condition cannot follow a blank.

Using Hyphens as Placeholders

There may be cases where you want to unconditionally execute a statement without checking one or more existing status indicator values, while preserving the state of that indicator level. To accomplish this action, you can use a ?-? (hyphen) as a placeholder within the true/false execution conditions. For example:

```
      IF    TAR WORK FLAG              EQ  1
-     IF    TAR RECEIPT1 POST STARTED  EQ  1
```

In this example, the first IF statement executes unconditionally and sets the level 1 internal true/false status indicator to *T* or *F*. The second IF has a '-' in the first position of its execution conditions so it also executes unconditionally, setting the level 2 internal true/false status indicator (level 2 corresponds to the leftmost execution condition with a blank value). You can now execute additional statements conditionally based on the first two levels, which can be *TT, TF, FT*, or *FF*. This type of ?truth table? logic can be extended to additional levels.

For instance, you can perform a three-statement series as shown in the following example, and then check for internal true/false status indicator values of *TTT, TTF, TFT, TFF, FTT, FTF, FFT*, or *FFF*.

```
      IF    TAR WORK FLAG              EQ  1
-     IF    TAR RECEIPT1 POST STARTED  EQ  1
--    IF    TAR POST ERRORS            GT  0
```

Simple T/F Examples for Comparison

To demonstrate the rules given so far, the following four examples each present a two-statement series using a READ followed by an IF.

```
      READ  TAR RECEIPT1               HOLD 0 FT 0 BY RECEIPT1 KEY
      IF    TAR RECEIPT1 POST STARTED  EQ  1
```

The results of the first example (with no conditions) are:

The READ statement executes unconditionally.

If the READ is successful, the level 1 true/false status indicator is set to *T*. If it is not successful, the level 1 indicator is set to *F*.

The IF statement executes unconditionally. It does not test the result of the READ statement.

If the IF condition is true, the level 1 true/false status indicator is set to *T*. If the IF condition is not true, the level 1 indicator is set to *F*. Note that APPX sets the same indicator here that the READ statement previously set, so the result of the READ operation is no longer available.

Internal status indicator values possible at the end of this example are *T* or *F*.

```
     READ    TAR RECEIPT1                HOLD 0 FT 0 BY RECEIPT1 KEY
T    IF      TAR RECEIPT1 POST STARTED      EQ     1
```

The results of the second example (with a True condition on the IF) are:

The READ statement executes unconditionally.

If the READ is successful, the level 1 true/false status indicator is set to *T*; otherwise, level 1 is set to *F*.

The IF statement executes only if the READ operation is successful (the level 1 indicator is *T*).

Assuming the level 1 indicator is *T*, if the IF condition is true, the level 2 true/false status indicator is set to *T*; otherwise, level 2 is set to *F*. Note that APPX retains the first value as set by the READ statement, so it is still available for subsequent checking.

Internal status indicator values possible at the end of this example are *F, TT,* or *TF*.

```
     READ    TAR RECEIPT1                HOLD 0 FT 0 BY RECEIPT1 KEY
F    IF      TAR RECEIPT1 POST STARTED      EQ     1
```

The results of the third example (with a False condition on the IF) are:

The READ statement executes unconditionally.

If the READ is successful, the level 1 true/false status indicator is set to *T*; otherwise, level 1 is set to *F*.

The IF statement executes only if the READ operation is not successful (the level 1 indicator is *F*).

Assuming the level 1 indicator is *F*, if the IF condition is true, the level 2 true/false status indicator is set to *T*; otherwise, level 2 is set to *F*.

Internal status indicator values possible at the end of this example are *T, FT,* or *FF.*

```
     READ    TAR RECEIPT1                HOLD 0 FT 0 BY RECEIPT1 KEY
-    IF      TAR RECEIPT1 POST STARTED      EQ     1
```

The results of the fourth example (with a hyphen placeholder on the IF) are:

The READ statement executes unconditionally.

If the READ is successful, the level 1 true/false status indicator is set to *T*; otherwise, level 1 is set to *F.*

The IF statement executes unconditionally, regardless of whether the READ operation is successful (the first indicator may be either *T* or *F*).

If the IF condition is true, the level 2 true/false status indicator is set to *T*; otherwise, level 2 is set to *F*.

Internal status indicator values possible at the end of this example are *TT, TF, FT,* or *FF.*

Using AND and OR Statements

You may frequently use an AND or an OR statement following an IF statement to further qualify a condition specified by the IF statement. AND places a further constraint (both or all of two or more conditions must be true), while OR lessens the constraint (either or any of two or more conditions must be true). Depending on whether the AND/OR statement is true or false, APPX either modifies or preserves the value of the true/false status indicator just set by the preceding IF statement. With AND and OR statements, you effectively give APPX two or more opportunities to set (or modify) the same status indicator.

See the following sections demonstrating using AND after an IF statement and using OR after an IF statement.

Using AND After an IF Statement

Consider the following example using an AND statement after an IF. In this example, the two statements are really part of a single logical verification since your intent is to check if both of the two statements are true.

```
IF    TAR CUSTOMER BALANCE        GT  0
AND   TAR WORK ON ACCOUNT AMOUNT  NE  0
```

When the IF statement executes, it automatically sets the level 1 true/false status indicator to either *T* or *F,* as appropriate.

If the IF statement is false, setting level 1 to *F*, the AND statement is bypassed because the possibility that both conditions are true has already been eliminated.

If the IF statement is true, the AND statement executes. If the AND statement is true, the level 1 indicator is preserved (left unchanged as *T*). If the AND statement is false, the level 1 indicator is changed to *F*.

Using OR After an IF Statement

The example below using an OR statement is very similar to the previous example using an AND, except that the OR verification checks to see if either of the two statements are true:

```
        IF      TAR CUSTOMER BALANCE        GT  0
        OR      TAR WORK ON ACCOUNT NUMBER  NE  0
```

When the IF statement executes, it automatically sets the level 1 true/false status indicator to either *T* or *F,* as appropriate.

If the IF statement is true, setting level 1 to *T*, the OR statement is bypassed because the possibility that both statements are false has already been eliminated.

If the IF statement is false, the OR statement executes. If the OR statement is false, the level 1 indicator is preserved (left unchanged as *F*). If the OR statement is true, the level 1 indicator is changed to *T*.

Adding Execution Conditions

Now consider the following modification to the example in Using AND After an IF Statement:

```
T       IF      TAR CUSTOMER BALANCE        GT  0
T       AND     TAR WORK ON ACCOUNT AMOUNT  NE  0
```

Notice that the first execution condition of each statement now has a *T* in it. Adding the *Ts* results in the following:

The IF statement executes only if the level 1 true/false status indicator is *T.*

If it executes, the IF statement sets the level 2 indicator to *T* or *F,* as appropriate.

The AND statement executes only if the level 1 indicator is *T* and the level 2 indicator is *T*. (If the level 2 indicator is already *F*, there is no need to execute the AND statement.)

The AND statement changes the level 2 indicator to *F* if the AND statement is false; otherwise, the level 2 indicator is preserved (left unchanged as *T*).

Potential Misuse of AND and OR

We can modify the previous example slightly to point out a potential misuse of an IF/AND statement combination:

```
        IF      TAR CUSTOMER BALANCE        GT  0
T       AND     TAR WORK ON ACCOUNT AMOUNT  NE  0
```

If the IF statement is true, the IF statement sets the level 1 internal true/false status indicator to T and the AND statement executes. But the AND attempts to modify the level 2 internal true/false status indicator, which has not been set. This generates a runtime error. A similar problem would result for an IF/OR statement combination with mismatching execution conditions.

In general, AND and OR statements should be subject to the same execution conditions as the statement they qualify (that is, the statement which originally sets the internal status indicator).

AND and OR with Statements Other Than IF

You can use AND and OR statements to qualify another type of statement other than an IF statement, provided the statement affects the true/false status indicators (see Table 4-2-1). AND and OR statements behave in exactly the same manner as previously described when used after IF statements. For example:

```
     READ   TAR CUSTOMER              HOLD 0 FT 0 BY CUSTOMER NO
     AND    TAR CUSTOMER BALANCE          NE     0
T    SET    --- INCLUDE RECORD            =      Y
```

In this example, the SET statement executes only if both the READ statement is successful and the AND statement is true.

CHAPTER 4-3

Specifying Statements

Specifying Statements

Every statement you specify within an ILF routine occupies a single line. For each statement, you enter a number of individual components, beginning with a keyword. Each statement type, identified by its unique keyword, has its own *syntax* (the name given to the predefined pattern of words and symbols) that determines what information you must provide. Table 4-1-1 provides a complete list of statement keywords by category, and ILF Keyword Reference describes each statement in detail, including syntax requirements and available options. There are, however, a number of patterns that apply to several statement types. There are also rules that govern the use of many of the common statement components. This chapter describes many of these patterns so that you can apply them to individual statements as you develop ILF routines.

Remember, when entering or editing ILF statements, the F1 (Help) key provides context-sensitive help relating to the field at which you are positioned.

Patterns of Statement Keyword Use

With the previous definitions and categories in mind, there are several patterns that govern how different statement keywords operate. The following are some general principles to help you understand some of the differences in how certain statements require you to specify different components and types of data:

The condition testing statements (IF, AND, and OR) require that you specify two fields to be compared. The two fields must be of the same data type (alpha-to-alpha, numeric-to-numeric, etc.). You are allowed to compare two numeric fields regardless of their storage format. For example, you can check to see if an integer field is greater than a packed decimal field. No intermediate data conversion is required. To compare two fields of different data types, first use a SET statement to convert one of the fields to a type compatible with the other field. You can also use the condition testing statements to compare a field to a constant.

Several statements deal only with external data representations, such as BLINK, BRIGHT, and INVERSE. You use these keywords to affect how an item appears to an end user on the screen or in a report. These statements are known as *characteristic-type* statements.

Several statements operate only on internal data representations, such as SET, COMPUTE, APPEND, and SET TEMP. You use them to compute or modify stored data values.

Some statements deal specifically with numeric computations, and the destination field (the result of the computation) must be a numeric data type. COMPUTE and CALC are examples of this category of statements.

Another category of statements, such as READ and READNEXT, operates at a file level. These statements require you to specify a file name.

The text statements allow you to provide a message string that displays or prints information for a user under circumstances that you specify.

Rules for Statement Components

Each ILF statement consists of a number of words, symbols, phrases, and special characters that together represent a specific logical operation for the system to perform. Although each statement has a unique syntax, most of the individual statement components are derived from a common set of items that are used in several statement types. The following sections describe the most widely used statement components.

The T/F Execution Conditions

The first five positions of almost every statement type are reserved for true/false execution conditions. The following is a list of the only values allowed in this group and a brief description of what they mean. See section T/F Execution Condition Values in True/False Status Indicators for a complete discussion.

Blank indicates no conditions are specified.

Tindicates a true conditional check.

Findicates a false conditional check.

- - (hyphen) indicates an *either true or false* conditional check.

C or * indicates the presence of a temporary comment. APPX bypasses any statement that has a C or * in the first position. It is up to you to reset the indicator to one of the four values previously listed before APPX will execute the statement.

The following example demonstrates the true/false execution conditions:

```
TTFF  IF      TAR  RECEIPT1 POST STARTED   EQ   1
```

In this statement, the execution conditions *TTFF* requests APPX to match the corresponding values to the set of five internal true/false status indicators before executing the statement.

The Statement Keyword

The statement keyword is usually an action word (such as COMPUTE, SET, or READ). The *keyword* indicates to APPX which statement to invoke. When you begin to specify a statement after you enter the keyword,APPX provides you with a template to assist you in entering the remaining statement components. The keyword is always eight or fewer characters long and consists of letters and, in some cases, embedded spaces. The only exceptions to this pattern are the comment keywords, denoted by * and **. The keyword must be entered exactly as specified in the statement description provided in *ILF Keyword Reference*. For example:

```
T       BEG READ TAR CUSTOMER                HOLD 1 KEY IS   CUSTOMER NO
```

The statement in this example invokes the logic associated with the BEG READ keyword. Notice that there is an embedded space between the two parts of the keyword.

The Application ID

The *application ID* component identifies the application that a specified file or field is associated with. This allows you, for example, to compare the value of a field in one application to that of a field in a second application. All the statement types that allow you to specify files or fields require you to provide the corresponding application ID. Note that, when you refer to any of the predefined fields (PDFs) in a statement, you enter '---' (three hyphens) as the application ID. When you specify a constant (such as when adding the value 3 to a designated numeric field), you leave the application ID as spaces. The following is an example of an application ID reference:

```
TFT     READ     TAR RECEIPT1                HOLD 0 FT 0 BY RECEIPT1 KEY
```

The component TAR refers to the application ID in which the RECEIPT1 file is defined.

When you are entering new ILF code with an application ID component, the application ID defaults to the current application but you can override it. APPX automatically changes the application ID to "---" if the referenced field (or file or process) cannot be found in the application specified but does exist in application 0LA, the runtime application. This lets you refer to predefined fields, files, or processes without having to change the application ID.

The File Name

The *file name* component identifies the name of a file you wish to operate on. You must specify the complete file name as defined in the APPX data dictionary. For example:

```
TFT     READ     TAR RECEIPT1                HOLD 0 FT 0 BY RECEIPT1 KEY
```

The name RECEIPT1 refers to a file in the TAR application, which you want APPX to read.

The Field Component

Many statement types require you to specify either one or two *field* components, in which you enter a field name or value. Categories of field components are as follows:

A ***defined field***is one that is specified in the data dictionary of the current application, or in another APPX application. For example, ORDER1 CUSTOMER NO might be a defined field in the Order Processing (TOE) application.

A ***work field***, like a defined field, is also specified in the data dictionary, but is not stored in a file.

A predefined field specifies any one of APPX's predefined fields (PDFs). A complete list of the PDFs and a discussion of their nature and use are provided in Predefined Fields and Processes.

A ***constant*** includes any of four types of values, including numeric, alpha, date/time, or logic. Unlike some languages, you do not enclose a constant within quotation marks when you specify it in APPX. In addition to letters and numbers, constants may contain special characters. Refer to the discussion about specifying constant values later in this chapter.

ILF Keyword Reference provides the syntax of each statement and also details the specific categories permitted for each field component. Unless a key field is specifically required, a defined field or work field can be used wherever the syntax calls for a field name. Predefined fields and constants can only be used where explicitly stated

Partial-Record I/O

In order to increase performance associated with very wide RDBMS tables, you can specify either a file name or a field name when using any of these statements:

READ

READNEXT

BEG READ and END READ

WRITE

REWRITE

If a file name is specified, APPX operates on the entire record. If a field name is designated, the I/O statement operates on the named field only. If the field is a group header, the I/O will be performed on all members of the group. Using this feature limits the amount of data transferred between APPX and an RDBMS. For example, if you know that a particular section of ILF code needs to update only one or two fields within a record, you can change the I/O statements to refer to those fields only.

Traditional method:

```
BEG READ  TAR CUSTOMER                HOLD 1 KEY IS  CUSTOMER NO
COMPUTE   TAR CUSTOMER CREDIT LIMIT     *      1.05
REWRITE   TAR CUSTOMER                FAIL 0
END READ  TAR CUSTOMER
```

Using Partial-Record I/O:

```
BEG READ  TAR CUSTOMER + CR LIMIT     HOLD 1 KEY IS  CUSTOMER NO
COMPUTE   TAR CUSTOMER CREDIT LIMIT     *      1.05
REWRITE   TAR CUSTOMER                FAIL 0
END READ  TAR CUSTOMER + CR LIMIT
```

When you WRITE a single field (or group field as shown above), APPX will write NULL values into the remainder of the record. When you READ (or READNEXT or BEG READ) a partial record, the remainder of the record will contain NULL values. If you REWRITE a partial record, the remainder of the record is not modified.

Other considerations:

Even though the END READ statement allows you to specify a field name, this is for consistency purposes only and is not actually used other than to indirectly identify the file name so that the END READ can be associated with the appropriate corresponding BEG READ statement.

REWRITE statements allow you to specify either a file or field name. If a field name is specified, only the named field or group of fields will be updated. All other values in the record being updated remain unchanged. The field name specified on the REWRITE statement does not need to be the same as the field name specified on the READ statement used to retrieve the record. The entire record can be read with hold by specifying a file name on the READ statement but just a single field can be updated by specifying that field name on the REWRITE statement. Or, you can READ a group of fields and REWRITE a subset of that group of fields.

Partial-Record I/O only reads the field or group of fields specified. The key field specified on the READ statement is not read unless the key field is included in the group of fields specified on the READ statement. If the key field must be read, remember that a SYNONYM for the key field can easily be included in any group that you may define in the Data Dictionary. The object of Partial-Record I/O is to dramatically decrease the amount of data being retrieved and updated, therefore key fields that are not part of the READ statement are not retrieved.

The READNEXT statement allows a field name to be entered (instead of a file name). However, that field name is not really used to restrict the set of fields retrieved from the RDBMS server. Because APPX is generating SQL statements as it executes, a select <column-list> from <table> where <beg-at-constraints> and <end-at-constraints> statement is generated when a BEG READ/END READ loop is executed. Executing that select statement causes the RDBMS to generate a record set that contains all of the selected columns for each selected record. The READNEXT statement (and the END READ statement, as well) cannot change the record set, it can only retrieve the next row from that record set.

Therefore, the field name supplied to a READNEXT or END READ statement is for consistency purposes only. You cannot use a READNEXT statement to change which columns are present in the record set.

The Label

Some of the control type statements allow you to identify the name of a specific point in an ILF routine where control passes. This name is called a *label*. You often use labels to cause a branching operation to be performed. For example:

```
T       GOTO        :CALCTOTAL
```

The label :CALCTOTAL refers to the name of a section of the ILF routine to execute next. In this example, APPX passes processing control to the label :CALCTOTAL if the first internal true/false status indicator has a value of *T*.

> Note that the label in our example begins with a colon. This is because many programmers find a colon helps to make a label name stand out from ordinary field names but there is no requirement to use a colon.

The Occurrence Number

Many statements allow you to specify which *occurrence* of a multi-occurrence field you want to compare or operate on. For example:

```
TT      IF          TGL COUNT                   001 EQ TGL COUNT                   002
```

The left-hand field in this example refers to the first occurrence of the field COUNT in the TGL application, and the right-hand field refers to the second occurrence of the field COUNT. You indicate if a field is to have more than one occurrence as a specification in the data dictionary.

Occurrence vs Appearance. A field may appear on an image multiple times. A field with an Occurrence number is unique onto itself. If there are two fields on an image, WORK ADDRESS OCC 001 and WORK ADDRESS OCC 002 and the second occurrence value is changed, Appx will recognize that change and display the new value. If, however, WORK ADDRESS (no OCC) is on an image more than once you must identify these instances with the Appearance parameter.

Characteristic-Type Statements

Characteristic-type statements, such as BLANK, BLINK, BRIGHT, INVERSE,.and others in this category, operate on items displayed on an image, rather than on fields. You use these statements to affect how an item appears to an end-user on the screen or in a report. In other words, they affect the external

data representation only, not the contents of the field itself. Because you can paint a single field more than once on an image, an extra parameter called the appearance number is required to uniquely identify an item. Appearance numbers (starting at 1) are assigned to each occurrence of each field beginning at the top left-hand corner of an image, continuing across the row to the right and, then, to each subsequent row in the same manner. The following example demonstrates this pattern:

FIELD A (OCCURRENCE 1) (APPEARANCE 1)	FIELD A (OCCURRENCE 1) (APPEARANCE 2)
FIELD B (OCCURRENCE 1) (APPEARANCE 1)	FIELD A (OCCURRENCE 2) (APPEARANCE 1)
FIELD A (OCCURRENCE 2) (APPEARANCE 2)	FIELD A (OCCURRENCE 1) (APPEARANCE 3)

In addition, these statements are meaningful only in event points that are associated with an image (such as *Pre-Display* or *Verify*). Compiling a characteristic statement in a non-image event point is not an error; instead, the statement is ignored. This makes copied routines (using COPY or GOSUB statements) more flexible. A routine with a characteristic instruction may be copied into a non-image event point; therefore, the characteristic instructions verify at runtime that they are operating in an image-associated event point.

In general, the operation of a characteristic statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is generated. It is important to note that a characteristic statement has no effect until the specified item(s) become active. An item becomes active when the current entry level is greater than or equal to the entry level specified for that item.

Characteristic-Type Statement Keywords

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

In the following example, if the customer number entered on an order is not a valid customer, the customer name displays as blank.

```
     SET     TAR CUSTOMER NO          =  TAR ORDER CUSTOMER NO
     READ    TAR CUSTOMER        HOLD 0 FT 0 BY CUSTOMER NO
F    BLANK   TAR CUSTOMER NAME        (AT APPEARANCE #    )
```

The Appearance Number

Many of the characteristic-type statements allow you to specify which iteration, or *appearance number*, is to be affected by the statement. An appearance number is applicable only when a field appears more than once on an image. For example:

```
T    INVERSE TAR CUSTOMER NAME        (AT APPEARANCE # 002)
```

This example indicates that the system should make the CUSTOMER NAME field in the TAR application appear as inverse on the terminal for the second appearance only of this field on the image. The text, *AT APPEARANCE #*, is automatically provided by the ILF as part of this statement?s format template.

Occurrence vs Appearance. A field may appear on an image multiple times. A field with an Occurrence number is unique onto itself. If there are two fields on an image, WORK ADDRESS OCC 001 and WORK ADDRESS OCC 002 and the second occurrence value is changed, Appx will recognize that change and display the new value. If, however, WORK ADDRESS (no OCC) is on an image more than once you must identify these instances with the Appearance parameter.

The Arithmetic Operator

The *arithmetic operator* component includes the four basic arithmetic operator signs and two hash symbols:

+ (plus)

- - (minus)

* (multiply by)

/ (divide by)

P (hash-plus or -add)

M (hash-minus or -subtract)

A hash total allows you to validate the accuracy of certain fields. For example, you can sum the numeric equivalent of a customer number field as a check on operator input.

The Relational Component

The *relational* component (or *relation*) includes several abbreviations that correspond to a series of relational operators that are used when comparing the values of two fields, as follows:

LT (less than) checks if the value of a first-named field is less than that of a second field.

GT (greater than) checks if the value of a first-named field is greater than a second field.

LE (less than or equal to)checks if the value of a first-named field is less than or equal to a second field.

GE (greater than or equal to) checks if the value of a first-named field is greater than or equal to a second field.

EQ (equal to)checks if the value of a first-named field is equal to that of a second field.

NE (not equal to) checks if the value of a first-named field is not equal to that of a second field.

IN (includes)checks if a specified character string is included within the value of a field. For example, you could check to see if the letter string *NOR* is included in the CUSTOMER NAME field.

EX (excludes) checks if a specified character string is excluded from the value of a field. For example, you could check to see if the letter string *NOR* does not exist in the CUSTOMER NAME field.

The Message Text

Message text is a free-form text area that allows you to display messages to a user. You can enter up to 64 characters in this area, including alphabetic, numeric, and special characters. If you specify leading spaces, they show accordingly in the displayed text.

The FAIL (or FT) Parameter

For many of the statements that set true/false status indicators, the statement format also offers a *fail action type* parameter. These statements include the process-type statements (such as INPUT, OUTPUT, STATUS, etc.) and certain file-related statements (such as CREATE, IF EXIST, READ, etc.) as shown in the example below.

```
        STATUS   TAR END OF MONTH STATUS          SUBPROCESS   END? Y  FAIL 3
        *        or
        READ     TAR UNPAID                 HOLD 0 FT 2 BY UNPAID KEY
        *        or
        SCRATCH  TAR TEMP              FAIL 0 CACHE? N
```

The *FAIL* (or *FT*) parameter controls what additional action to take if the statement returns a false condition, as follows:

0 = Do nothing,

1 = Issue a warning message,

2 = Issue an error message, or

3 = Cancel.

> Note that the system message generated according to a *FAIL* parameter is descriptive in nature and may not contain sufficient detail to locate the point of failure in the program. For instance, if an OPEN statement with *FAIL* = 2 were to fail, the message generated could simply be "Error - File Does Not Exist". Therefore, it might be desirable to code WARNING or ERROR messages on a false condition as an alternative or to provide supplemental information as shown in the example below.

```
        OPEN     TGL ACCTMS   SHARE? Y  FAIL 2 CACHE? N
F       ERROR    Unexpected Error OPEN TGL ACCTMS (see error message above)
```

However, if a cancel is issued, either by use of *FAIL* = 3 or by a CANCEL statement, any supplemental warning/error messages will only appear if an output report or error log is also generated.

File-related statements with the *FAIL* parameter that return a false condition also set the STATUS CODE predefined field, a token field containing the reason for the I/O command failure. It can be used to obtain a descriptive error message from the system message file (this is the same message that would be generated by a FAIL parameter set to 1-3).

A Non-APPX Program Name

There are two ILF statements that can invoke a non-APPX program name. Use RUN to execute complete external programs. Use CALL to call external subroutines. Most operating systems support dynamic link libraries. If the subroutine you wish to call is part of a dynamic link library, you can invoke it directly in APPX by using the CALL statement. If a subroutine must be statically linked, you will have to create a custom APPX engine in order to invoke it. Contact your system administrator for details regarding this procedure.

When you invoke external programs and subroutines with the RUN and CALL statements, you specify the exact program name that you would enter if you were communicating directly with the native operating system on a command line. If you do not have enough spaces to specify the name completely, you can define a work field in the data dictionary and set its value to the complete program name. In turn, specify the work field name in the RUN or CALL statement to achieve the desired effect.

Another reason to consider using a work field definition is ease of maintenance. You may RUN or CALL the same program or routine in several places in your application environment. If for any reason you need to change the name of a program and had specified it directly in a RUN or CALL statement, you must change each statement where the name is specified. If you define a work field in the data dictionary, you only have one change to make if the program name changes.

Miscellaneous Operands

There are a few other miscellaneous operands that are unique to a specific statement or to a category of statements. For example:

```
        BEG LOOP A  = 001 TO 010  STEP 001
        *        (perform processing)
        END LOOP A
```

Here, the BEG LOOP and END LOOP statements both have a loop index operand while the BEG LOOP statement also has operands for "from", "to", and "step" values.

Table 4-1-1 provides a complete list of statement keywords by category, and *ILF Keyword Reference* describes each statement in detail, including any unique operands. The format template displayed after entering the keyword in the ILF editor also assists you in determining the type of entry that is required.

Using Predefined Fields (PDFs) in Statements

In the runtime application, APPX includes and maintains a number of fields called predefined fields or PDFs. These fields contain various 'points of reference', such as who the current user is and the company address. Although the names of these fields are pre-specified, you can use them as you would any field that you defined in the data dictionary of your own applications. The primary difference between predefined fields and those you specify in the data dictionary is that APPX initializes the values of PDFs and automatically maintains these values at all times. As a designer, you can set or modify the values of certain PDFs with statements, and may thereby alter this pattern of automatic maintenance. Within the context of statements, you can examine the value of a PDF at any point in time, modify a PDF?s value (if allowed), and display a PDF in a report or on a screen image.

There are five categories of predefined fields:

Current status PDFs provide information about current values, such as the current user ID.

Process control PDFs control what will happen next in the application.

Terminal management PDFs provide information about such factors as current cursor position.

Report management PDFs provide information about the disposition of reports, such as the print destination.

General purpose PDFs are used as index work variables or work fields in ILF statements.

Each PDF has a number of attributes that uniquely define how it is initialized and maintained by APPX. A table of PDFs and a complete description of each can be found in Predefined Fields and Processes.

PDFs and Field-Naming

In the APPX environment, you always specify field names within the context of an application ID. Therefore, you could specify CUSTOMER NAME as a field name within application TAR, and CUSTOMER NAME as a completely different field name within application TOE, if desired. Because PDFs by definition exist within the application ID (---), you are allowed to use the same name when you define fields or work fields in one of your own applications. Thus, the predefined field USER ID is different from a field named USER ID in the TGL application, for example.

The A through Z and AI through ZI PDFs

Within the overall context of PDFs, there are two sets of fields that have special uses as index work variables:

The fields A through Z are a special set of 26 floating-point numeric fields reserved for use in ILF statements. You can use the fields A through *Z* as index work variables for any type of calculation. These fields can also be used as index work variables in BEG LOOP/END LOOP and SET TEMP statements and in place of occurrence numbers and/or appearance numbers wherever such numbers occur. When used in calculations, the number of digits to the right of the decimal varies to ensure the retention of 15 significant digits at all times. For example, if predefined field *A* contains a value of 10 and is divided by 3, *A* is set to 3.33333333333333.

The fields AI through ZI are a special set of 26 integer fields. You can use the fields *AI* through *ZI* as index work variables for calculations which require only integers. These fields can also be used as index work variables in BEG LOOP/END LOOP and SET TEMP statements and in place of occurrence numbers and/or appearance numbers wherever such numbers occur. The range of values for these predefined fields is from -2,147,483,648 to +2,147,483,647, inclusive. Any calculations resulting in decimal positions are rounded up to the next higher integer. For example, if predefined field *AI* equals 10 and is divided by 4, the result (2.5) is rounded up to 3, and *AI* is set to a value of 3. If predefined field *AI* equals 9 and is divided by 4, the result (2.25) is rounded down to 2, and *AI* is set to a value of 2.

Specifying Constant Values

You can use constant values in certain ILF statements where a field name is allowed. You leave the application ID blank when specifying a constant value. Because there are different types of fields included within an APPX application, you need to understand exactly how to specify each data type as a constant value.

APPX **stores or communicates data in any of three formats**, and automatically translates between these formats as appropriate. The three data representations are:

The **external or display format** communicates data to an application user. This format includes characters such as $, -, and #, which often provide a more meaningful presentation to a user.

The **internal or stored format** allows APPX to store and manage data in a specified (and usually optimum) manner. For example, you may choose to store a numeric money field in packed decimal format.

The **universal format** allows you to reference a field within the context of ILF statements, regardless of how the data is stored or displayed.

Use the *universal format* to specify constants as fields within statements.

Universal Data Formats

Each of the four basic data types has its own universal format which is used for specifying constants within ILF statement and is described below:

A **numeric constant** consists of digits, an optional decimal point, an optional trailing or leading minus sign, or a blank for a null entry. A plus sign is implied for positive numbers but is not allowed as a symbol. Currency signs, such as $, are not allowed.

A **date/time constant** consists of a mandatory series of 16 digits (or hyphens, as described below), or a blank for a null entry. The 16 digits incorporate eight sets of two digits each that represent, from left to right, century, year, month, day, hour, minute, second, and hundreds of a second. To indicate that a particular part of a complete date/time format should be ignored in a comparison or operation, you can enter a pair of hyphens in the appropriate positions. For example, you would enter December 31st as '----1231--------'.

An **alphanumeric constant** consists of any combination of letters, numbers, and special characters. Leading, embedded, or trailing spaces are allowed. Leading and embedded spaces are treated as significant for comparison purposes.

A **logic constant** is one that contains the answer to a 'yes/no' question, such as, 'Is this a domestic customer?' The valid values for a logic-type field within an ILF statement are:

The **number 1** or the **letter Y** is equivalent to yes or affirmative or ☑.

The **number 0** or the **letter N** is equivalent to no or negative or ☐.

A **blank** (space) is equivalent to an unknown response or ?. It means the answer is not known or that the field value is not filled in yet.

CHAPTER 4-4

The ILF Editor

The Editor and Automatic Compilation

The ILF includes an integrated ILF editor that allows you to create, modify, and delete individual statements, sections of ILF routines, and entire routines. When you are finished with your work on an ILF routine, APPX automatically takes care of *compiling* the routine when an end user first executes the process from a runtime menu. You do not need to perform a separate step to compile a routine. This automatic compilation translates the source statements you enter into optimized internal instructions that APPX uses when a process executes.

The Features of the Editor

The ILF editor includes many features that allow you to manage statements and ILF routines. With the ILF editor, you can:

Create new ILF routines by selecting the desired event point option from one of the process component definition screens.

Create stand-alone subroutine processes.

Recall existing ILF routines and modify them.

Edit (add, change, delete) statements with a full-screen editing facility that provides entry format 'templates' as a guide.

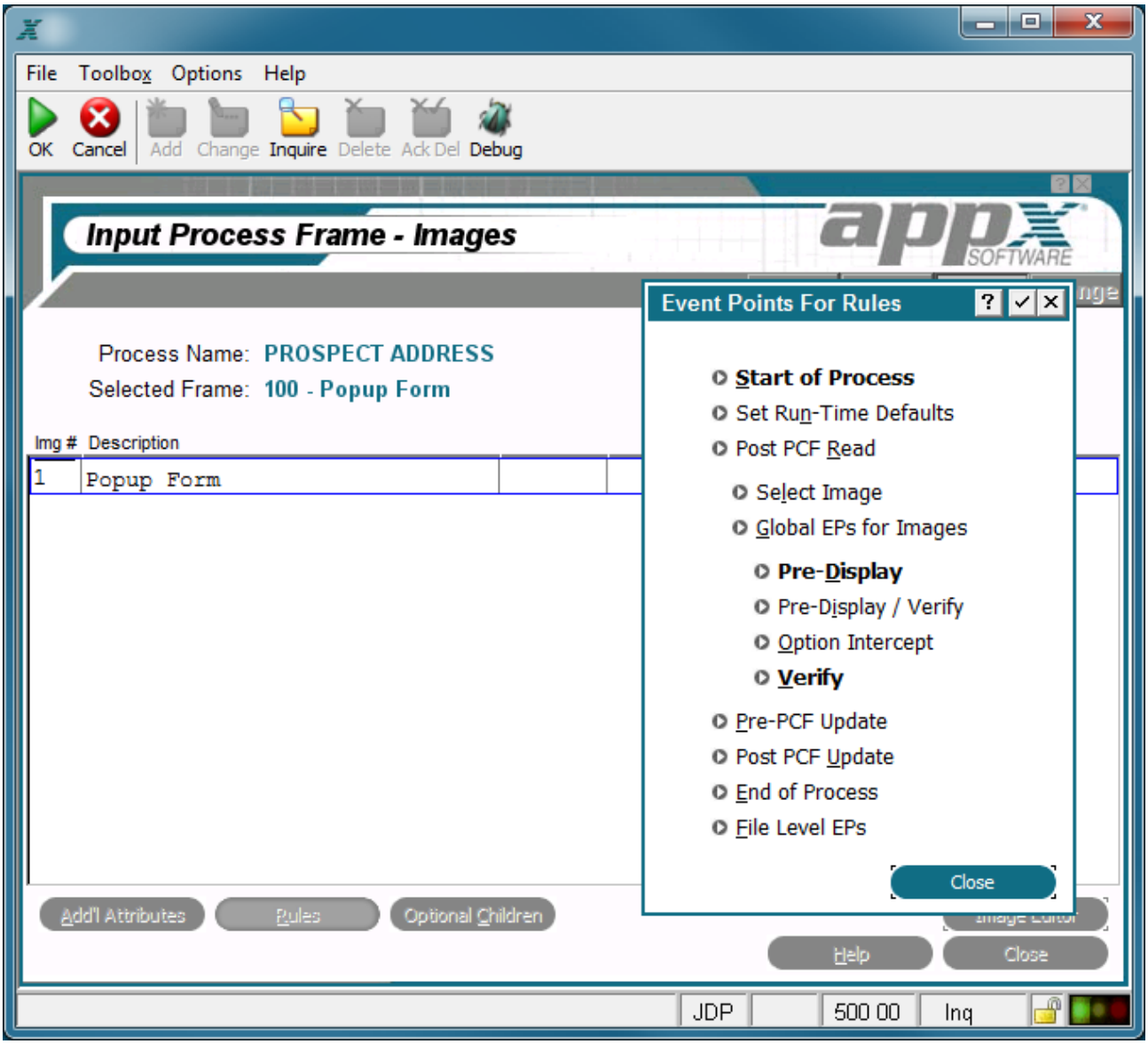
Copy existing routines to use as a starting point for developing similar routines.

'Drill down' to view or edit fields referenced by the current process. This is accomplished by selecting the referenced field, then selecting Option 94. Upon exiting the referenced field, you are returned to the original process.

Invoking the ILF Editor

You invoke the ILF editor from within the context of process definition by selecting the appropriate *Rules* option displayed near the bottom of the screen. The editor automatically associates the statements you enter with the process/event point you selected. The figure below is an example of a *Rules* overlay where you may choose to invoke the editor. Note that only the event points that currently contain ILF statements are highlighted.

The ILF routine you develop is 'attached' to the appropriate process and event point within your application, so that it is invoked when an end user runs the process.

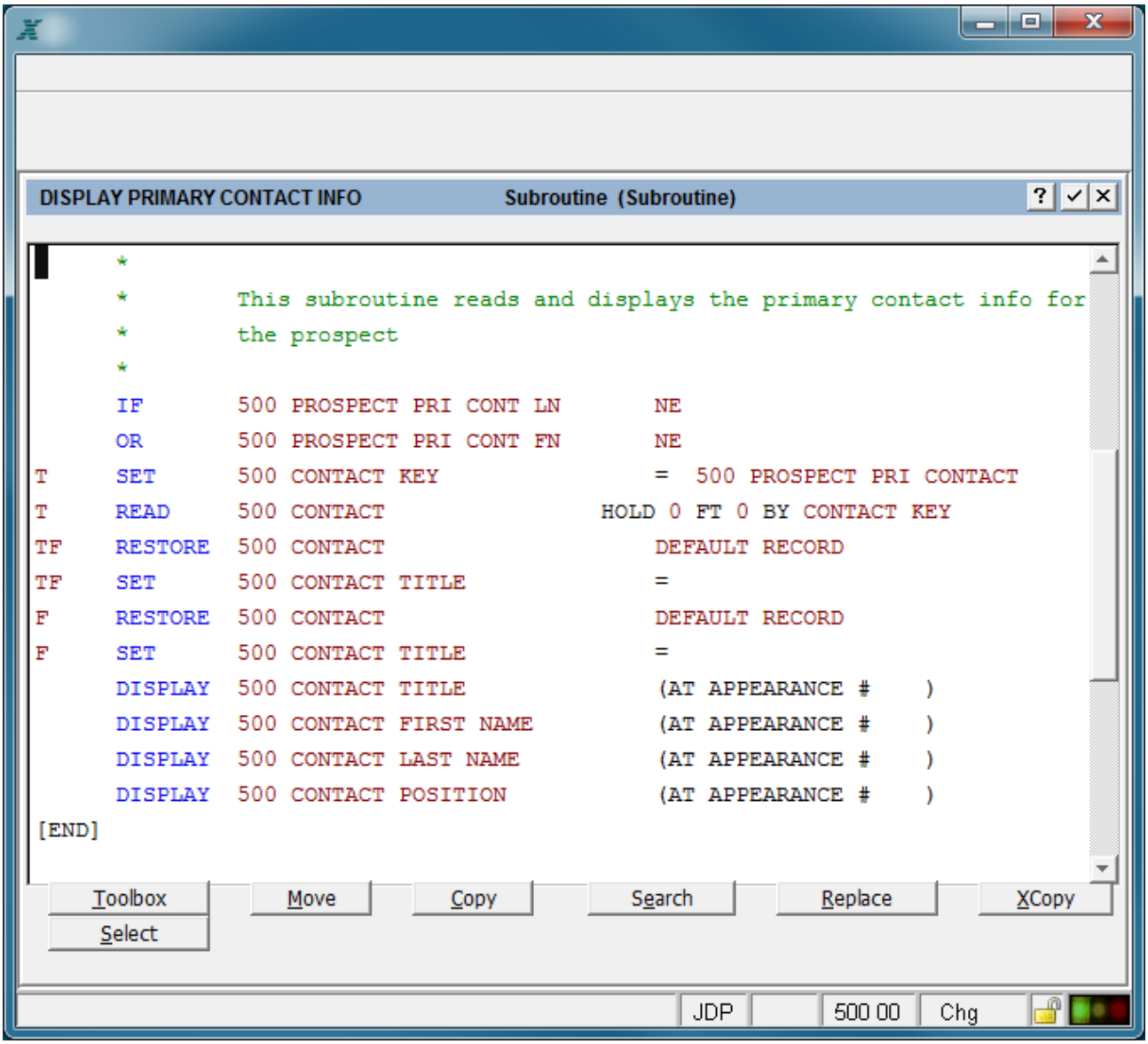


Invoking the ILF Editor

The Layout of the Editor Screen

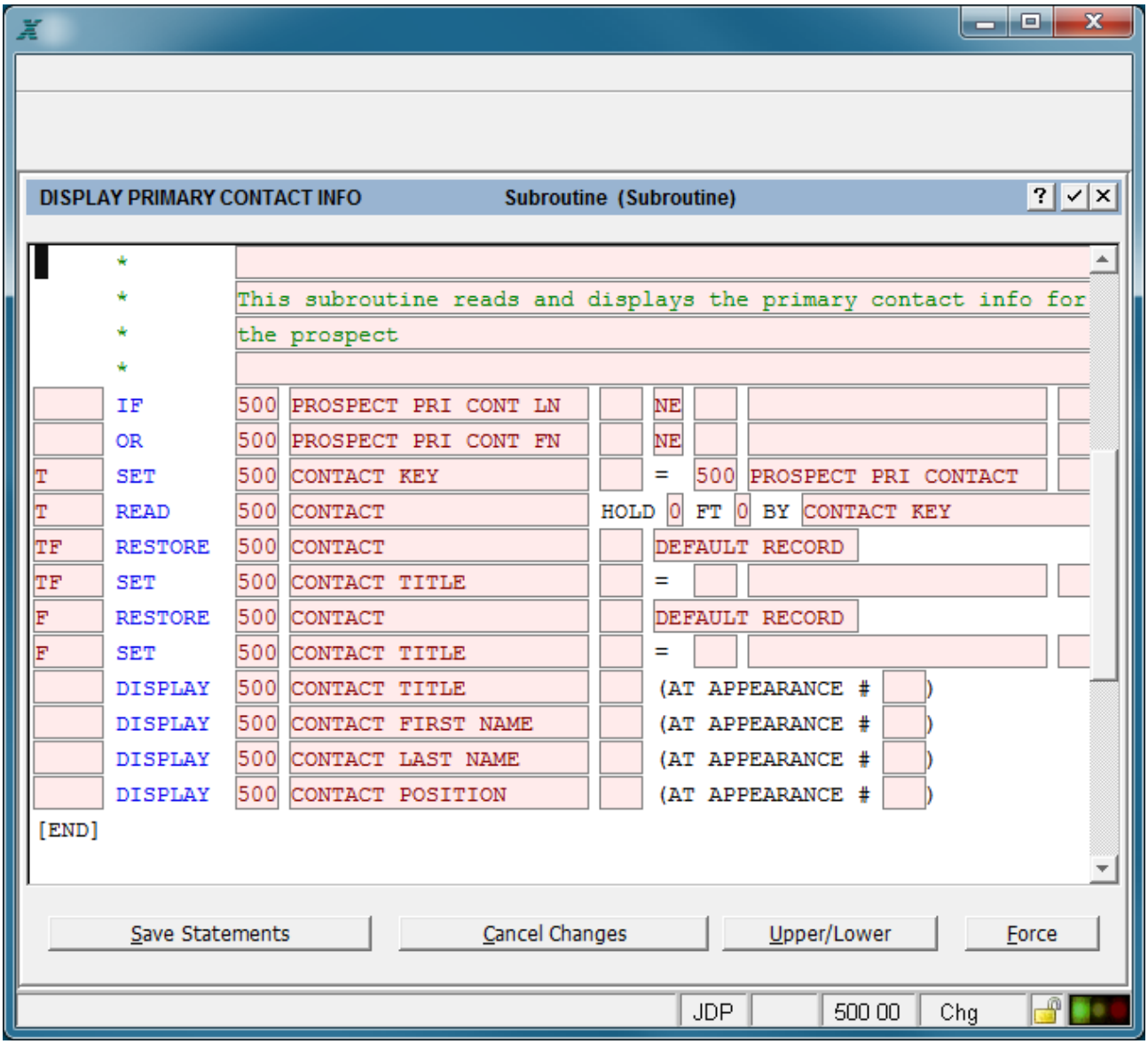
An ILF Editor screen consists of three separate areas. Refer to the figure that highlights each area.

The **identification line** identifies the process component and the event point that the ILF routine is associated with. After you invoke the editor, the identification line is filled in and the cursor is positioned in the statement editing area. The components are identified, starting with the process name and continuing (if applicable) with the frame number, image number, and child ID. In the center of the identification line, APPX displays the process type and, in parentheses, the event point.



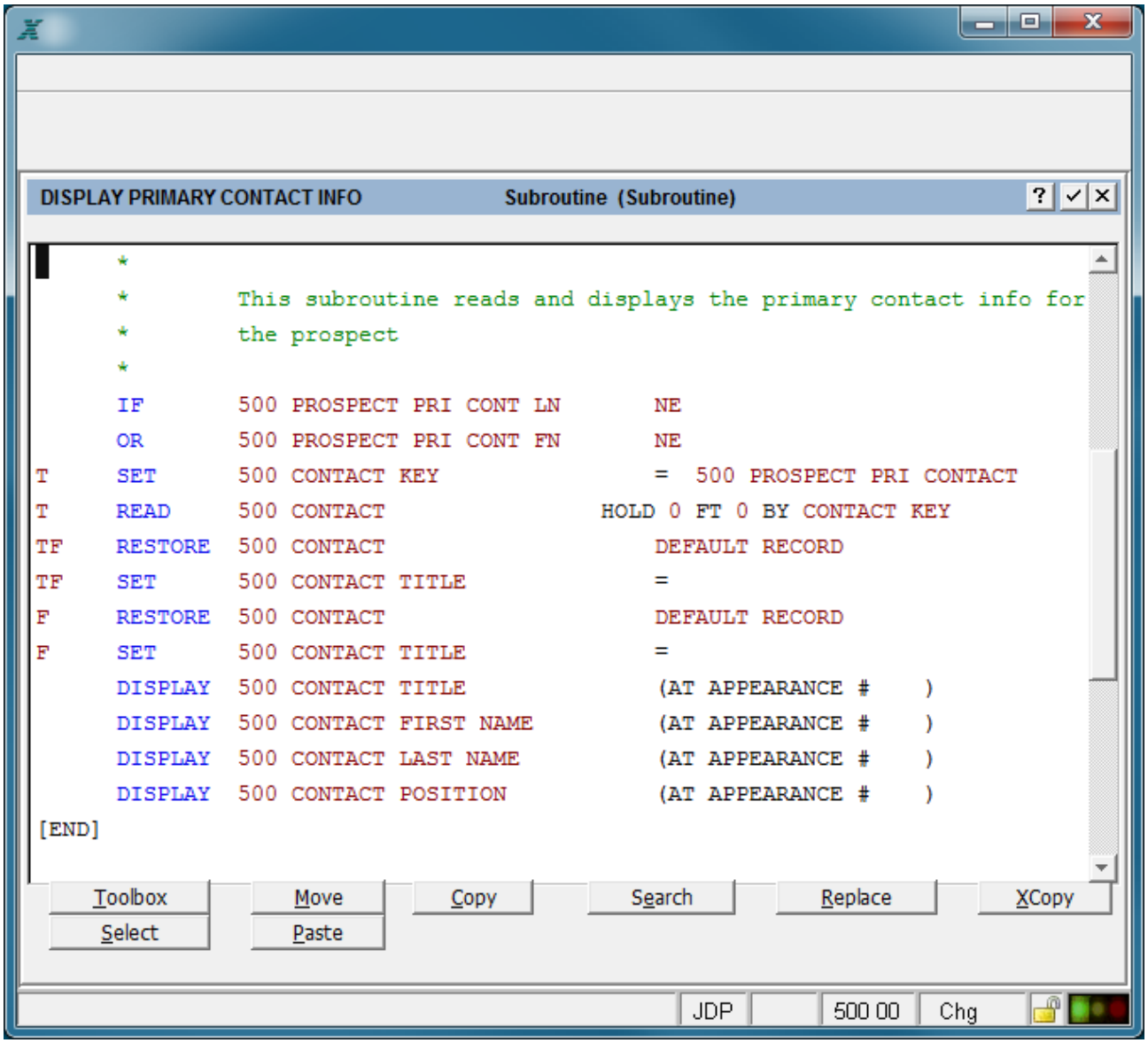
An ILF Editor Screen, Viewing Mode.

The **statement display and edit area**, shown below, in an ILF Editor screen shows individual statements. This area, designated by a pink background, is where statements display, and where you enter and modify them. Note that you cannot change the statement type, only the statement parameters.



An ILF Editor Screen, Edit Mode.

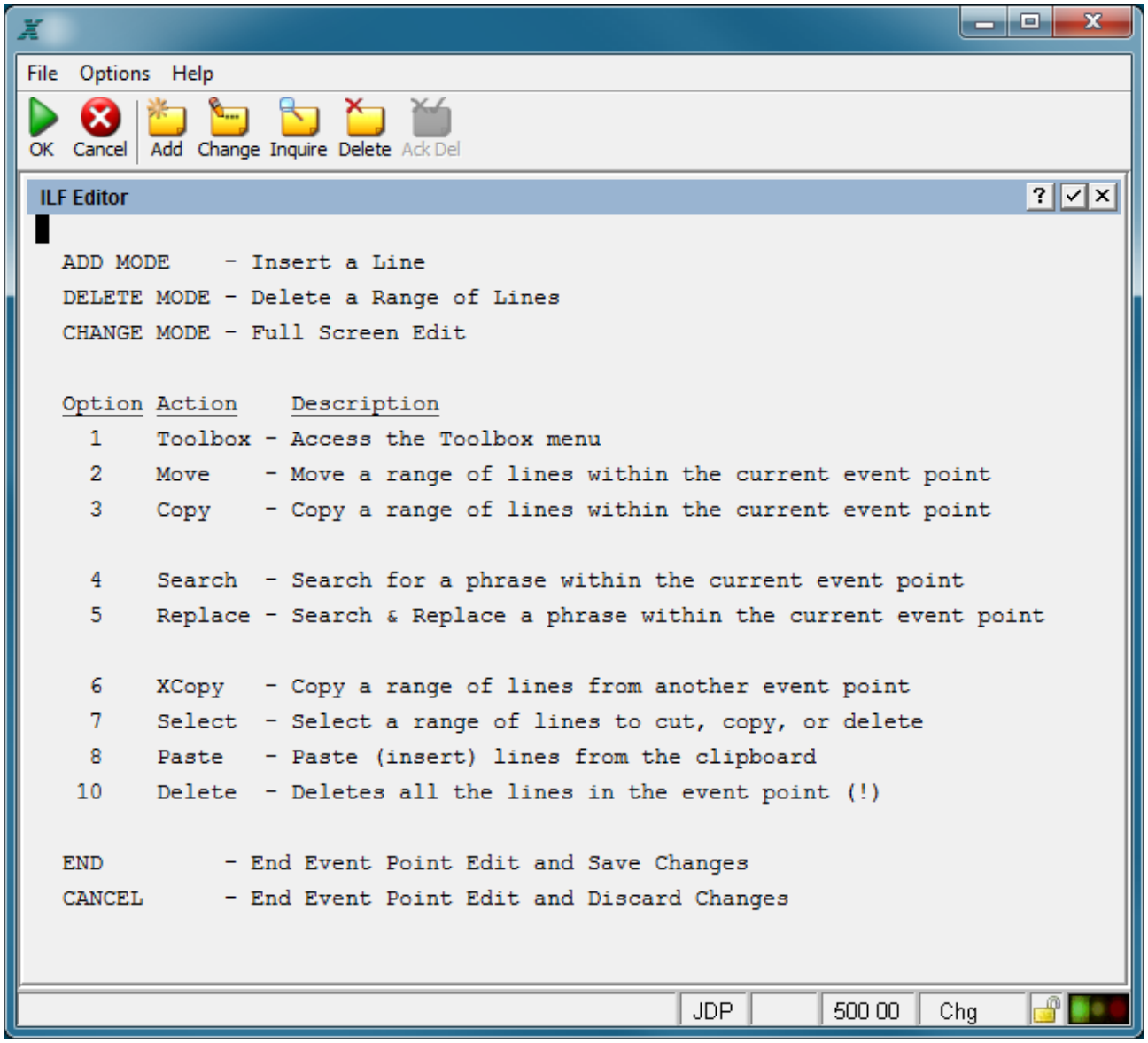
The **options** found at the bottom of the ILF Editor screen can be selected to perform editing functions. The options are shown below. Please note that the options available are dependent on the phase of the editor.



The Options in an ILF Editor Screen

The Help Option

The Help option is available on every editor screen. Press Help (F1) to display a list of all options that are used in any of the editor functions. Select End or press Enter to return to the screen that displayed when you selected Help. The screen below is the ILF Editor *Help* screen:



The ILF Editor Help Screen

The Edit Modes and Options

When you enter the editor, you are initially placed in display mode. If you are reviewing or editing an existing routine, the first statements display on the screen (the exact number may vary, depending upon your terminal). If you are creating a new routine, all you see is [end] that indicates the end of the statements. To review existing statements, select from among the standard scrolling options to move around in an ILF routine. You can also use the arrow keys to position to a specific statement. If you want to perform any function other than displaying statements, you can select any of several other options. The following options are available (see corresponding sections for details):

Toolbox allows quick access to the Database Management option.

Move provides for moving selected statements within the ILF routine.

Copy provides for duplicating selected statements within the ILF routine.

Search provides for searching the ILF routine for specific text.

Replace provides for replacing specific text within the ILF routine.

XCopy (external copy) provides for copying selected statements from another ILF routine.

Select provides for selecting a block of code to move or copy to another process or event point

Paste provides for inserting the lines of code copied to the clipboard. The data on the clipboard may have come from a previously executed Select function or from another source on the desktop, the Appx Wiki for example.

Restore provides the ability to revert any changes made in this event point up to the last time the save was invoked.

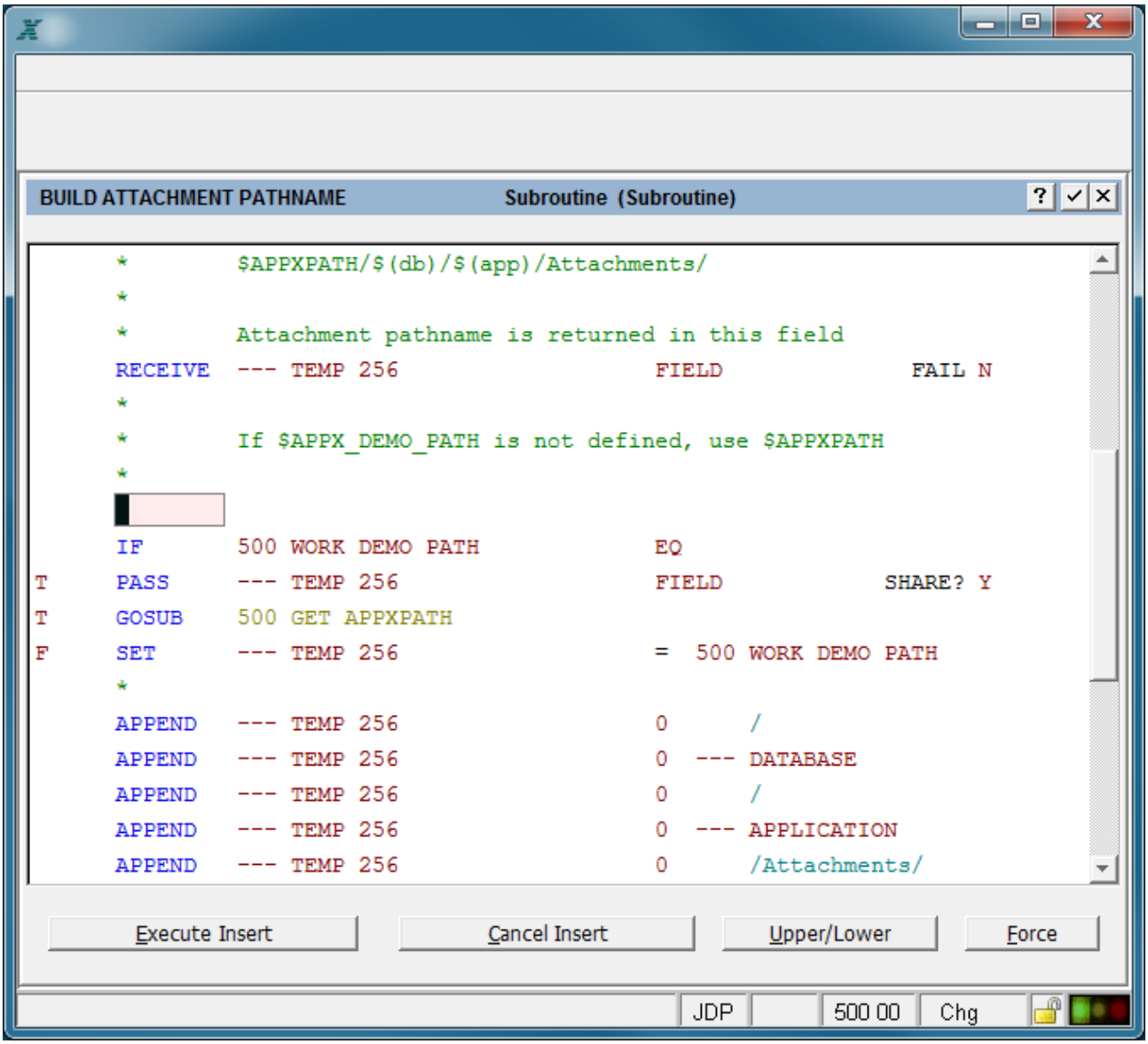
Save [reference unavailable in the source] Saves the event point and returns to the image level screen.

Save and Exit

Press the End key (Esc on most workstation) to exit the IFL Editor and save all changes.

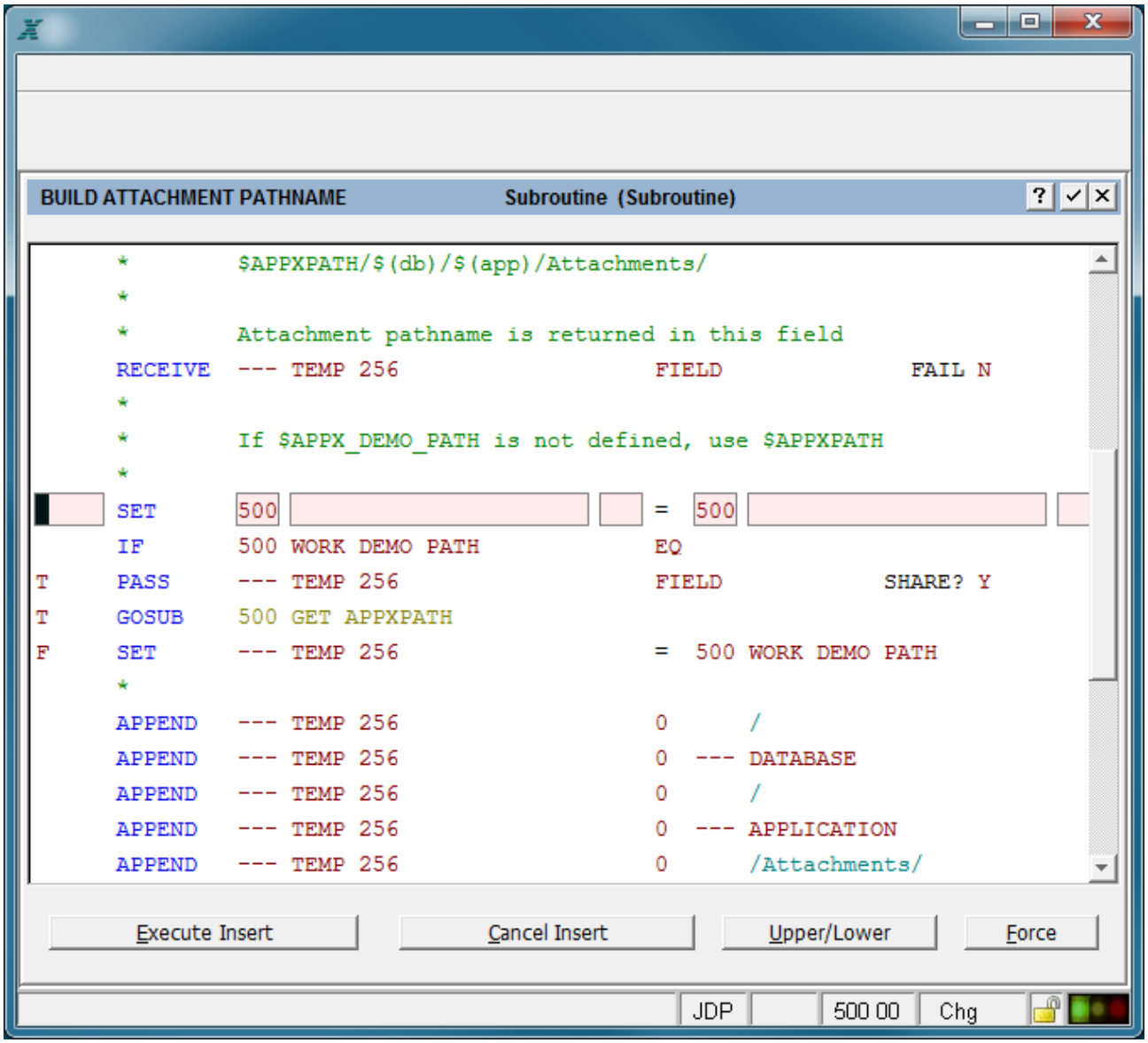
ADD MODE

Select Add mode (option 9, F9) when you want to enter statements in a new ILF routine, or when you want to insert additional statements in an existing routine. First, position the cursor anywhere on the statement *before which* you want to insert a new statement line and then select add mode. The screen that displays when you select this option differs from other editor screens: there is one blank line, the keyword area shows pseudo blanks, and the cursor is positioned on the first character of the keyword area. The editor is effectively reserving one line so you can enter a new statement. Now enter the desired keyword and then press Enter. The screen at this point appears as follows:



An ILF Editor Screen in Add Mode

After you press Enter, the appropriate format 'template' for the statement type you specified with the keyword displays. For example, the screen below displays for a SET statement.



A SET Statement Format Template in Add Mode

The editor may display some default field values that you are likely to use, such as the application ID. You can override these defaults by entering the desired values or by entering spaces. When you enter a field name, APPX automatically searches for that name in the specified application's data dictionary. If it finds the specified field, it leaves the application ID as is. If it does not find the field, it next searches for the field in the runtime application's data dictionary (where all predefined fields are defined). If it finds the specified field, APPX automatically changes the application ID to '---' to signify the runtime application. If it does not find the field in either place, the editor provides an error message.

You now must enter all the statement operands that are appropriate for the keyword you specified. Table 4-1-1 provides a complete list of statement keywords by category, and ILF Keyword Reference describes each statement in detail, including syntax requirements and available options. After you completely specify a statement, press Enter to save the inserted statement in the existing routine.

Then, APPX allows you to insert another statement by reserving a new line with pseudo blanks in the keyword area. The same cycle continues until you complete inserting all your statements. When you finish, leave the keyword blank and press Enter to return to display mode.

The following options are available in add mode:

Return to Execute Insert. Press Enter when you want to insert the current statement.

Cancel (Cancel Insert) cancels the insert. Selecting this option from the tool bar returns you to display mode. Any statements you entered on the screen are lost.

Upper/Lower allows you to enter upper- and lowercase letters. Some statements automatically default to upper/lowercase. Examples are CANCEL, ERROR, MESSAGE, and WARNING. Most other statements default to all uppercase. Sometimes you may want to specify message text that uses upper- and lowercase appropriately, without using the MESSAGE statement. You select this option to 'toggle' between the uppercase-only and upper-and-lowercase modes.

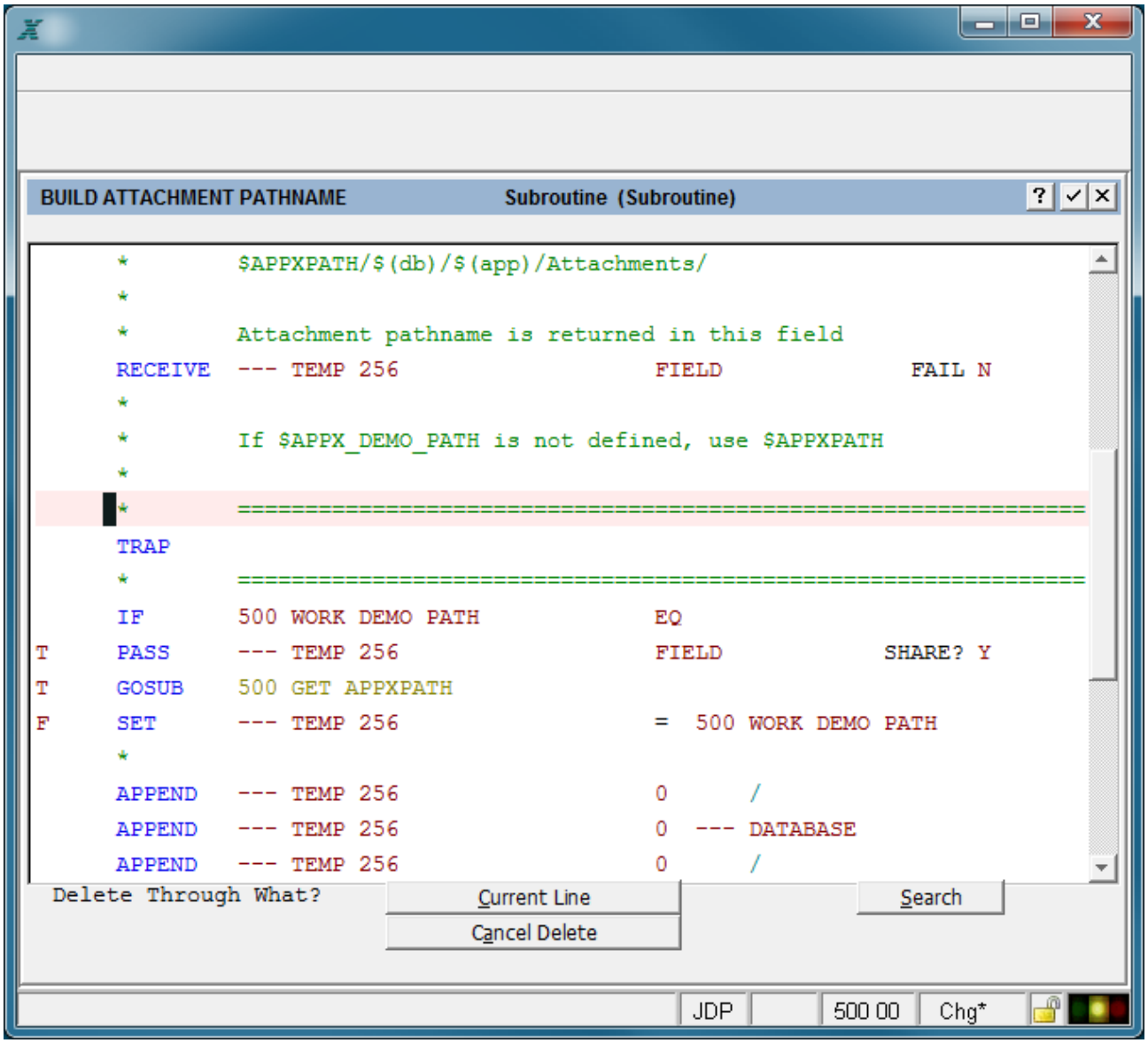
DELETE MODE

Select Delete Mode (Option 10, F10) when you want to delete a single statement or a group of contiguous statements within an ILF routine. Position your cursor anywhere on the first (or only) line you want to delete. When you select delete mode, two things happen:

You automatically set a 'delete marker' on the line where the cursor is positioned, and

You enter into delete mode with its own set of options.

When you select delete mode, the screen below displays.



An ILF Editor Screen in Delete Mode

The question ***Delete Through What?*** is now on the left side of the option area. Each option is described as follows:

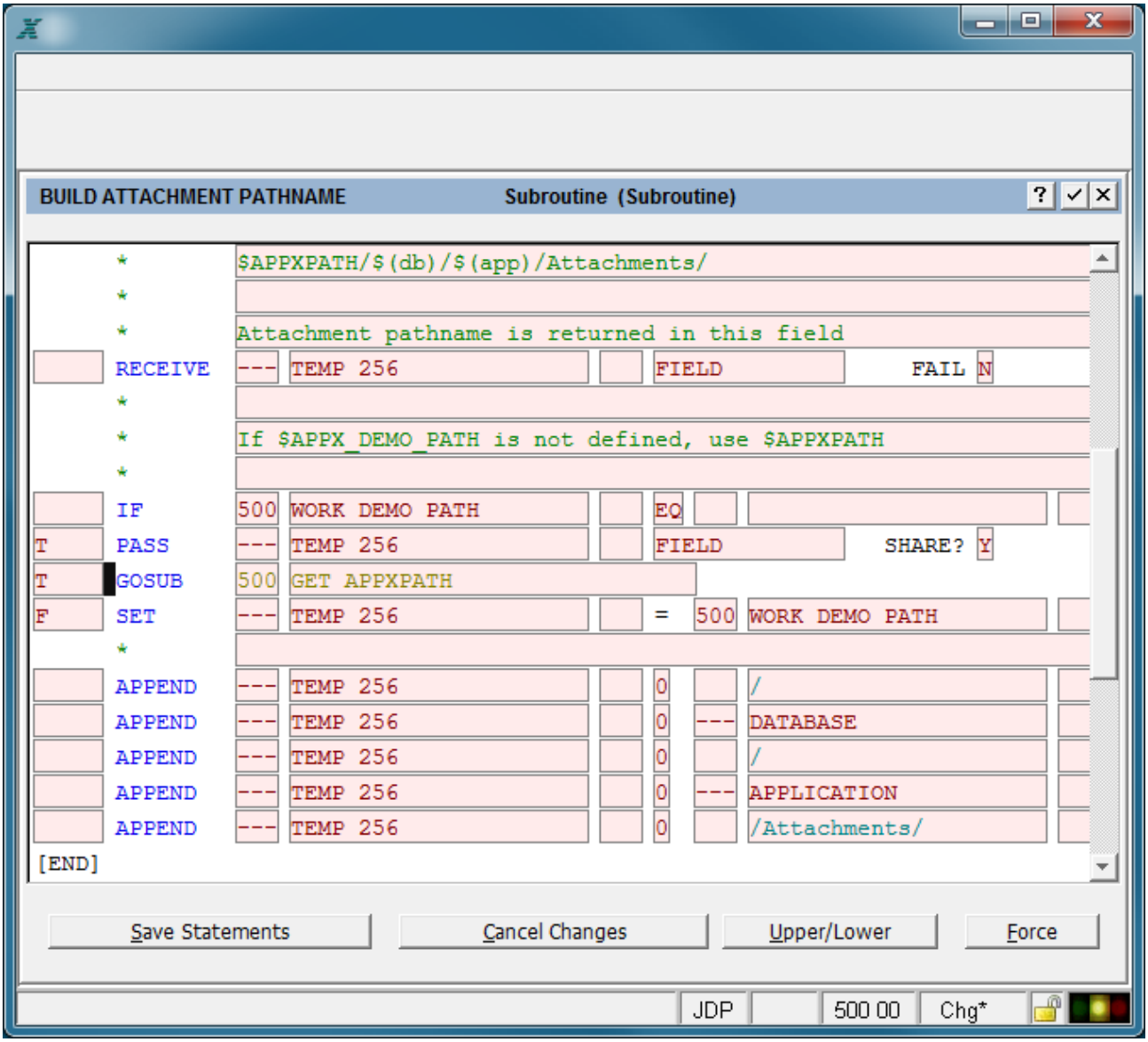
Return (current line) By positioning the cursor (using *First, Last, Previous, Next, Down, Up,* the arrow keys, or Search, described later in this chapter), you indicate to the system a second 'delete marker'. The second marker, together with the original marker that you set before you selected delete mode, specifies the range of statements you want to delete. The second marker can be above (before) or below (after) the original marker in an ILF routine. The cursor can be positioned anywhere on the statement line. To delete a single statement, do not move the cursor from its current position. When you press Enter, all statements within the specified range (including the statements with markers) are deleted. Until you press Enter, no deletion occurs; the Enter button triggers the delete operation.

Cancel (Cancel Delete) cancels the deletion. Selecting this option from the tool bar returns you to display mode. No statements are deleted if you select this option.

Search allows you to search for a particular word or string of characters to locate a particular statement line. Refer to the description of the Search option later in this chapter.

CHANGE MODE

When you select Option 12, F12, you are in full-screen editing mode. Up to an entire screen of statements displays, available for editing. In change mode, you can make modifications to any component of a statement except the keyword, which is protected from update. When you select change mode, the screen below displays.



An ILF Editor Screen in Change Mode

The following describes the options presented in a change screen:

Return to Save Edited Statements Press Enter to save an entire screen of edited statements as modified.

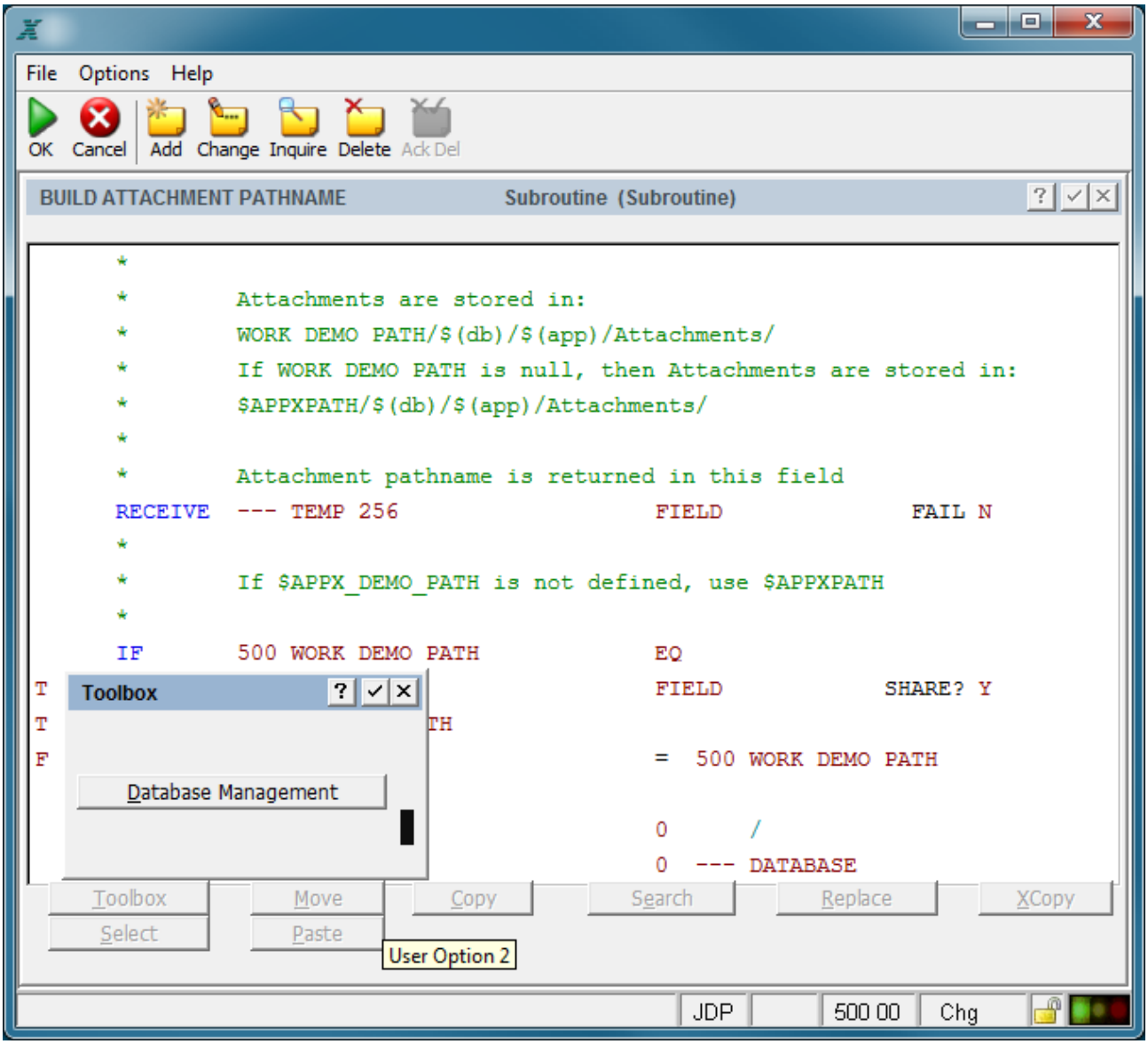
Cancel (Cancel Changes) cancels the modifications. Selecting this option from the tool bar returns you to display mode. Any changes that you just keyed on the screen are lost.

Upper/Lower toggles between uppercase-only and upper-and-lowercase mode. APPX usually defaults to uppercase-only mode. Refer to the previous description under Add Mode for a complete set of rules for using the Upper/Lower option.

Toolbox (Option 1)

Toolbox

The toolbox option allows you to have access to the Database Management option with all of its facilities for maintenance of domains, files and fields, and work fields. The figure below is an example of the ILF Editor Toolbox overlay.



ILF Editor Toolbox Overlay

Move (Option 2)

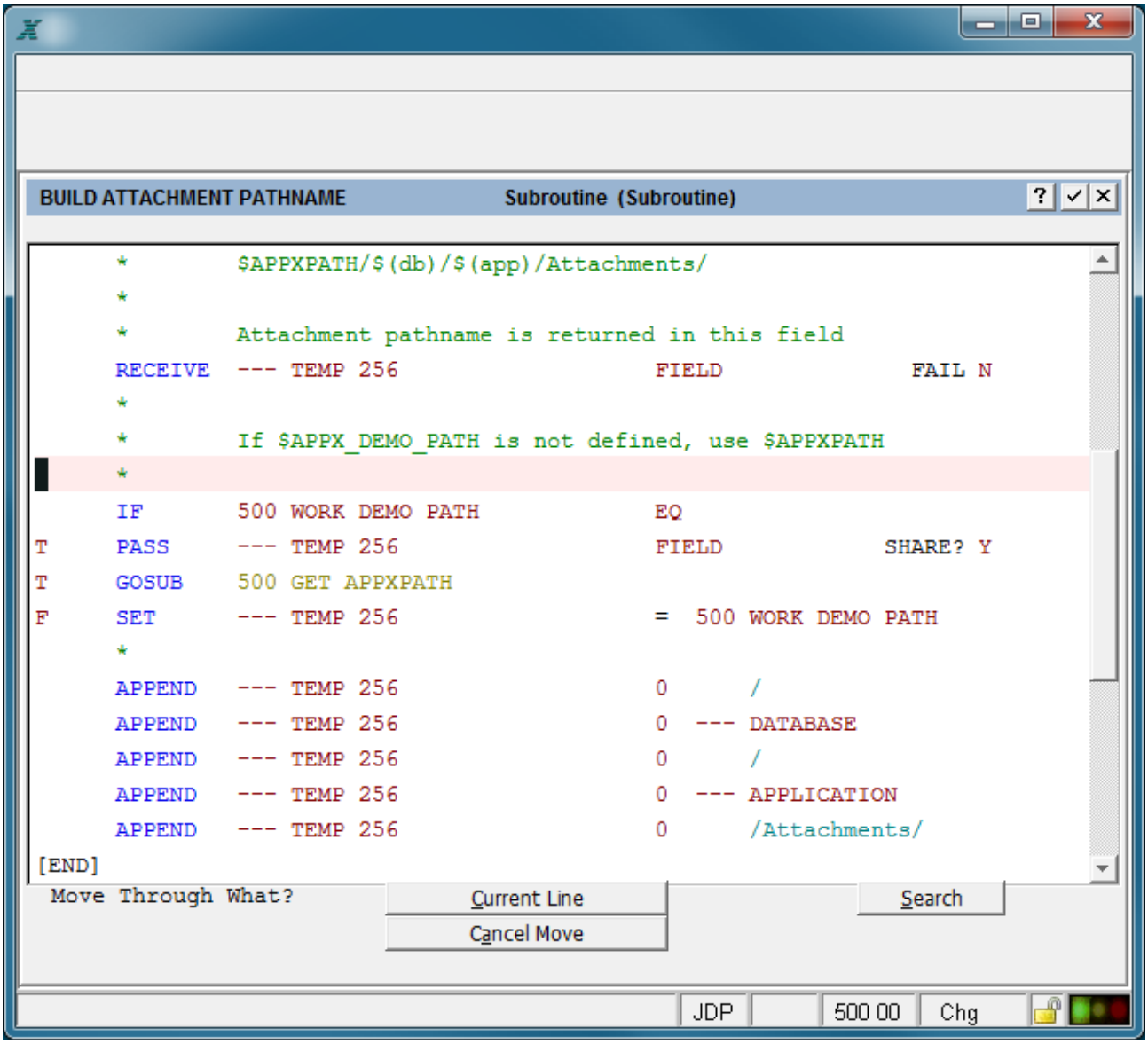
Move

Select this option when you want to move a single statement or a group of contiguous statements within an ILF routine. Position your cursor anywhere on the first (or only) line you want to move. When you select the Move option, two things happen:

You automatically set a 'move marker' on the line where the cursor is positioned, and

You enter into move mode with its own set of options.

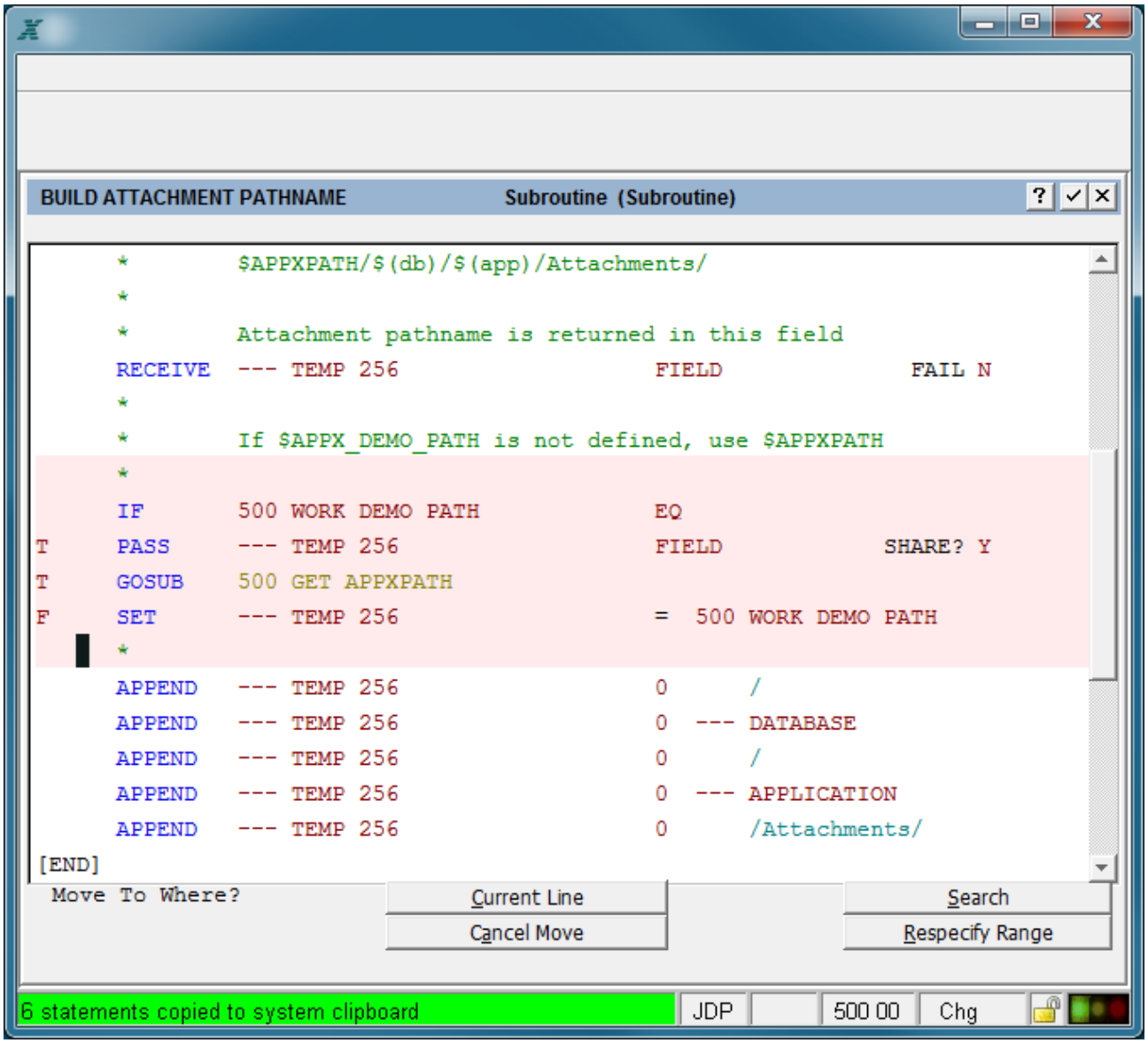
When you select move mode, the screen below displays.



First Move Mode Screen in the ILF Editor

The question *Move Through What?* is now on the left side of the option area. Each option is described as follows:

Return (current line) By positioning the cursor (using *First, Last, Previous, Next, Down, Up,* Search, or the arrow keys), you indicate to the system a second 'move marker'. The second marker, together with the original marker that you set before you selected move mode, specifies the range of statements you want to move. The second marker can be above (before) or below (after) the original one in the ILF routine. The cursor can be positioned anywhere on the statement line. To move a single statement, do not move the cursor from its current position. When you press Enter, the screen below appears.



Second Move Mode Screen

The question *Move To Where?* now appears on the left side of the option area. Using the appropriate options and arrow keys, you move the cursor onto the statement *before which* you want to move the range of statements you marked. Then, press Enter to finish the move. Until you press Enter, no move occurs. The following options are available on this screen:

Return (Current Line) Press Enter to finish the move operation.

Cancel (Cancel Move) cancels the move operation. Selecting this option returns you to display mode. No statements are moved if you select this option.

Search allows you to search for a particular word or string of characters to locate a particular statement line. Refer to the description of the Search option later in this chapter.

Respecify Range allows you to reset the second move marker.

Copy (Option 3)

Copy

This option operates in the same manner as the *Move* option described previously, except that the original statement or group of statements is left intact, and a duplicate copy of the statement(s) is inserted at a designated spot in a routine. There is both a ***Copy Through What?*** and a ***Copy To Where?*** screen where you specify the statement(s) you want to copy and the location to which you want to copy them. Refer to the instructions previously provided under *Move*, replacing the word *move* with *copy* wherever it occurs.

Search (Option 4)

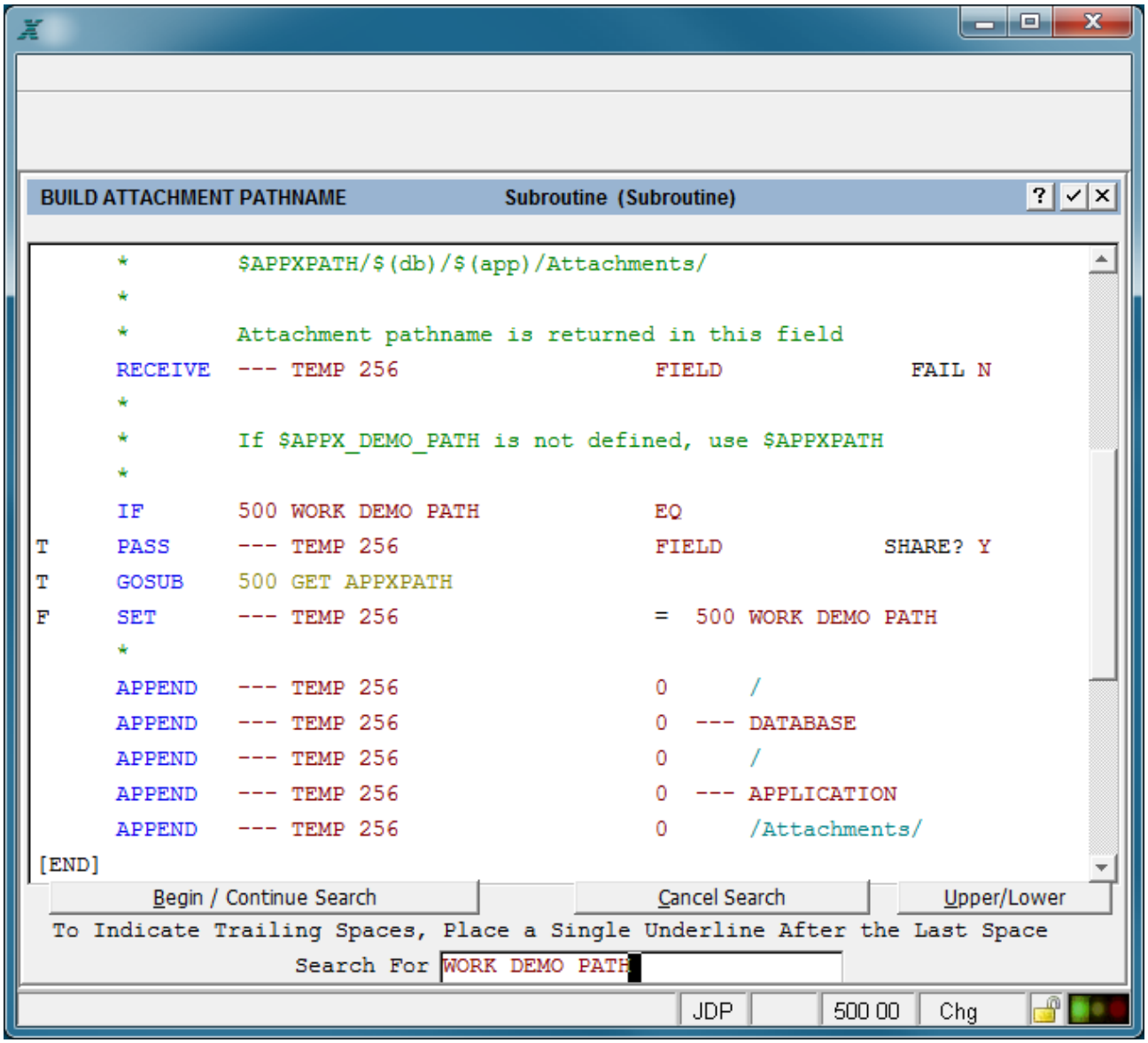
Search

Select this option when you want to search for a specific word or string of characters contained anywhere in an ILF routine. After selecting Search, the screen below appears.

The Search screen presents a place on the bottom line to enter a word/string to be used in a search, and three options to choose from. The cursor is positioned on the first character of the search area at the start of a search operation.

You begin a search by entering the exact word or character string you want to find, up to 28 characters long. You enter the string after the *Search For* label at the bottom of the screen.

You may specify significant embedded spaces so that you can distinguish, for example, between a search for MAKE-UP from one for MAKE UP. You may enter a partial word such as ACC, which would find a match with both ACCOUNT and ACCESS, for example.



ILF Editor's Search Option

To indicate trailing spaces, enter a single underscore character after the final space you want to specify. For example, if you wanted to search for NAME with one space after the word, leave one space after NAME and enter an underscore after the space.

> Note also the use of the Upper/Lower option defined below to distinguish upper- and lowercase letters. The Search operation is case-sensitive, so if you want to search for the string 'Invalid Entry', you need to select Upper/Lower before entering the words 'Invalid Entry'. If you do not select the Upper/Lower option, your entry would be INVALID ENTRY, and you would not get a match on 'Invalid Entry'.

After entering the desired search text, you have the following three options to select from:

Return to Begin / Continue Search Press Enter to initiate a search, and APPX highlights the first occurrence of the matching word/string. The cursor is positioned on the first character of the matched text, and the entire statement line is highlighted. Each time you press Enter, you direct the system to locate the next occurrence of the matching word/string. If no match is found, either initially or in a subsequent search, a message to this effect displays.

Cancel (Cancel Search) terminates the search operation and returns you to display mode.

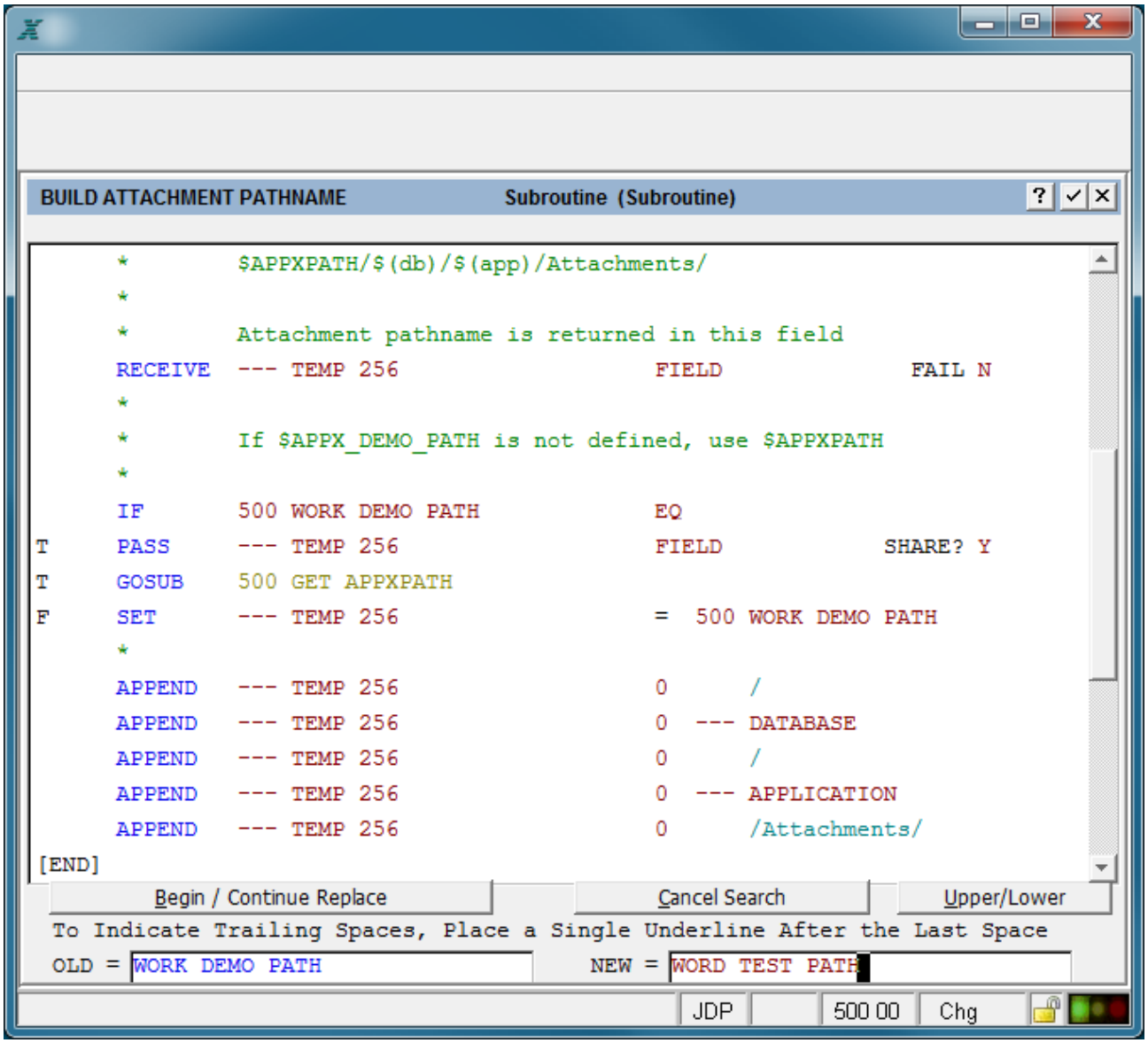
Upper/Lower toggles between uppercase-only and upper-and-lowercase mode. See the previous description of this feature.

The editor preserves the character string you enter until you leave the current event point. If you want to search for a different string, type over the previous text. If the previous string is longer than the new text you are entering, be sure to press the space bar enough times to clear out unwanted characters at the end of the string.

Replace (Option 5)

Replace

This option allows you to replace all occurrences of a specified word or character string with another string you designate. The Replace Option appears very similar to the Search Option described previously. The primary difference is that you specify both the old value (which APPX searches for) and the new value that is to replace the old one. You control each replacement operation by pressing Enter, and you can cancel at any time. The Replace Option screen is shown below.

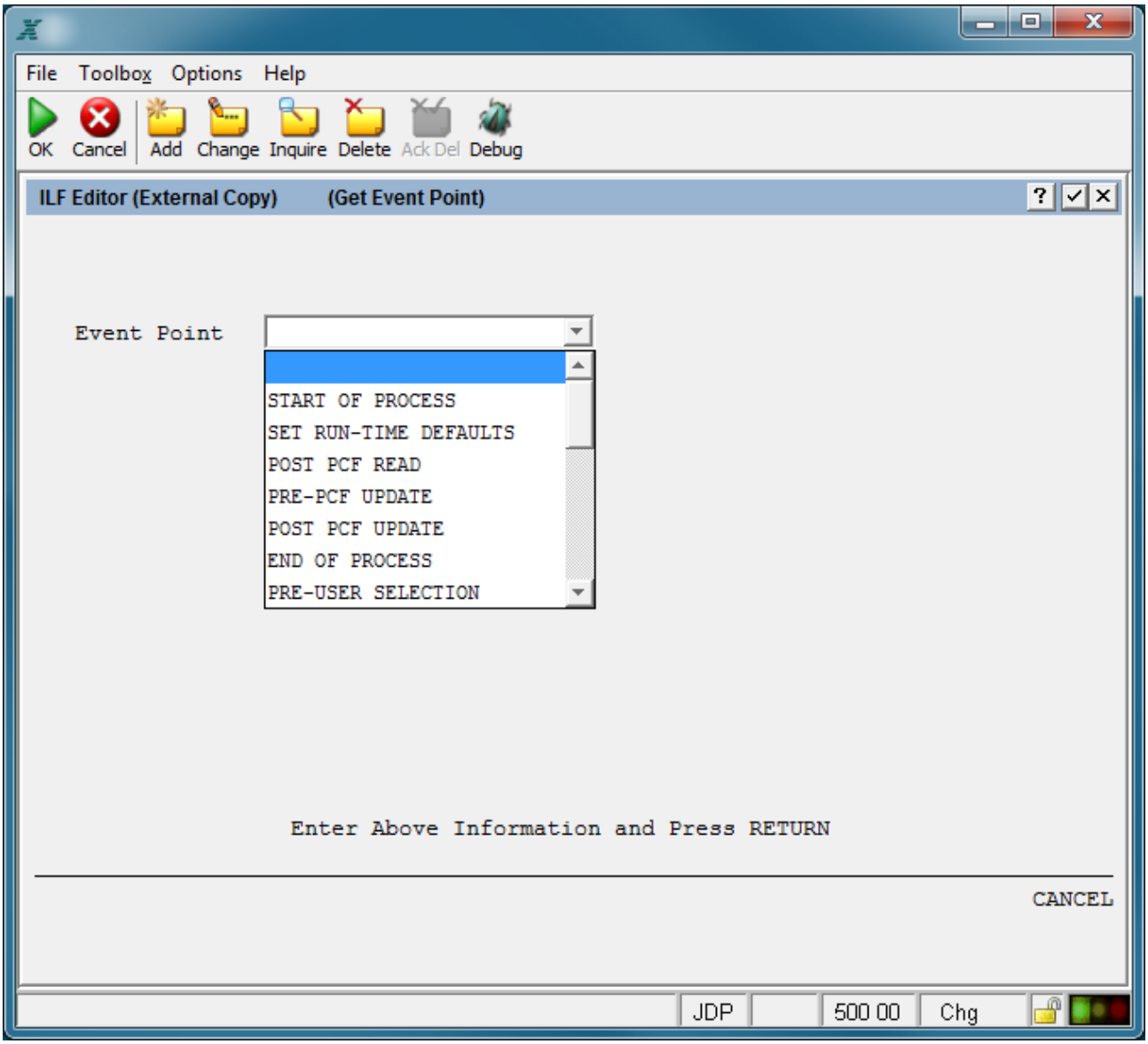


Replace Option Screen

XCopy (Option 6) (external copy)

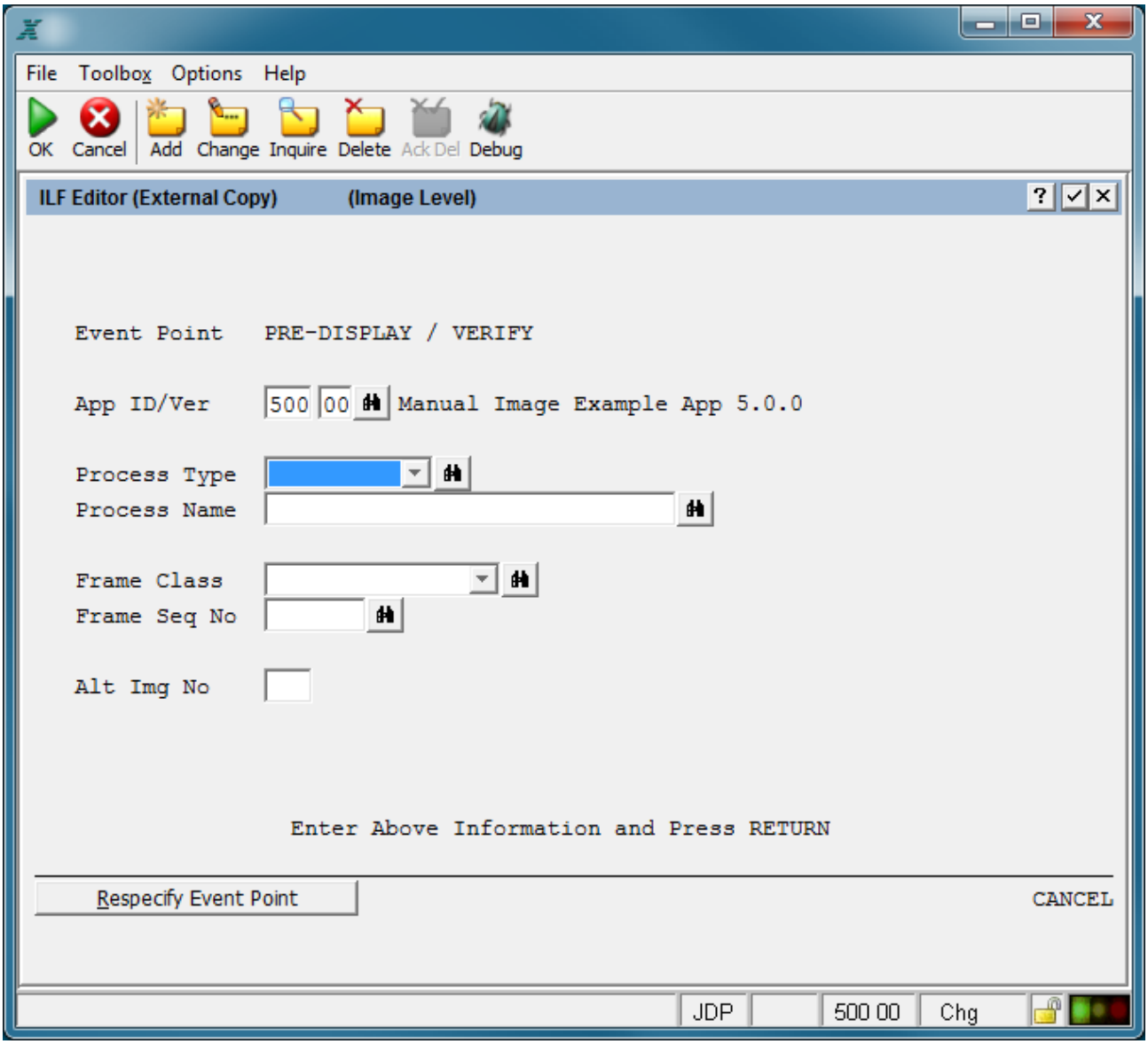
XCopy (external copy)

This option allows you to identify another existing ILF routine and copy some or all of the statements from that routine into the one you are currently working on. To use an existing routine as a 'starting point' for a new routine, select the desired event point and, once on the editor screen, immediately select Xcopy and copy the desired statements. Then you can proceed to modify the copied routine as desired. For routines that already have existing statements, position the cursor on the line *before which* you want to move the external statements after you select the desired range of statements. The screen in below displays when you select the Xcopy option.



ILF Editor External Copy (Get Event Point) Screen

Enter the name of the event point from which you want to copy statements. The Help option can tell you all of the possible event points. Depending on your entry, another screen will request additional information. On the screen shown below, you are being asked to identify the process type and name for the *Pre-Display/Verify* event point.



ILF Editor External Copy (Process Level) Screen

If you specify a frame, or image-level event point, you will also be asked for the frame and/or image number.

Select (Option 7)

COPY NEW TEXT HERE

Paste (Option 8)

COPY NEW TEXT HERE

Restore (Option 11)

COPY NEW TEXT HERE

Using Comments

There are two special keywords that you can use to enter comments in a routine: either a single or double asterisk (* or **). Refer to ILF keywords * (Comment) or ** (Comment) for details on how to use them.

In addition, during the course of debugging a routine, you may want to temporarily disable one or more valid statement keywords to see how a routine would execute without the statement(s) included. You can use the editor to accomplish this by entering a 'C' or an '*' (for comment) in the first character position of each statement line. This area is normally reserved for a true/false execution condition but a 'C' or an '*' overrides this normal use. When you execute the routine, the lines are bypassed as if they were comments. After appropriate testing, use the editor to reinstate the original true/false execution condition value, if desired, or delete the statements if you want to remove them permanently.

CHAPTER 4-5

The Appx ILF Debugger

Analyzing Logic Errors

As described in ILF Integration, APPX automatically identifies errors encountered during statement entry, during the compilation process, and at runtime. However, ILF routines may still include the more subtle logic errors that can be identified and resolved only by thorough testing procedures. It is up to you to detect logic errors before you actually put an application into 'live' production mode. The ILF provides you with a powerful tool to assist in this testing and debugging activity called the *ILF Debugger*.

The Features of the Debugger

The ILF debugger includes many features that allow you to test the logic of ILF routines. Within the debugger, you can:

Watch the effect that a single statement or group of statements has on specific field values.

Execute a routine one statement at a time.

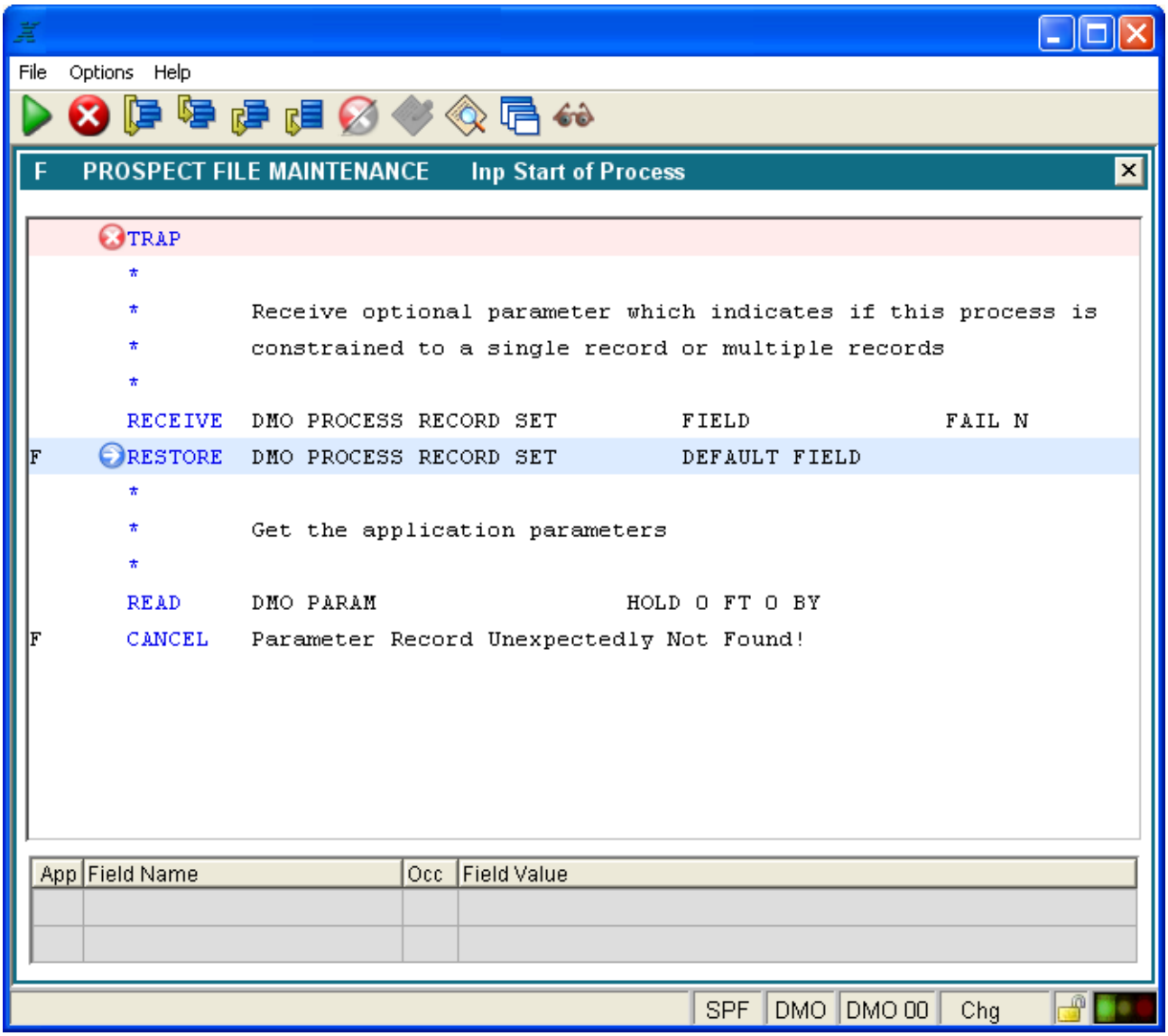
Dynamically set and clear break points to interrupt a routine at a point where you want to review and analyze it.

Dynamically enter called subroutines and use the debugger in the called subroutines.

Modify field values in accordance with known or desired expectations.

Overview

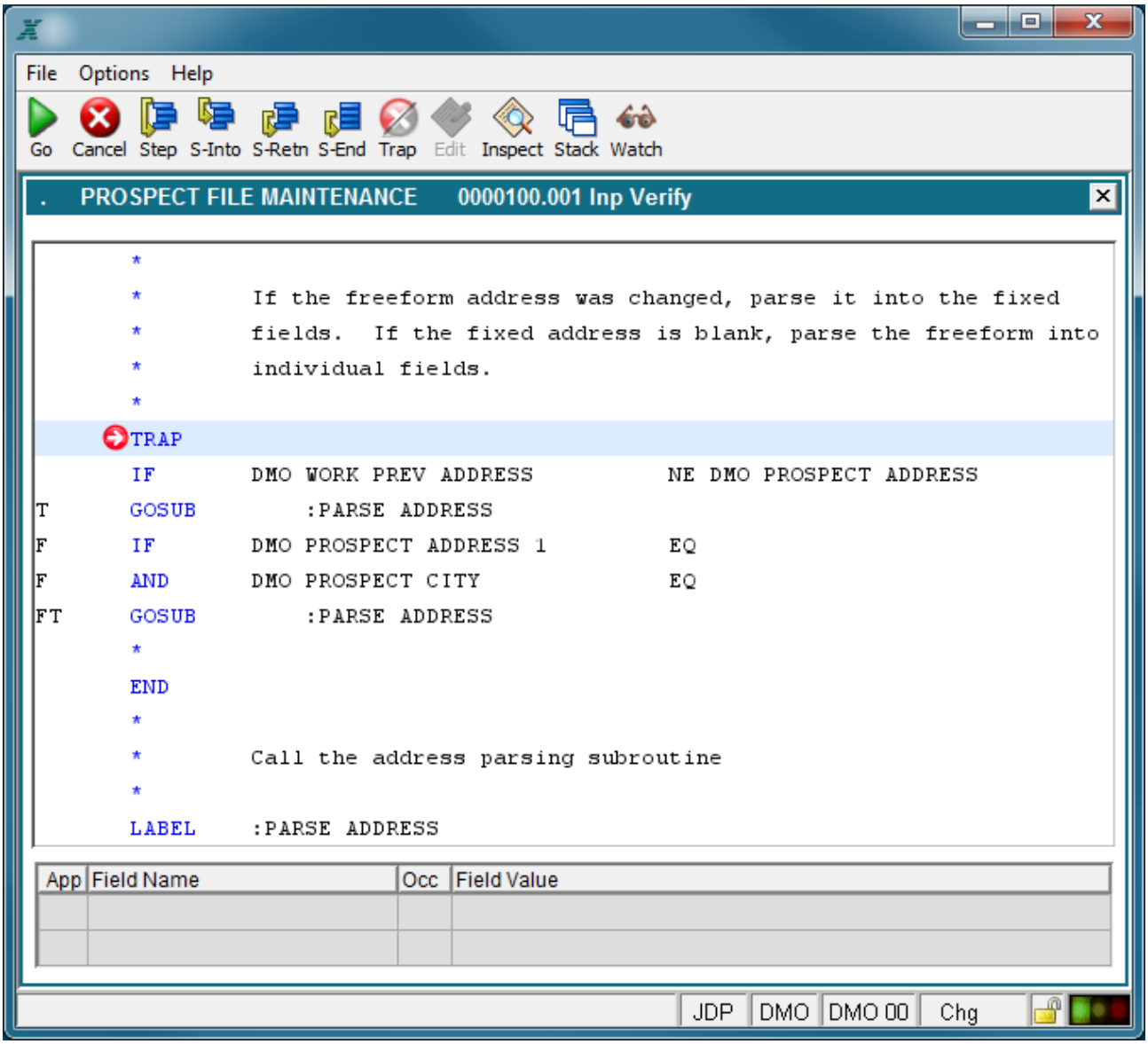
The APPX ILF debugger is a powerful debugging tool that enables the APPX application designer to examine field values and to observe how field values change as individual ILF statements are executed. The APPX ILF Debugger is invoked as the result of executing a TRAP statement when testing a process or automatically as the result of encountering a runtime error such as a Numeric Overflow.



Appx ILF Debugger

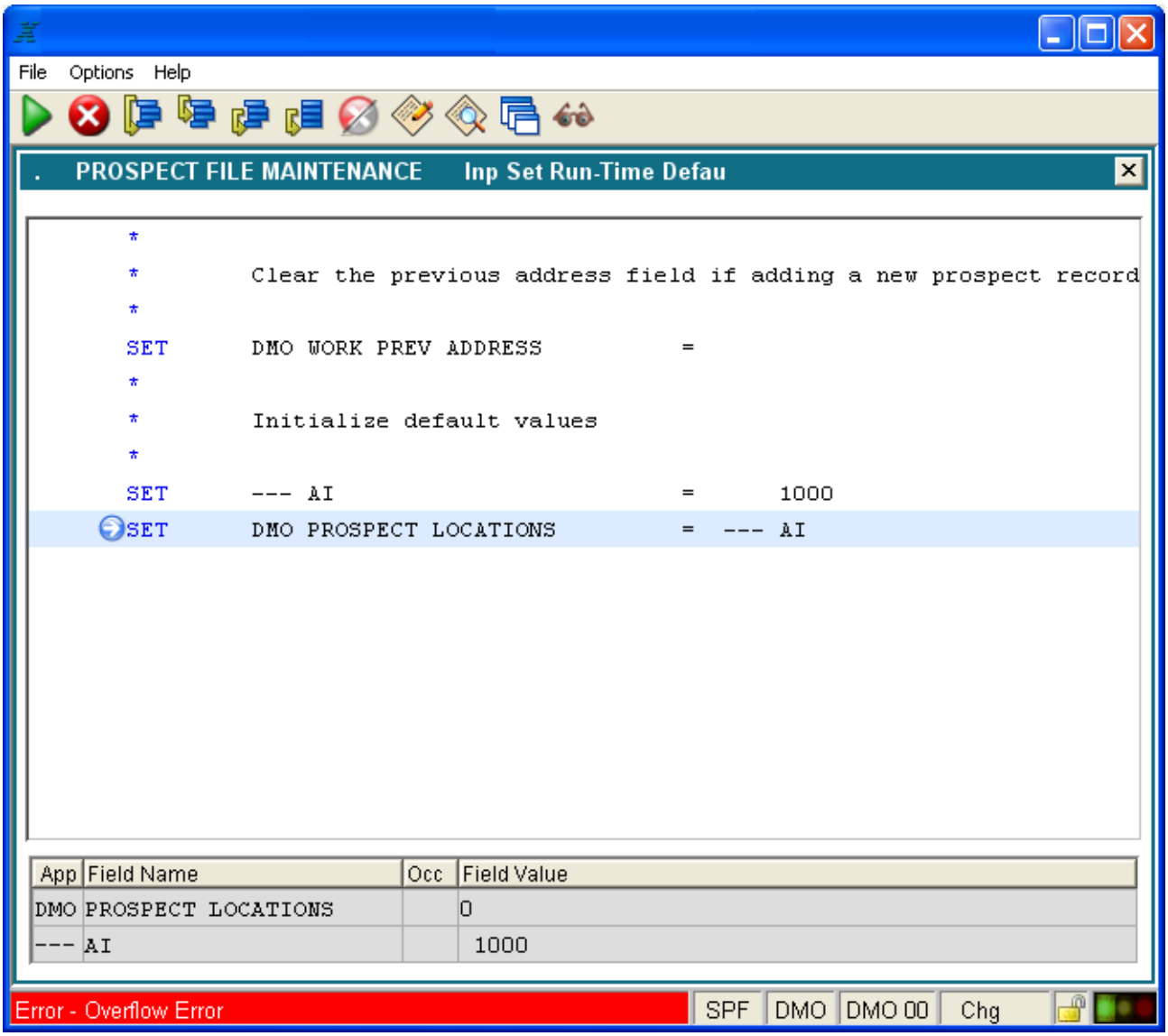
Main Debugger Window

The main window of the ILF debugger displays the ILF statements which precede and follow the next line to be executed. If the ILF debugger is displayed as the result of encountering a TRAP statement, the next line to be executed will be the TRAP statement. In the example below, the TRAP statement is highlighted with a light blue background. The white arrow in the red circle points to the statement to further hightlight it.



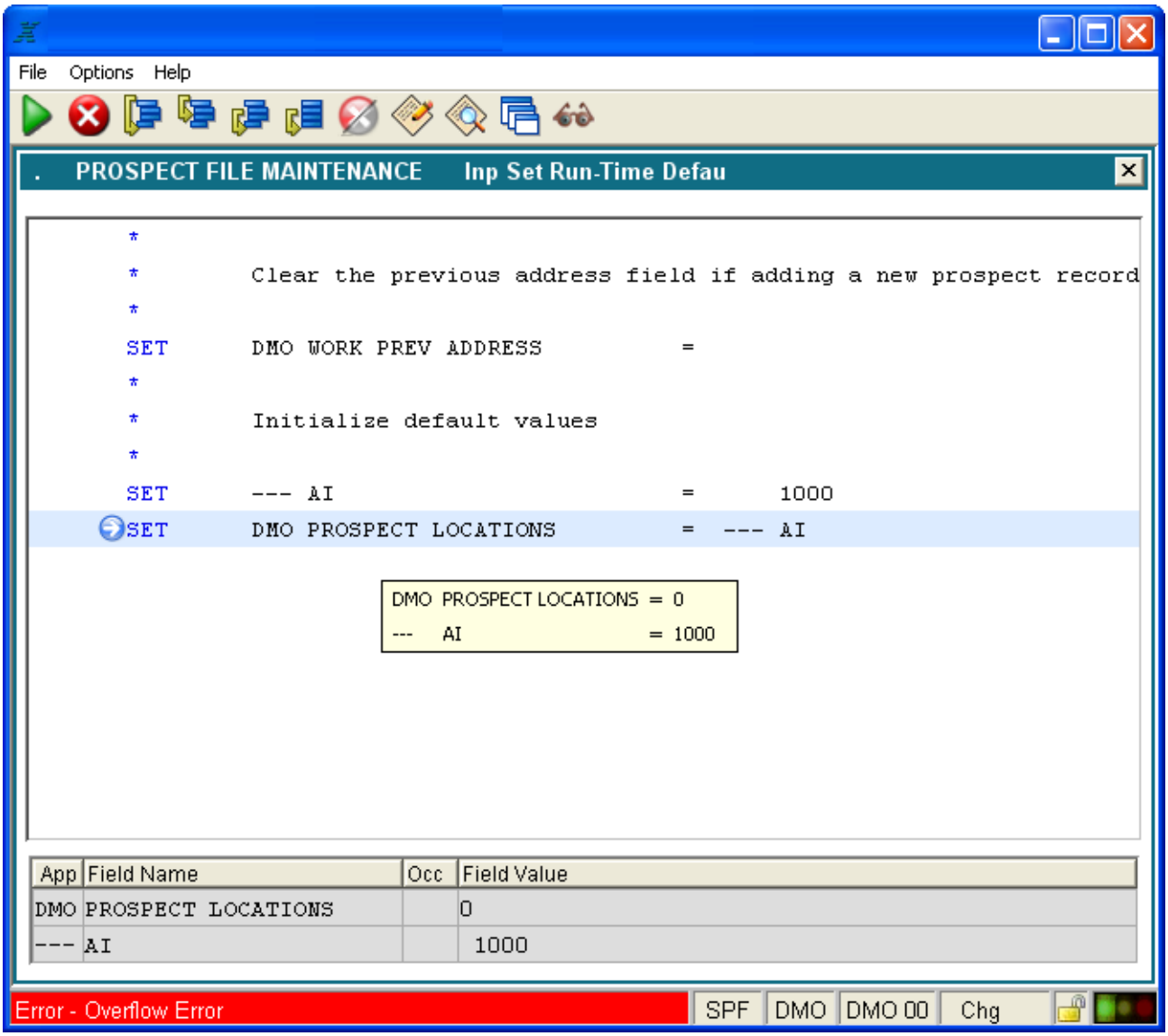
ILF Debugger

If a runtime error causes the ILF debugger to be invoked, the statement which caused the error will be highlighted with a light blue background color. The white arrow in the blue circle points to the statement to further hightlight it. In the example below, notice that the value for the fields for the current statement are displayed in the field value window on the bottom of the screen.



ILF Debugger

Field values can also be viewed in a popup tooltip by moving the mouse pointer over any ILF statement which references a field.



ILF Debugger

Toolbar Buttons

The Toolbar contains a variety of buttons that facilitate debugging of a process:

Go [Option 0]- Resume normal execution.

Cancel [Ctrl+F8]- Abort process being debugged.

Single Step [RETURN] - Execute the current line and stop on the next line in the current routine.

Step Into [Option 1] - Execute a process or subroutine and stop on the first statement of the routine.

Step Return [Option 2] - Resume execution and stop on the next RETURN statement.

Step End [Option 3] - Resume execution of the current routine and stop on the last statement in the routine.

Toggle Trap [F3] - Enable/Disable a trap on the current statement.

Edit Values [F12] - Edit the value of the variables on the current statement.

Inspect/Edit Value [F11] - Inspect and/or edit the value of a specified variable

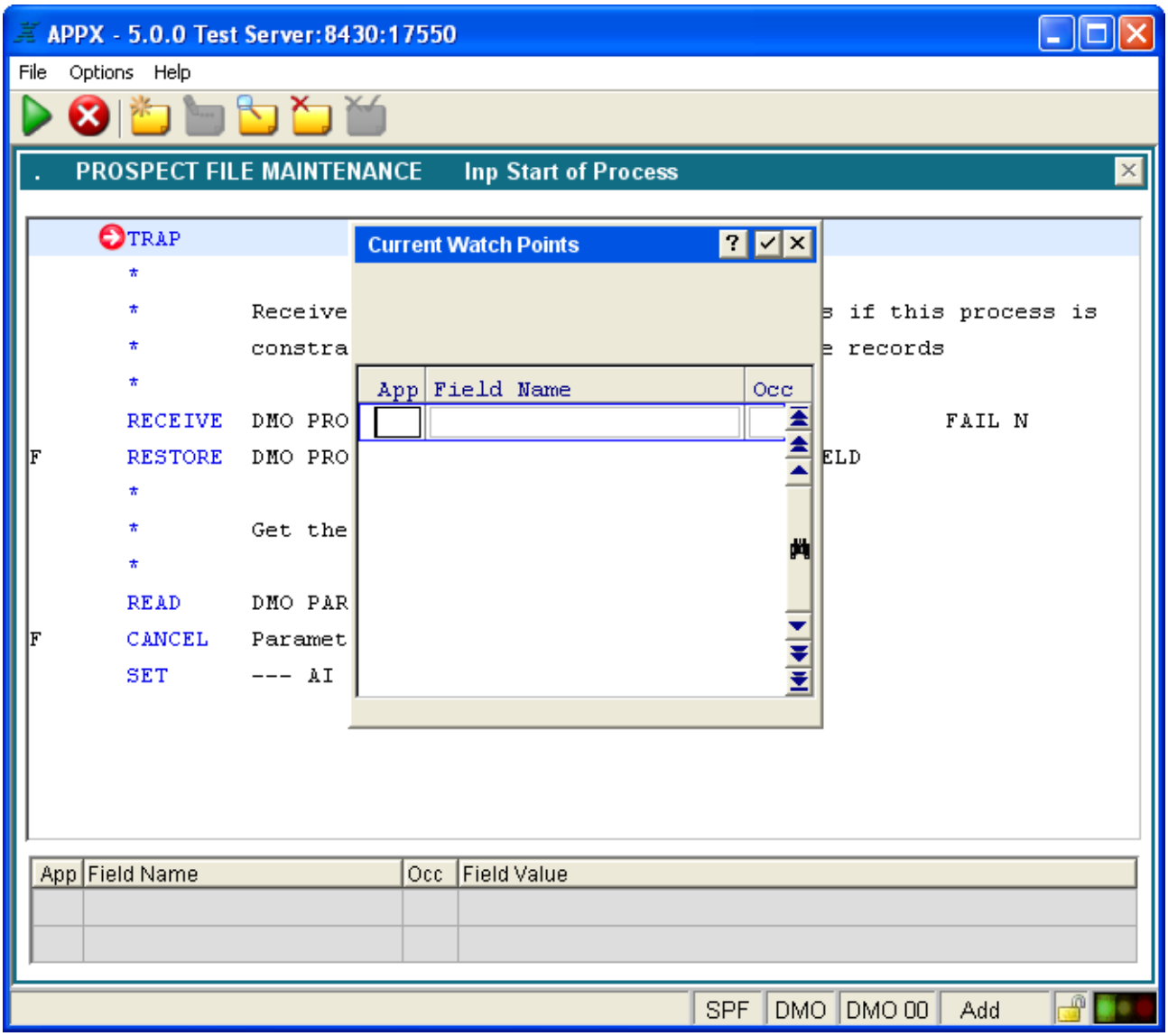
View Process Stack [Ctrl+1]

Watchpoint [F10] - Set or Clear watch points on individual variables

Execute Next [F9] - Set next statement to execute

Watchpoints

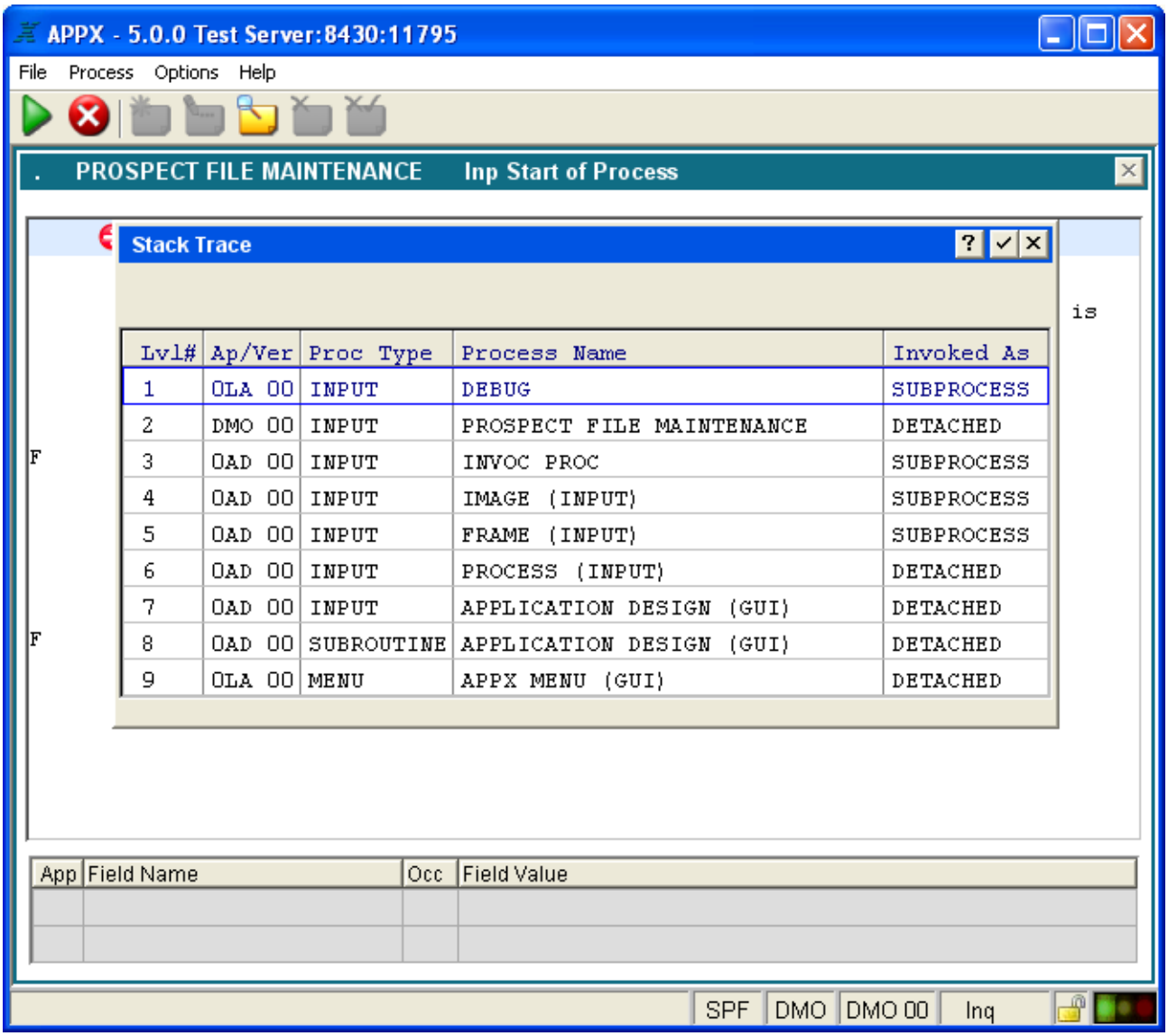
Watch points can be very helpful when debugging a process. An APPX watchpoint is a field name that you want APPX to "watch". Anytime the value of the field changes, APPX will invoke the ILF Debugger and alert you to the change in value.



Watchpoints

Process Stack

When debugging a process, it is sometimes useful to be able to view the process stack. The process stack is simply a list of the "ancestor" processes of the process that is currently running. In the example below, the level 1 process is the current input process named DEBUG which displays the process stack list. The level 2 process is the process that is currently being debugged. In this example, the process being debugged is an input process in application DMO named PROSPECT FILE MAINTENANCE. The level 3 and higher processes identify the various processes in application design that were run to design and then test the PROSPECT FILE MAINTENANCE input process.



Process Stack

The Layout of the Debugger Screen

The debugger screen includes four separate areas:

Key Information

Display and Debugging Area

Data Values Area

Options

Key Information

The **key information** line (or title line) under the APPX toolbar. The figure below contains the following items, from left to right:

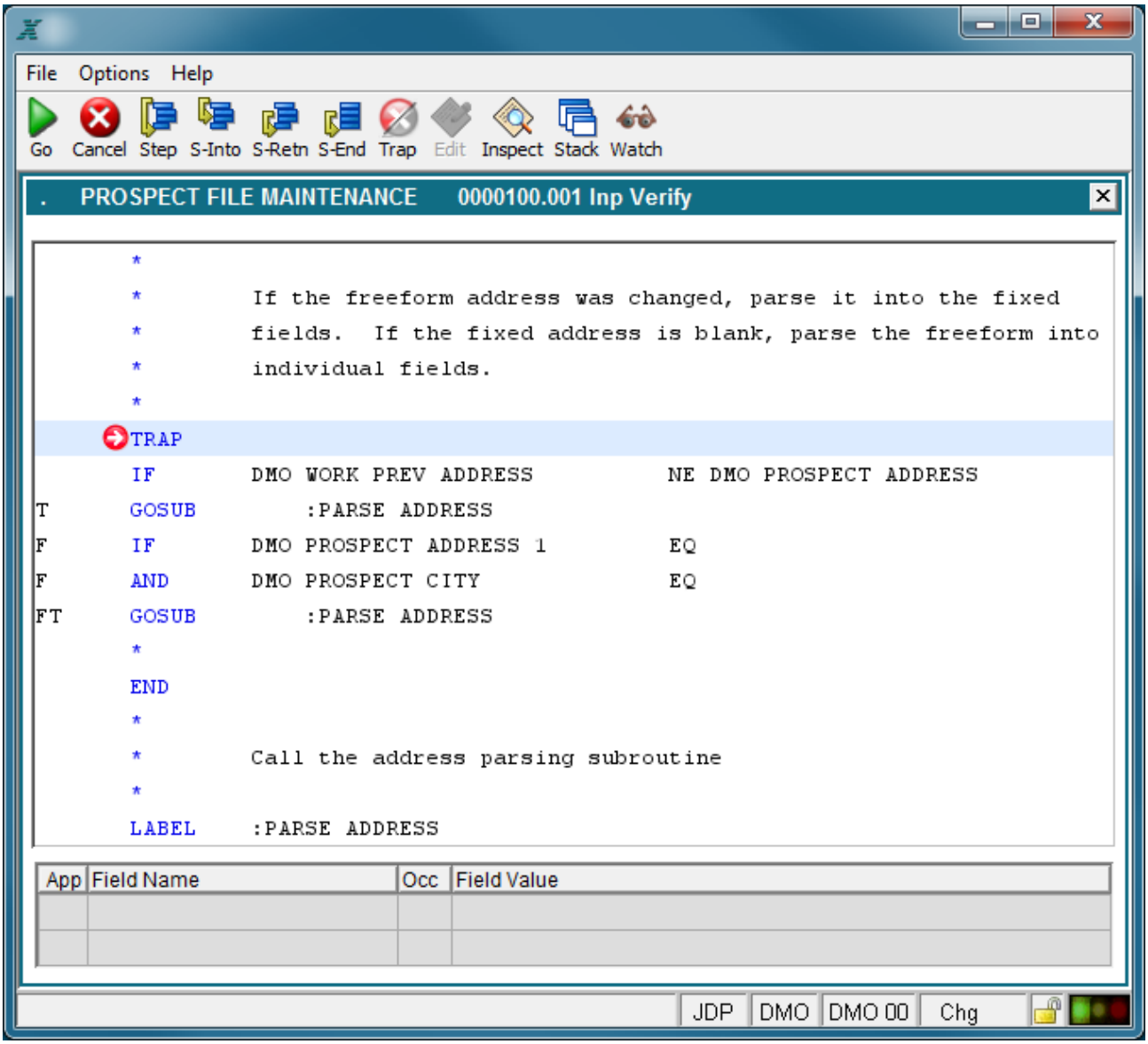
Positions 1 through 5 display the current values of the internal true/false status indicators. As you execute statements during the debugging procedure, the system dynamically updates these values as they are set and reset to help you evaluate whether statement logic is correct. Note that the line is left justified so if no true/false indicators are currently set, the next field (process name) appears first.

The **process name**, such as "PROSPECT FILE MAINTENANCE".

The **frame number, image number,** and **child sequence number**, such as "0000100.001".

The **process type** abbreviated, such as 'Inp' for input.

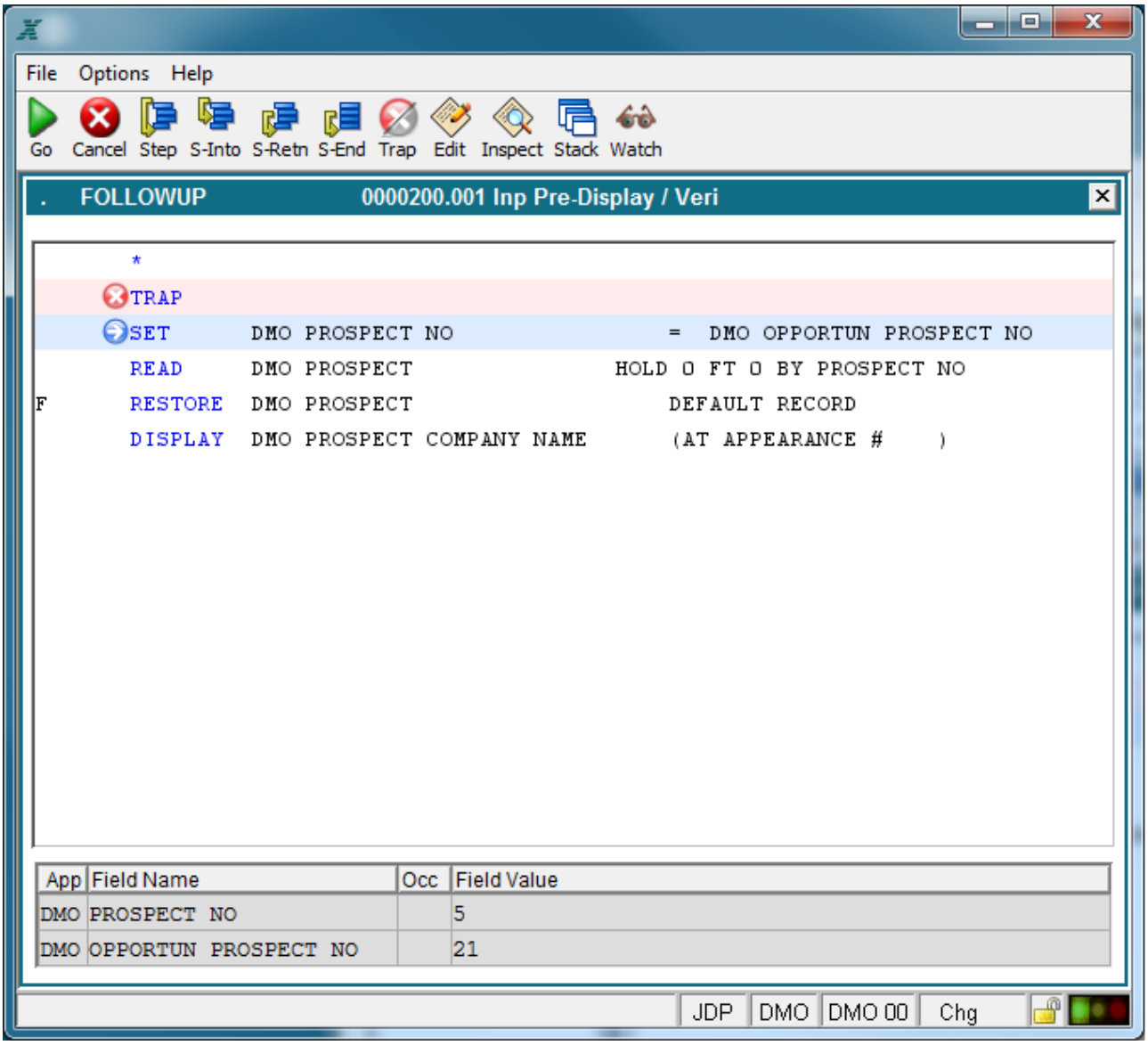
The **event point**, such as *Verify*.



An Initial Debugger Screen With Key Information

Display and Debugging Area

The statement **display and debugging area** shows individual statements, and is where you specify which statements to include in the debugging operation. Note that the statement line where the cursor is positioned is highlighted; this is called the *current line*. This area is shown below:



Display and Debugging Area of a Debugger Screen

Data Values Area

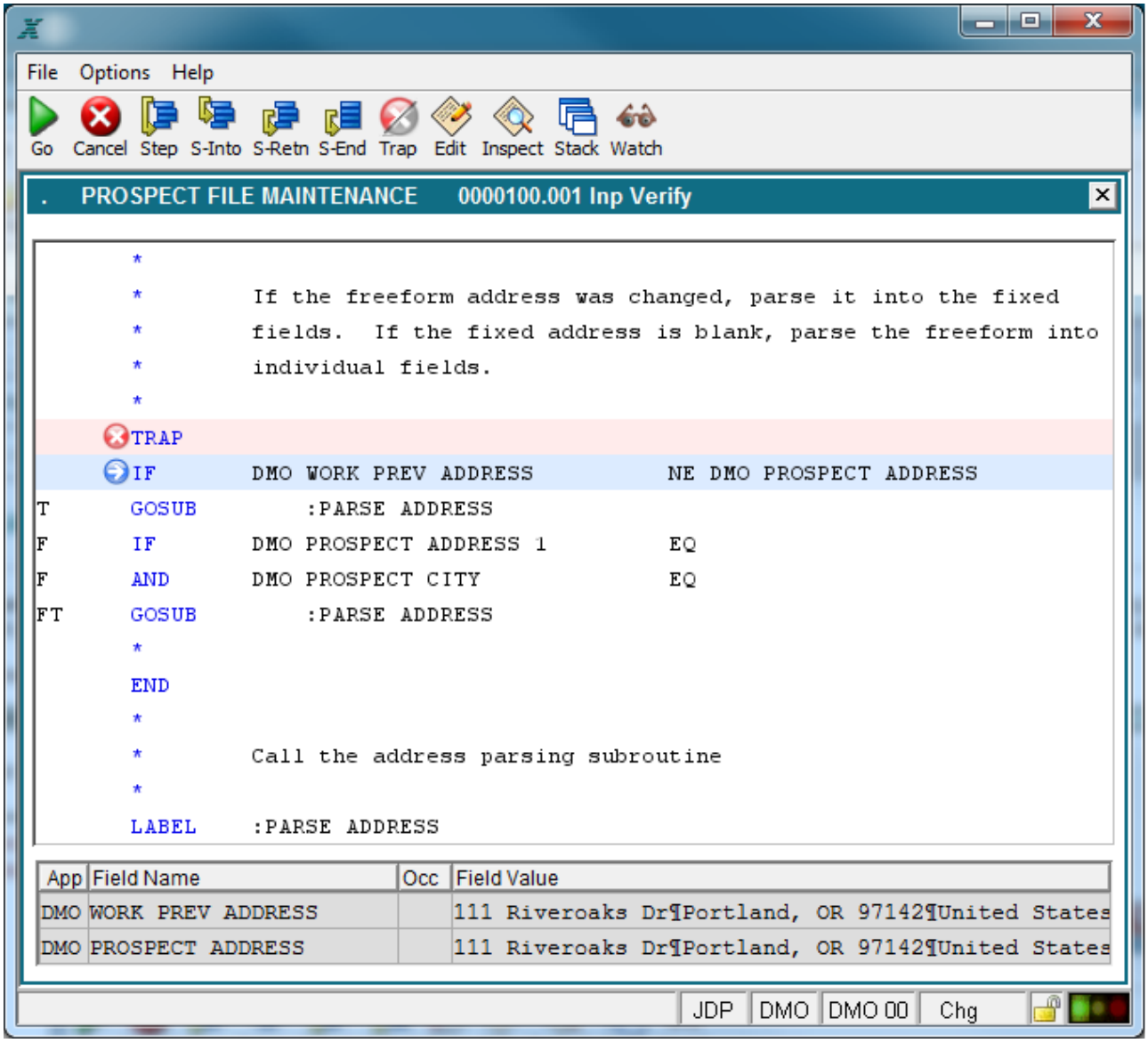
The *data values area* displays the current values for any fields that are specified in the statement that is currently highlighted in the debugging area. The highlighted statement has not yet executed, so the values reflect the last statement executed. If the current statement has no specified fields, this area is blank.

Consider the following statement example:

```
     IF        DMO WORK PREV ADDRESS     NE DMO PROSPECT ADDRESS
```

The data area may look as follows, as shown below:

```
Appl Field NameOcc  Field Value
DMO   WORK PREV ADDRESS 111 Riveroaks DrPortland, OR 97142United States
DMO   PROSPECT ADDRESS  111 Riveroaks DrPortland, OR 97142United States
```



Data Area of a Debugger Screen

If the highlighted statement specifies only one field, the other field name and value will be blank. In the following example, only one field is referenced:

```
    DISPLAY  DMO WORK PREV ADDRESS    (AT APPEARANCE #   )
```

The data area may look as follows:

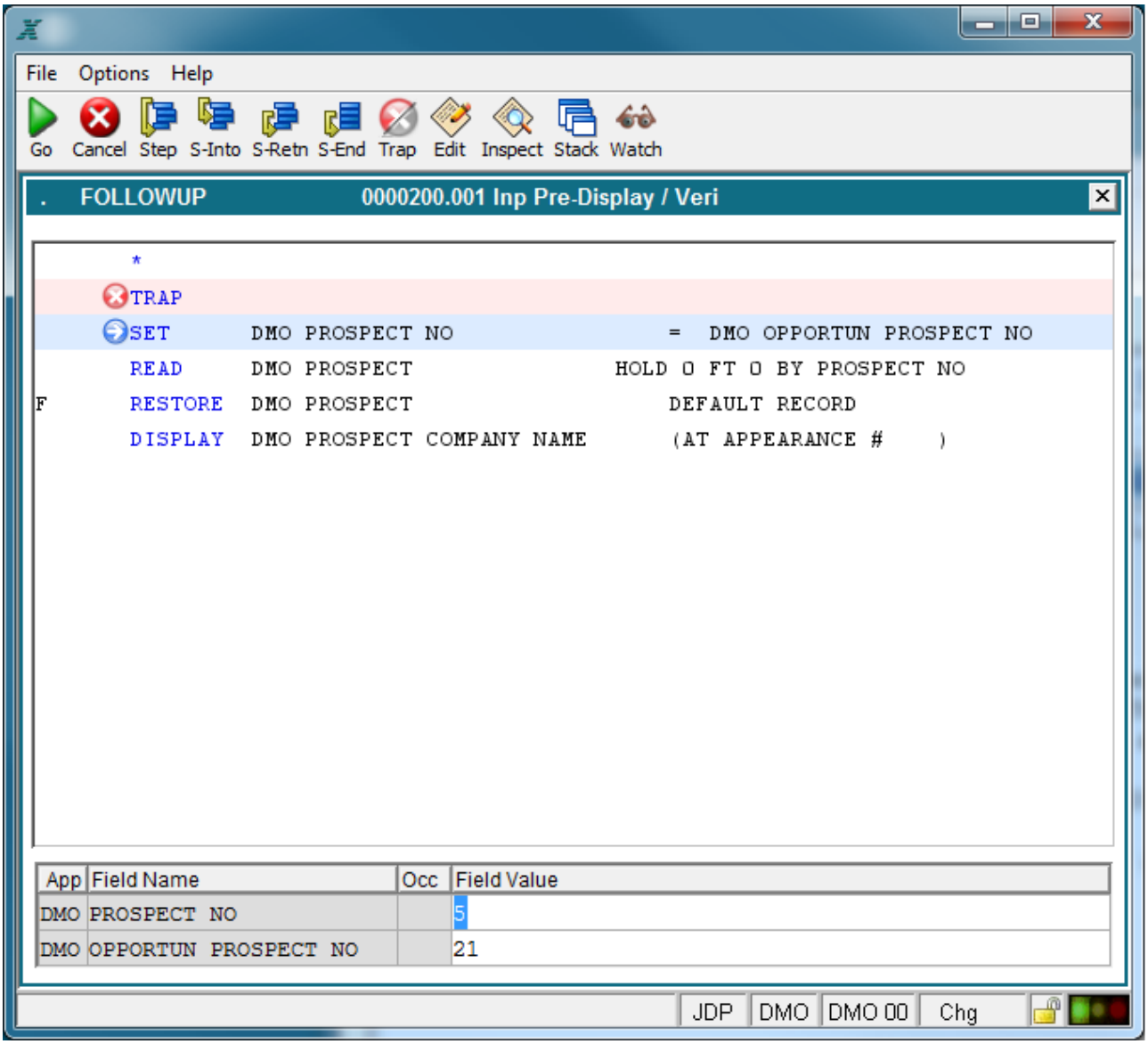
```
Appl Field NameOcc  Field Value
DMO   WORK PREV ADDRESS 111 Riveroaks DrPortland, OR 97142United States
(Line 2 is blank.)
```

For statements such as TRAP that have no field references at all, both field names and values are blank, as shown previously *here*.

While stepping thru ILF code, you can press F11 to inspect the value of any field, as usual. When prompted for the field name, you can press F2 to scan the Data Dictionary for valid field names. You can also press F2 on the 'App' field to scan for valid Application Id's.

Options

Below the data area in a debugger screen are the ***options*** that allow you to perform the various debugging functions. These options are shown below. The next section discusses available options and describes how to use them.



.Options Area of a Debugger Screen (Change Values Selected)

The TRAP Statement

By inserting a TRAP statement in a routine, you are setting a break point that signals APPX to invoke the debugger when the process containing the routine executes. The placement of a TRAP statement is significant because, when the debugger is invoked, the first statement that displays on the debugger screen is the first TRAP statement that executes during the normal execution of a process. You can optionally include additional TRAP statements at other points in a routine. If you insert more than a single TRAP, you are effectively setting a series of break points where processing is interrupted, one break point at a time, by repeatedly selecting the Go option. Each selection of the Go option moves you to the next break point.

Conditional Execution of the TRAP Statement

Like other statements, the TRAP keyword allows you to specify up to five true/false execution conditions. It is possible that, when a process executes, a TRAP statement is bypassed because of non-matching true/false status indicators. In this case, the TRAP does not interrupt processing, nor does it invoke the debugger. You are placed in the debugger only if a TRAP statement actually executes.

Hard Coded versus Dynamic Trapping

If you insert only one TRAP statement in an event point, you have several alternatives upon reaching the debugger screen:

By selecting Go, you can execute from the TRAP statement all the way through to the logical end of a process. To reach the logical end of a process, you may be taken through the invocation of one or more automatic children along the way. The only exception is that, if the routine involves a loop that causes the logic to re-execute the TRAP statement, processing is interrupted again at the TRAP until the loop ends.

By pressing Enter you can single-step through a routine, one statement at a time, beginning with the TRAP statement.

You can set additional break points dynamically by positioning the cursor on any desired statement line and pressing Select (F3) to clear or set a TRAP. When you select Go, you execute from the TRAP statement up to (but not including) the next break point.

By selecting Step/End, you can step directly to the last statement in the current event point (and execute all the statements along the way). If, at this point, you press Enter, you execute the last statement of the current event point and automatically step to the first statement of the next event point within the current process. In this way, you can debug more than one routine with only a single TRAP statement. If there are no more event points, you are taken to the normal end of the process.

You can use Select to 'turn on' and 'turn off' a trap on any line, including TRAP statements. If you turn off a TRAP statement, it is simply bypassed during execution. The debugger alerts you to the statements that are in *active trap* mode; these active lines are brightened. To reverse the existing active/inactive status, simply position the cursor anywhere on the desired statement and press Select (F3). If a line was previously brightened, it reverts to normal color, and vice-versa. In this way, you control which lines have a TRAP set and, therefore, where break points occur when you execute a process by selecting the Go option.

The Options on the Debugger Screen

The options available on the debugger screen are listed below. Each option is described in detail in a following section of this manual.

Go [Option 0]- Resume normal execution.

Cancel [Ctrl+F8]- Abort process being debugged.

Single Step [RETURN] - Execute the current line and stop on the next line in the current routine.

Step Into [Option 1] - Execute a process or subroutine and stop on the first statement of the routine.

Step Return [Option 2] - Resume execution and stop on the next RETURN statement.

Step End [Option 3] - Resume execution of the current routine and stop on the last statement in the routine.

Toggle Trap [F3] - Enable/Disable a trap on the current statement.

Edit Values [F12] - Edit the value of the variables on the current statement.

Inspect/Edit Value [F11] - Inspect and/or edit the value of a specified variable

View Process Stack [Ctrl+1]

Watchpoint [F10] - Set or Clear watch points on individual variables

Execute Next [F9] - Set next statement to execute

Add Mode

Inquire Mode

Change Mode

Go

Go [Option 0]- Resume normal execution.

Single Step [RETURN]

Single Step

Single Step [RETURN] - Execute the current line and stop on the next line in the current routine.

This option allows you to 'step through' the routine one statement at a time by executing the current line (which is highlighted).

The logic of the current statement executes.

The data values change to reflect the result of executing the current statement.

The cursor moves to the next logical line in the routine, and it becomes the new current line (and is highlighted).

One important thing to note about Return is that the next statement is the next executable statement, not necessarily the next sequential statement. For example, in the following routine:

```
    IF       TAR WORK AVAILABLE CREDIT   LT   0
T   WARNING  Customer Han Exceeded Credit Limit!
    DISPLAY  TAR WORK AVAILABLE CREDIT        (AT APPEARANCE #   )
```

If the IF statement in this example encounters a false condition and sets the first true/false status indicator to *F*, the WARNING statement is not executed. By using Return to single-step, the debugger skips from the IF statement directly to the DISPLAY statement.

Additionally, using Return at a COPY or GOSUB statement takes you to the first executable statement immediately following the COPY or GOSUB statement, allowing you to skip over the statements in the subroutine.

StepInto

Step Into [Option 1] - Execute a process or subroutine and stop on the first statement of the routine.

To view the contents of the COPY or GOSUB routine, you must select Step/Into while positioned at the COPY or GOSUB statement. This steps you 'out' of the current statements and 'into' the referenced subroutine. Selecting Step/Into instead of Return keeps you 'in line', and allows you to execute the subroutine statements. Select Return to move through the subroutine one statement at a time, or select Step/End or Step/Ret to move to the next RETURN statement. Then, use Return to leave the subroutine.

Step/Ret

Step Return [Option 2] - Resume execution and stop on the next RETURN statement.

Step/End

Step End [Option 3] - Resume execution of the current routine and stop on the last statement in the routine.

This option allows you to step directly to the end of the current event point. All statements from the current statement line up to (but not including) the last statement in an event point execute. At this point, using Return executes the final statement and moves you directly to the first statement in the next logical event point of the current process. This sequence (Step/End followed by Return) effectively continues a trap operation, even if there are no more break points in subsequent event points of a process. It allows you to continue your testing procedure without having to leave the debugger to set additional break points.

You can proceed through all the event points of a process in the same manner. While in the second and subsequent routines, you can perform all normal debugging operations, such as setting additional break points and modifying field values. To leave the debugging facility, simply select Go to move to the normal end of a process.

[F3] Select (Clear or Set Trap)

🎯 Toggle Trap [F3] - Enable/Disable a trap on the current statement.

Select this option to reverse the active/inactive 'trap' status of the current statement line. You need to move the cursor to the desired line and then press Select (F3) to initiate a TRAP (if it is not already brightened), or deactivate a TRAP (one that is currently brightened). Select lets you 'toggle' back and forth between active and inactive 'trap' status. Remember, you can use Select on a TRAP statement as well as on any other statement type.

Add Mode (Debugger Screen)

Press the Add mode button (F9) to change the point of execution. While you are stepping through ILF code, the debugger highlights the next statement that will be executed. If you position the cursor to another executable line of ILF code and select the Add mode option, then that line will become highlighted and will be the next line executed. You can use this feature to skip sections of code, change a value and repeat a test, or step into a normally unreachable section of code. Care must be taken not to introduce logic problems such as executing an END READ without having executed the corresponding BEG READ first.

Restrictions to the Add mode option are as follows:

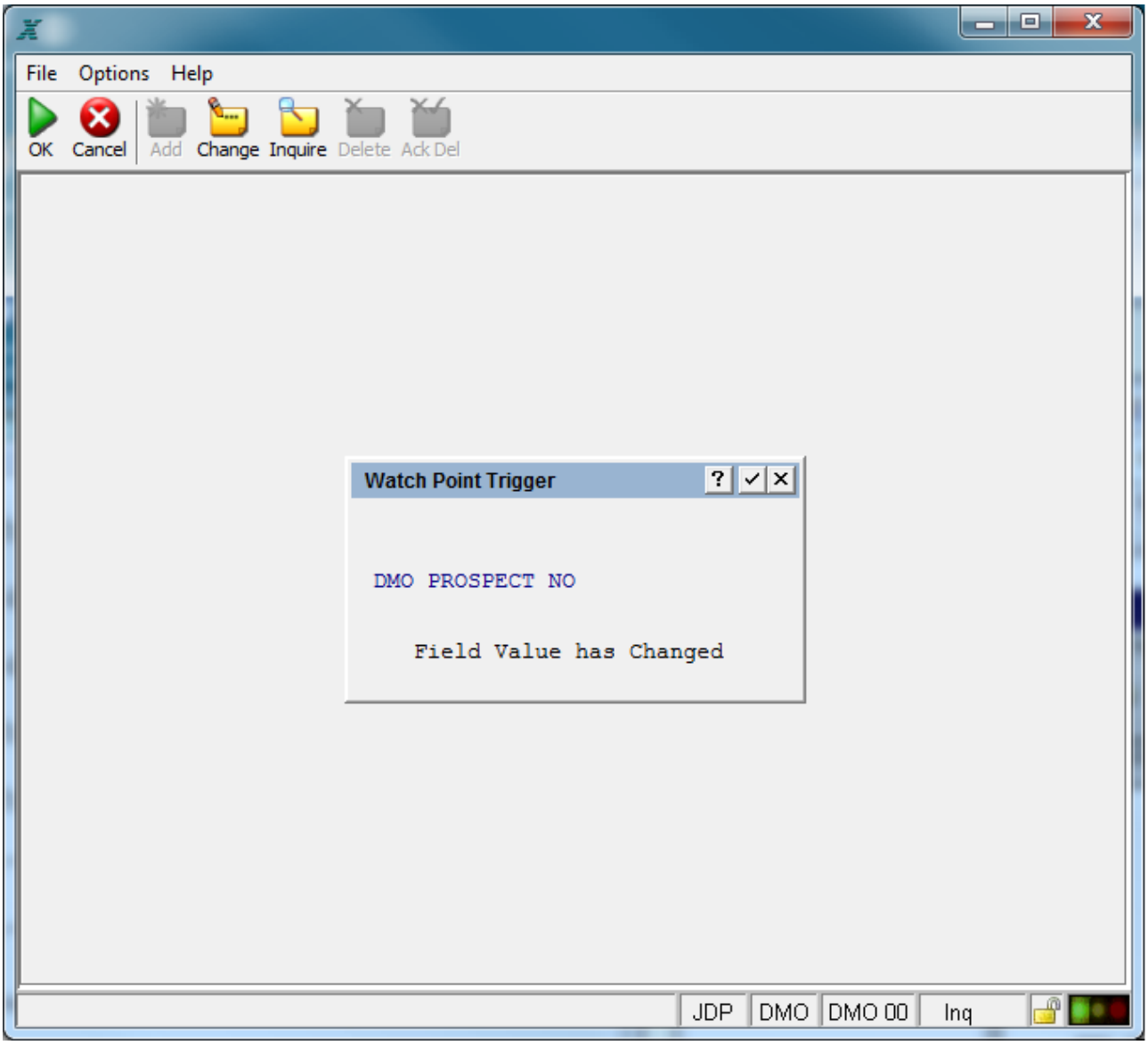
You cannot change your point of execution if you are currently stopped at a TRAP statement.

You cannot change your point of execution to continue with a LABEL or comment (*) statement.

Watch Points

👀 Watchpoint [F10] - Set or Clear watch points on individual variables

A Watch Point can be defined for a variable (field, work field, or PDF) that is either in the PCF or mentioned in ILF statements in your current process. When you define a Watch Point, APPX remembers the current value of the field and will watch that field for the remainder of the current process, including child processes. If the value of that field is changed, APPX will display a *Watch Point Trigger* pop-up window as shown below and will step into the ILF debugger as soon as possible, allowing you to view the code which modified the field.

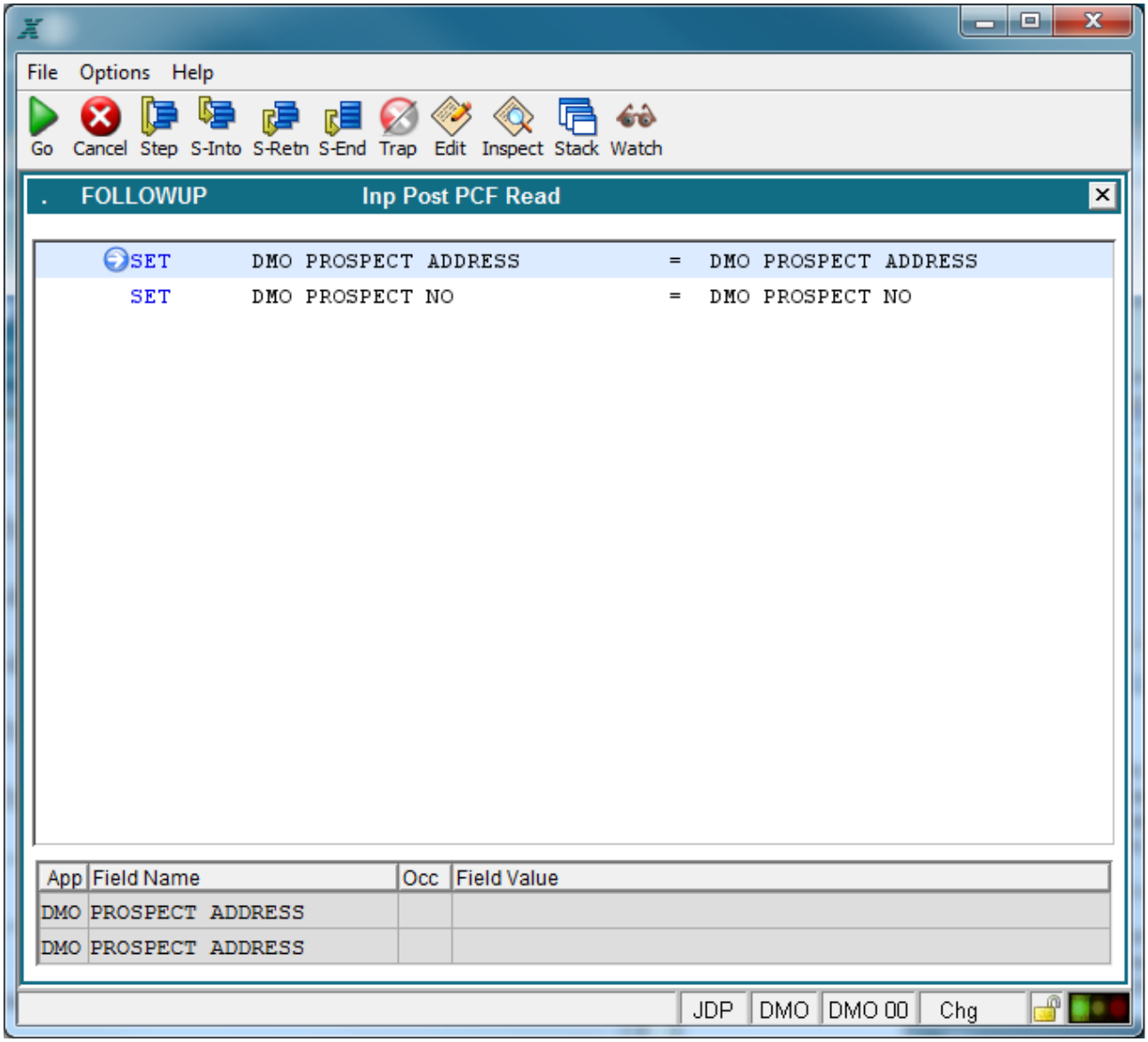


Watch Point Trigger Pop-Up

You define a Watch Point by selecting the Delete Mode icon from the APPX toolbar. As shown below, you will be prompted for an Application ID, Field Name, and Occurrence Number for each field or fields you want to track. You will receive a warning if APPX cannot set a TRAP on the field that you specify. This happens if the selected field is not in the PCF and also not accessed by ILF statements in the current process. You can add a reference to the field if you need to. You can remove previously defined watch points by deleting them. Select the Delete Mode and then Confirm Delete icons to accomplish this. Select End to return to the debugging process.

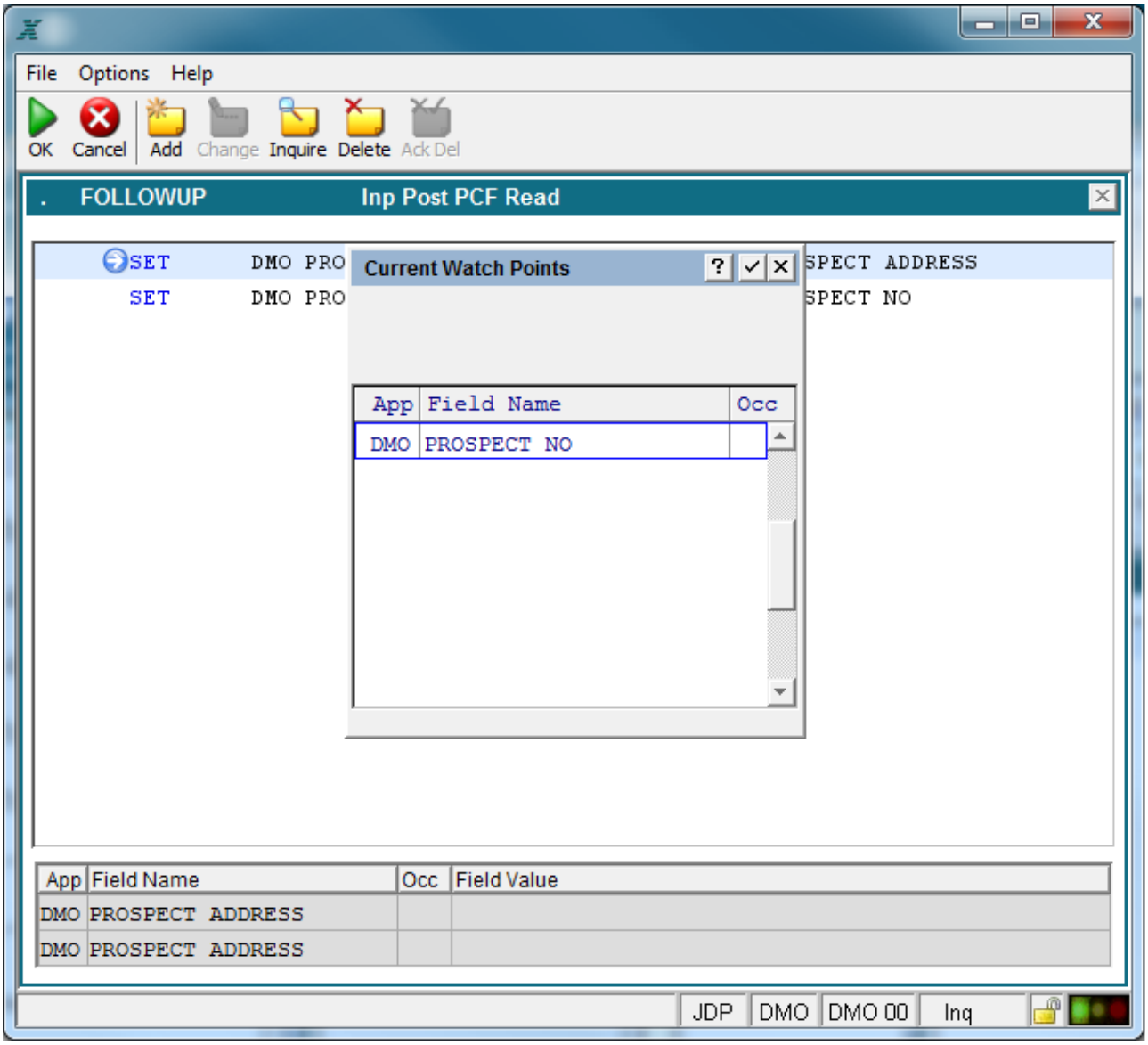
When a watch point field's value changes, APPX will replace its saved field value with the current field value in order to prevent excessive watch points.

The cause of a watch point TRAP may not be immediately obvious. It may not be initiated by an ILF statement. For example, if you are watching a field defined in your PCF, you may notice that APPX TRAPs the first statement in the Post PCF Read event point even though that statement does not refer to the field being watched. This is because APPX has read in an entire record and the value of the field in the new record is not the same as the value of the field in the previous record.



Current Watch Points Overlay

Press the Delete key (F10) to see watch points that are currently active. The figure below is an example of the current watch point screen.



Current Watch Points

Inquire Mode (Debugger Screen)

Select this icon to examine and modify the contents of any field known to the current process. A field is known to the current process if any of the following are true:

the field is part of the PCF

the field is mentioned in ILF code

the file containing the field is mentioned in ILF code

the field is a PDF

the field is in a file related through data lookup

Restrictions to the Inquire Mode option include:

the *Scan* option cannot be used to select fields

only the first occurrence of a field may be viewed

any errors are reported by displayed question marks

Selecting this icon will open the data area of the screen, allowing you to enter the Application ID, Field Name, and Occurrence Number (if applicable) of the field you want to examine. Press Enter to view the current contents of the field. Press Enter again to return to normal debugging mode.

Change Mode (Debugger Screen)

This icon allows you to enter or change the values currently displayed in the data values area of the screen. You first position the cursor to any desired statement line in an event point and then select Change Mode. The cursor moves to the data value area, makes the field values modifiable, and allows you to enter or change the values currently on the screen. After entering the desired values, press Enter to return to normal debugging mode. From this point forward, the ILF routine operates based on the new values you entered.

Other Options

The next six options (*First, Last, Prev, Next, Up*, and *Down*) are the same options described previously for the ILF editor. These options allow you to move through statements in an event point so that you may examine the statement and set or clear break points as desired.

Suggested Uses for the Debugger

At this point, you have learned about the mechanics of the ILF debugger: how to invoke it, what information is provided on the screen, how to clear and set TRAPs dynamically, and how to execute portions of a routine. How and under what circumstances you make use of the debugging facility is up to you, but the following are some suggested ways to make the most effective use of this tool.

Perhaps the most fundamental use of the debugger occurs when execution of a process produces results known or suspected to be erroneous. The debugger allows you to evaluate statements individually or in groups, to examine exactly how the values were generated. Most of the other uses of the debugger supplement this basic principle.

You can set the value of a field(s) in the current statement to watch how this value affects subsequent processing. You usually set a field to a known or desired value and evaluate its effect on the remainder of the process. You may need to subsequently enter the ILF editor and make one or more modifications to statements in other ILF routines, based on the results of your testing.

You can directly enter another ILF routine to examine the logic in a previous or subsequent event point that may affect the routine you are testing with the debugger.

If you suspect a problem is within a particular event point, you can set a TRAP in that routine and enter the debugger. By using Return, you can effectively test the entire routine (and only this routine), and evaluate the results to see if they meet your expectation.

As you test and evaluate a particular ILF routine, you may not uncover a logic problem. You may want to proceed with the testing, even if you failed to set break points in subsequent routines. By using Step/End with Return, you can continue testing from one event point to the next without leaving the debugger.

Leaving the Debugger

There are two ways to leave the debugger:

Select Go until no more break points are encountered. You will end up at the normal termination point of the process you executed.

Select Step/End until the final statement of a routine executes, allowing the process to continue executing in the normal manner.

Clearing Out Break Points

To clear out hard-coded break points (TRAP statements), you can invoke the ILF editor and delete them. Alternatively, there are processes on the Utilities, Toolbox menu in Application Design that 'Turn All TRAPs Off' and 'Turn All TRAPs On' in a given application. The first process converts TRAP statements into 'tftft TRAP' comments (where 'tftft' is replaced by the actual T/F indicators if any are present on the TRAP statement) and the second process converts the comments back to TRAP statements. Remember that TRAP statements are not intercepted in the end user environment, so ordinary users will never be aware of their existence.

If TRAP statements are not deleted or turned off, they remain a permanent part of a routine. The break points that you set dynamically within the debugger by using Select (F3) are automatically cleared when you leave the debugger. You must reactivate any dynamic break points when you return to the debugger.

CHAPTER 4-6

ILF Keyword Reference

Keyword Shortcuts

ILF Keyword Shortcuts

The following table shows the “Shortcut” which can be used during entry of ILF commands. When you enter a shortcut and press the Return/Enter Key, Appx will translate the shortcut and complete the full command name. These shortcuts are also show in parenthesis next to the full command in the following pages describing ILF Keywords.

Shortcut	ILF Command
S	SET
I	IF
T	TRAP
A	APPEND
G	GOSUB
BA	BEG_AT
BEG A	BEG_AT
BR	BEG_READ
BEG R	BEG_READ
ER	END_READ
END R	END_READ
EA	END_AT
END A	END_AT
BL	BEG_LOOP
BEG L	BEG_LOOP
EL	END_LOOP
END L	END_LOOP
CA	CALC
CO	COMPUTE
READN	READNEXT
READP	READPREV
R	READ
REW	REWRITE
W	WRITE

* (Comment)

The * (Comment) statement allows you to enter permanent comments, notation, or documentation in an ILF routine. Comment lines have no effect on the processing logic and are intended to provide the designer with a means of explaining what the statement coding does or how it operates.

```
*
```

(1)

(1) Comment (text) (64 characters maximum)

Using the Statement

You can use a * (comment) statement at any point in an ILF routine, including the beginning or end.

Restrictions

The '*' (asterisk) must be in the first position of the keyword area.

Statement Ignored

Comments are ignored during execution.

Related Statements

** (Comment)

Example

```
*
*
*
*
*
```

You can also add "white space" in your comment area by leaving the text area blank. In the following example there is a blank comment line before and after to provide space between the comment and coding (not shown). There is also a blank comment within the comment to add to its readability.

Also notice that the comment text can start in any column as shown below.

```
*
*       The following set of statements computes the value of
*       interest due, where:
*
*           A = Amount of loan
*           R = Annual rate of interest
*           M = Number of months to repay the loan
*
```

** (Comment)

The ** (Comment) statement is identical to the * (Comment) statement except that, when the ILF routine is listed (using the Print Technical Documentation option on the Doucmentation Tab in Application Design), a top-of-page is generated before the comment is listed.

```
**          [                                                    ]
            (1)
```

(1) Comment (text) (64 characters maximum)

Using the Statement

You can include ** (comment) statements anywhere in an ILF routine, including the beginning or end.

Restrictions

The ** (asterisks) must be in the first two positions of the keyword area.

Statement Ignored

Comments are ignored during execution.

Related Statements

* (Comment)

Example

```
**          This statement series is a separate computation of
*           extended price for assembled components.
```

AND

The **AND** statement adds a second or subsequent conditional check to a preceding statement, such as the series 'IF A is true **AND** B is true, then ...'. The **AND** statement itself compares the contents of two fields, or the contents of a field with a constant, to determine if a condition is true.

```
[    ] AND  [    ] [                    ] [   ] [   ] [   ] [                    ] [   ]
(1)         (2)   (3)                    (4)   (5)   (6)   (7)                    (8)
```

(1) T/F execution conditions
(2) 1st application ID
(3) 1st field name or PDF
(4) 1st occurrence (constant/index)
(5) Relation (LT,GT,LE,GE,EQ,NE,IN,EX)

(6) 2nd application ID
(7) 2nd field name, PDF, or constant
(8) 2nd occurrence (constant/index)

Sets True/False Status Indicator

The **AND** statement may modify the current value of the next internal true/false status indicator. If the preceding statement is true and the **AND** statement is false, the current status of the next indicator is changed to *F.* See Using AND and OR Statements for more information.

Using the Statement

The **AND** statement specifies a relationship between two values. The valid relational operators are:

less than (LT), greater than (GT), less than or equal to (LE), greater than or equal to (GE)

equals (EQ), not equal to (NE), includes (IN), and excludes (EX).

The relation *IN* means 'includes'. The relation is true if the value in the second field is included in the first field, and false otherwise. If the relation is true, the predefined field TEXT AT POSITION is set to the starting position of the second field within the first field. The first field must be an alpha field; the second can be either an alpha field or a constant. Trailing blanks are ignored if the second field is a constant; however, you may specify fixed spaces (by entering underscores) to include one or more trailing spaces as part of a character string that is being searched.

Normally, an **AND** statement is used immediately after an IF statement. However, the **AND** statement will operate successfully when used after any statement that sets the true/false status indicator. See AND and OR with Statements Other Than IF.

An **AND** statement may also be used in conjunction with one or more OR statements. For example:

```
IF    --- A    EQ 1
AND   --- B    EQ 1
OR    --- C    EQ 2
AND   --- D    EQ 2
```

Another example is:

```
IF    --- A    EQ 1
OR    --- B    EQ 1
AND   --- C    EQ 2
OR    --- D    EQ 2
```

Each of these examples could be expanded to add more **AND** and OR statements in various sequences but, no matter how many there are, the rules are always the same:

Each **AND** or OR statement performs only two checks at most: it checks the current value of the next true/false status indicator, and it evaluates its own condition. It does not matter how many statements preceded the **AND**/OR statement, nor what other statements follow the **AND**/OR statement.

If the current status of the next indicator is already false, the **AND** statement is bypassed since it is no longer relevant. If the current status is true and the **AND** statement is true, the current status is left unchanged as *T*. However, if the **AND** statement is false, the current status of the next indicator is changed to *F*.

Conversely, for an OR statement, if the current status of the next indicator is already true, the OR statement is bypassed since it is no longer relevant. If the current status is false and the OR statement is false, the current status is left unchanged as *F*. However, if the OR statement is true, the current status of the next indicator is changed to *T*.

Restrictions

The **AND** statement supports comparisons between like data types only (alpha-to-alpha, numeric-to-numeric, date-to-date, logic-to-logic). When comparing two date fields, results can be unpredictable if you are using a date field without a century component. Confirm that your System Administrator has set up the *Pivot Year* environment variable to avoid unexpected results.

Related PDFs

TEXT AT POSITION

Related Statements

IF, OR

Example

This example shows how to perform statement printing if the customer is not a miscellaneous customer and does not have a zero balance. If either condition is false, the level 1 true/false status indicator will be *F* and the subroutine to print statements will not be executed.

```
      IF      TAR CUSTOMER MISC CUSTOMER     NE     1
      AND     TAR CUSTOMER BALANCE           NE     0
T     GOSUB     :PRINT STATEMENTS
```

APPEND

APPEND (A)

The purpose of the **APPEND** statement isto join together the contents of two fields or character strings. Specifically, **APPEND** attaches the contents of a second, or source, field to the end of the current contents of the first, or destination, field, optionally inserting one or more blanks between the fields.

```
      APPEND
(1)         (2) (3)                    (4) (5) (6) (7)                    (8)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index
(5) Number of spaces between fields
(6) Source application ID
(7) Source field name, PDF, or constant
(8) Source occurrence (constant/index)

Using the Statement

The destination field must be an alpha field. The source field can be either alpha or constant.

The length of the destination field is determined by finding the last nonblank character in the field. Then, the number of spaces specified in the statement is added to the end of the destination field.

Spaces are added until the specified number of spaces has been added or the end of the destination field has been reached, whichever comes first. Then, the characters of the source field are copied and appended after the inserted spaces. Characters are copied from the source field to the destination field until the last nonblank character of the source field has been copied (or the end of the destination field has been reached).

Restrictions

The *justification-type* and the *pad character* are ignored. The characters copied are stored left justified in the destination field after the specified amount of blanks is added. No padding is performed, even if the source field is shorter than the space remaining in the destination field. No other templating takes place.

Related Statements

SET, SET TEMP

Examples

The following example shows how to set a field to a constant that is longer than 22 characters:

```
        SET     TGL WORK COLUMN HEADING     =   Total Customer-Related
        APPEND  TGL WORK COLUMN HEADING     1   Sales
```

This pair of statements generates a column heading, 'Total Customer-Related Sales.'

The next example shows how you can use **APPEND** to generate a message from a number of 'pieces', depending on conditional checks:

```
        SET     TGL WORK MESSAGE FIELD      =
        IF      --- ERRORS                  GE  1
T       APPEND  TGL WORK MESSAGE FIELD      1   RE-ENTER CUSTOMER ID
F       APPEND  TGL WORK MESSAGE FIELD      1   CONTINUE DATA ENTRY
```

The following is another example that properly formats line three of a customer's address:

```
SET      TGL WORK ADDRESS  003 =  TAR CUSTOMER CITY
APPEND   TGL WORK ADDRESS  003 0      ,
APPEND   TGL WORK ADDRESS  003 1  TAR CUSTOMER STATE
APPEND   TGL WORK ADDRESS  003 2  TAR CUSTOMER ZIP CODE
```

AT FIELD

AT FIELD is used to see if the cursor is positioned at a specified field within the current image of a menu or input process, usually as one part of a conditional check.

```
AT FIELD                          (AT APPEARANCE #    )
(1)      (2)  (3)                 (4)                 (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index
(5) Appearance (constant/index)

Sets True/False Status Indicator

If the cursor is positioned on the field specified (including the occurrence and appearance numbers if so specified), the next level of the true/false status indicator is set to *T*; otherwise, it is set to *F*. If you leave the occurrence number blank, cursor positioning on any occurrence of the specified field results in a true condition. If you leave the appearance number blank, cursor positioning on any appearance of the specified field results in a true condition.

If you leave field name blank, the **AT FIELD** statement returns a true value if the cursor is positioned in an item corresponding to any field within the specified application. If you leave all the parameters blank, the **AT FIELD** statement returns a true value if the cursor is positioned in any item within the current image.

Restrictions

The **AT FIELD** statement is valid only within the Option Intercept or Global Option Intercept event point. If you attempt to add this statement in any other event point, you will receive a warning that states "Warning - This statement has no effect in this event point". However, if the **AT FIELD** statement is encountered at compile time or runtime in any other event point, it is simply ignored. No other errors or warnings are generated.

Related PDFs

The system automatically sets the predefined fields, CURSOR AT OCCURRENCE and CURSOR AT APPEARANCE, to the corresponding values of the occurrence and appearance numbers for the field on which the cursor is positioned.

Example

The following example shows how to use **AT FIELD** as the first conditional check to determine the course of further processing. In this example, **AT FIELD** is used with an IF statement to check which option a user has selected while positioned on the designated field. The intention of the statement series is, If a user is positioned on field A, and then selects option 3, take the following actions....

```
      AT FIELD TAR CUSTOMER ID        (AT APPEARANCE #   )
T     IF       --- OPTION        EQ   USER 3
TT    SET      TAR WORK MESSAGE  =    ENTER CUSTOMER ID
TF    SET      TAR WORK MESSAGE  =    ENTER INVOICE NUMBER
```

BEG AT

BEG AT (BA or BEG A)

BEG AT specifies the starting key value for a range of records to be read from a file.You may use a **BEG AT** preceding a BEG READ/END READ loop, or before a READNEXT statement. If you want to specify the ending value for the range, you also include an END AT statement following a **BEG AT**.

```
      BEG AT
(1)          (2)  (3)      (4) (5) (6)                    (7)
```

(1) T/F execution conditions
(2) File application ID
(3) File name
(4) Relation (IN,EX)
(5) Field application ID
(6) Field name
(7) Occurrence (constant/index)

Using the Statement

When using a **BEG AT** statement, you specify a relation to indicate whether to start at a record with a key that includes (IN) or excludes (EX) the specified value.

> Note that you can specify any field, including a non-key field, in the **BEG AT** statement. If you specify a constant, it is assumed to be an alpha-type constant unless the file is sequential, in which case the value is assumed to be a numeric-type constant. The length of the alpha-type constant is

> determined by discarding all trailing blanks; hence, an all-blank constant will result in a length of zero, and will cause a subsequent BEG READ or READNEXT to position to the first record in the file, regardless of the relation (IN or EX).

If a BEG READ is not preceded by a BEG AT statement, records will be read from the beginning of the file. If a READNEXT is not preceded by a BEG AT statement, records are read from the current position in the file.

Restrictions

If the file to be read is sequential, the field used in the **BEG AT** statement must refer to a numeric domain, and the key field for the BEG READ or READNEXT statement must be blank.

Since **BEG AT** saves the contents of the specified field regardless of the field-type or format, the field must match the field-type and format of the key field used to access the file in a subsequent BEG READ or READNEXT statement. For example, if the key field in the subsequent BEG READ statement is a binary numeric field with nine digits, you cannot use a seven-digit numeric field or a packed-decimal numeric field in the **BEG AT** statement to set the starting value. This applies only to indexed files; for sequential files, any numeric field can be specified.

To ensure that the format of the field specified in the **BEG AT** is appropriate, use either the specified file's key, a field that is part of the file's key, or a field that is the same domain-type as the file's key. In any case, set the field's content to the desired starting value before executing the **BEG AT** statement.

You cannot use the **BEG AT** statement with one-record files.

Related Statements

BEG READ, END AT, END READ, READNEXT

Examples

The following example uses **BEG AT** (with END AT) to specify a range of records to be read in the file specified in the subsequent BEG READ statement. The example includes a transaction file of records to be posted to the master (CUSTOMER) file. The first part of the key to the transaction file is the customer ID. You want to restrict the reading of the transaction file to only the range of record keys that includes a specific customer ID.

```
        BEG AT   TAR TRANFILE IN TAR CUSTOMER ID
        END AT   TAR TRANFILE IN TAR CUSTOMER ID
        BEG READ TAR TRANFILE          HOLD 0 KEY IS  TRANFILE KEY
        *
        *        (Process each TRANFILE record for the specified customer)
        *
        END READ TAR TRANFILE
```

The preceding example processes records on the TRANFILE file with a key value within the range specified by the **BEG AT/END AT** pair of statements. If the **END AT** is not included, processing continues until the end of the file is reached. When used with **BEG READ**, and there are no records on the file that meet the specified starting range criteria, no statements within the BEG READ, END READ are executed.

The next example shows **BEG AT** used preceding a READNEXT statement:

```
        BEG AT    TAR ORDER    IN TAR TRANFILE CUSTOMER ID
        END AT    TAR ORDER    IN TAR TRANFILE CUSTOMER ID
        LABEL     :NEXT ORDER RECORD
        READNEXT  TAR ORDER                 HOLD 0 FT 0 BY ORDER CUST ID
        *         (Process each order record for the specified customer)
T       GOTO      :NEXT ORDER RECORD
        *         (Terminate order processing for specified customer)
```

In this example, if the ORDER file contains one or more records matching the specified customer ID, the true/false status indicator is set to *T* by the READNEXT statement.

BEG LOOP

BEG LOOP (BL or BEG L)

The **BEG LOOP** statement initiates the execution of a loop to repeat the same processing logic for a specified number of times. A matching END LOOP statement is always used in conjunction with a **BEG LOOP** to end the loop.

```
        BEG LOOP   =      TO       STEP
(1)     (2)        (3)    (4)      (5)
```

(1) T/F execution conditions
(2) Loop index (A to Z, AI to ZI)
(3) "From" value (constant/index)
(4) "To" value (constant/index)
(5) "Step" value (constant/index)

Using the Statement

BEG LOOP incorporates an index counter that is initialized to the starting or ?from? value. Looping continues until the index counter is greater than the ending or ?to? value (unless the increment has a minus sign, in which case the ?from? value is higher than the ?to? value and looping stops when the counter is less than the ?to? value). The increment or ?step? value is added to the index counter following each execution of the loop.

The index counter for the loop can be any of the predefined fields A to Z (variable decimal) or AI to ZI (integer). The ?from,? ?to,? and ?step? values can be any of the predefined fields A to Z or AI to ZI, or they can be specified as a constant integer value, either positive or negative.

Upon completion of the loop, processing resumes with the statement following the matching END LOOP statement.

If the step value is zero, the loop will continue to execute until a GOTO or END statement is encountered. You can also ?break out? of the loop by making the END LOOP statement conditional by using T/F indicators. If a condition is met that prohibits the END LOOP statement from being executed, the END LOOP statement is bypassed and the loop immediately ends.

If the A to Z predefined fields are used for the ?from,? ?to,? or ?step? values, you can increment the step in fractional amounts.

Restrictions

Every loop must eventually be ended by a matching END LOOP using the same index counter.

> Note that, although you are allowed to mix data types within a **BEG LOOP** statement, performance may degrade slightly.

Compilation Errors

The system generates a compile error if a matching END LOOP is not found after a **BEG LOOP** statement, or if an unmatched END LOOP is detected.

Statement Ignored

If the ?step? value is positive and the ?from? value is greater than the ?to? value or, if the ?step? value is negative and the ?from? value is less than the ?to? value, the entire loop is not executed.

Related Statements

END, END LOOP, GOTO

Example

The following example is a simple loop that increments the current monthly budgets by 5 percent for all 12 months:

```
        BEG LOOP AI = 001 TO 012  STEP 001
        COMPUTE  TGL BUDGET AMOUNT          AI  *   1.05
        END LOOP AI
```

After the twelfth repetition (where AI=12), control is passed to the next statement following the END LOOP statement.

The next example presents a nested loop that repeats its processing logic within each occurrence of the main loop. This loop also incorporates a conditional check to see if the value of field C equals that of field D, at which point the internal loop terminates and returns control to the main loop.

```
        BEG LOOP A = 001 TO 010  STEP 001
                 (Perform processing if needed)
        BEG LOOP B = 001 TO 005  STEP 001
                 (Perform processing)
        IF       --- C                  EQ --- D
T       SET      --- B                  =      5
        END LOOP B
        *
        END LOOP A
```

There can be more **BEG LOOP** statements in an ILF routine than END LOOP statements. For example:

```
T       BEG LOOP A = 001 TO 010  STEP 001
F       BEG LOOP A = 001 TO 005  STEP 001
                 (Perform processing)
        END LOOP A
```

In the preceding example, only one of the **BEG LOOP** statements can execute.

> Note also that mixing integer and variable decimal data types is allowed. This means that the following types of statements can be defined:

```
        BEG LOOP AI = B  TO CI  STEP D
          or
        BEG LOOP A = 001 TO XI  STEP ZI
```

In both of these examples, the number of repetitions and the step-values are variables, with values set within the context of the ILF routines.

BEG READ

BEG READ (BR or BEG R)

The **BEG READ** statement initiates a 'Read Next Record' loop, in which the next record that meets any previously specified range criteria is read. You end the loop with an END READ statement for the same file. Usually, you precede a **BEG READ** statement with a BEG AT and/or an END AT statement to specify the range of records to be read.

```
        BEG READ                                HOLD   KEY IS
(1)             (2)  (3)                   (4)         (5)
```

(1) T/F execution conditions
(2) Application ID
(3) File name (or field name for RDBMS)
(4) Hold type (0=do not hold, 1=hold,
(5) Access key field name

Using the Statement

When using this statement in conjunction with an RDBMS table, you can specify a field name instead of a file name to limit the volume of data being passed between APPX and the RDBMS. See the Partial-Record I/O section in Specifying Statements for more information.

When using a **BEG READ** statement, you specify whether the record is to be held for updating. If no update is to occur, enter *0*; if updating is possible or mandatory, enter *1*; if you want to hold the record for potential recovery, enter a *2*. While a record is held, no other user may update or delete it. The *HOLD with potential recovery* specification holds the record and saves a copy of it so that a subsequent rewrite or delete can be performed, even if the hold on the record is subsequently lost (by reading another record with hold before completing the rewrite or delete). 'Recover' can rehold the record as long as the saved copy is identical to the original record that was read. Note that performance is improved with *hold type 1*.

You must specify a keypath for indexed files that will serve as the access path to the file.

Records are read until the specified key has a value larger than the value of the field specified in the last END AT statement for the file. For sequential files, records are read until the relative record number for the file is larger than the record number specified in the last END AT statement for the file. If no END AT was executed, the 'Read Next Record' loop is repeated until an end-of-file condition occurs.

Execution continues with the statement following the corresponding END READ statement if:

- The end-of-file is reached,
- A record with a key value greater than that specified in the last END AT statement is read, or
- There were no records in the specified range.

If a 'Read Next Record' loop terminates for any reason, the record area contains the record that is causing the loop to end.

The file position that you can define by BEG AT/END AT, and maintained and used by the **BEG READ** 'Read Next Record' loop, is unique to that specific 'Read Next Record' loop. If the file being read by the 'Read Next Record' loop is accessed within the loop by other file-access statements, the file position will not be affected when the END READ is executed. For example:

```
BEG AT    TAR CUSTOMER IN  2
END AT    TAR CUSTOMER IN  7
BEG READ  TAR CUSTOMER     HOLD 0 KEY IS  CUSTOMER NO
SET       TAR CUSTOMER NO  =  10
READ      TAR CUSTOMER     HOLD 0 FT 0 BY CUSTOMER NO
END READ  TAR CUSTOMER
```

Customer 10 is outside of the range set up by BEG AT/END AT but the READ statement will be successful (assuming the customer 10 record is on file) because the range specified applies only to the **BEG READ** 'Read Next Record' loop. When the END READ executes, the file is repositioned to read the next record in the logical range for the 'Read Next Record' loop.

Assuming all customer records are on file, the looping logic for this example is:

- **BEG READ** reads the customer 2 record,
- READ reads the customer 10 record,
- END READ reads the customer 3 record and returns control to the statement immediately following **BEG READ**,
- READ reads the customer 10 record,
- END READ reads the customer 4 record,

and so on, until the customer 8 record is read, which ends the loop. Processing then continues with the statement following the END READ.

If a READNEXT is executed within the BEG READ 'Read Next Record' loop, its position in the file is maintained completely independently of the'Read Next Record' loop. For example:

```
BEG AT    TAR CUSTOMER IN  2
END AT    TAR CUSTOMER IN  4
BEG READ  TAR CUSTOMER     HOLD 0 KEY IS  CUSTOMER NO
READNEXT  TAR CUSTOMER     HOLD 0 FT 0 BY CUSTOMER NO
END READ  TAR CUSTOMER
```

Again assuming all customer records are on file, **BEG READ** reads the customer 2 record. READNEXT reads the customer 1 record (the first record in the file) which is outside the BEG AT/END AT range but, because the range applies only to the **BEG READ** 'Read Next Record' loop, the READNEXT succeeds. END READ reads the customer 3 record because this is the next logical record for the **BEG READ** 'Read Next Record' loop. READNEXT now reads the customer 2 record, the next logical record in its thread. Continuing in this way, END READ reads the customer 4 record, and READNEXT reads the customer 3 record. Finally, END READ reads the customer 5 record, which ends the **BEG READ** 'Read Next Record' loop.

You can also nest **BEG READ** 'Read Next Record' loops within a 'Read Next Record' loop. The following example loops through the CUSTOMER file and, for each customer record read, loops through the TRANSACT file records for that customer.

```
        BEG READ TAR CUSTOMER                HOLD 0 KEY IS  CUSTOMER NO
        BEG AT   TAR TRANSACT IN TAR CUSTOMER NO
        END AT   TAR TRANSACT IN TAR CUSTOMER NO
        BEG READ TAR TRANSACT                HOLD 0 KEY IS  TRANSACT KEY
        (Process transaction for customer)
        END READ TAR TRANSACT
        (Process customer information)
        END READ TAR CUSTOMER
```

Restrictions

For sequential files, you must leave the key field blank. Note that the **BEG READ** statement does not generate an 'In Use' message if the record to be held is currently being held by another user. The **BEG READ** statement either waits until the record is released or, if a TIMEOUT statement with a nonblank label was previously encountered, transfers processing control to the specified label. You cannot use the **BEG READ** statement with one-record files.

Compilation Errors

If there is no END READ statement that corresponds to the **BEG READ** statement, an error occurs at compile time.

Execution Errors

Once the **BEG READ** 'Read Next Record' loop terminates, re-executing an END READ statement without first re-executing a **BEG READ** generates a fatal file-processing error.

Related Statements

BEG AT, END AT, END READ, READ, READNEXT, TIMEOUT

Example

The following example demonstrates a common use of the BEG READ statement where a range is specified:

```
        BEG AT   TAR TRANFILE IN TAR CUSTOMER NO
        END AT   TAR TRANFILE IN TAR CUSTOMER NO
        BEG READ TAR TRANFILE                HOLD 0 KEY IS  TRANFILE KEY
        (Process each TRANFILE record for specified customer)
        END READ TAR TRANFILE
```

In this example, the system reads the TRANFILE file beginning with the first record where the TRANFILE CUSTOMER NO is equal to or greater than the CUSTOMER NO supplied. (TRANFILE CUSTOMER NO must be the first part of TRANFILE KEY.) The **BEG READ** 'Read Next Record' loop terminates when the TRANFILE CUSTOMER NO exceeds the value specified in the END AT statement. If no BEG AT is present, the read begins with the first record in the file. If no END AT is present, the read continues to the end of the file.

BLANK

You use a **BLANK** statement in input and output processes to display an item as entirely blank. A typical use occurs when entering key values to retrieve associated descriptions from a related file (for example, when entering a transaction type and displaying the description). If a matching key is not found on the 'description' file, you may want to blank any previously displayed description.

```
[    ] BLANK    [  ] [                    ] [  ] (AT APPEARANCE # [  ])
(1)             (2)  (3)                    (4)                  (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image. If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the **BLANK** statement affects all of the items painted on the associated image.

BLANK is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a **BLANK** statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

The system ignores any **BLANK** statements specified in non-image related event points.

Related Statements

BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

In the following example, if the customer number entered on an order is not a valid customer, the customer name displays as blank.

```
[    ] SET     [TAR] [CUSTOMER NO          ] [  ] = [TAR] [ORDER CUSTOMER NO      ] [  ]
[    ] READ    [TAR] [CUSTOMER             ] HOLD [0] FT [0] BY [CUSTOMER NO      ]
[F   ] BLANK   [TAR] [CUSTOMER NAME        ] [  ] (AT APPEARANCE # [  ])
```

BLINK

BLINK is used in input or menu processes to cause an item to blink on an image.

```
[    ] BLINK   [  ] [                    ] [  ] (AT APPEARANCE # [  ])
(1)            (2) (3)                    (4)                   (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index
(5) Appearance (constant/index)

Using the Statement

BLINK is often used in conjunction with an ERROR or WARNING statement to highlight the fields in error.

The appearance number can be used if the same field appears more than once on the image. If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the **BLINK** statement affects all of the items painted on the associated image.

BLINK is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a **BLINK** statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that, because characteristic statements operate on items other than fields, these statements are meaningful only in event points that are associated with an image.

BLINK is a terminal display attribute only and, therefore, is not allowed on images in output processes.

Statement Ignored

The system ignores any BLINK statements specified in non-image-related event points.

Related Statements

BLANK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, ERROR, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE, WARNING

Example

In the following example, the customer number is verified while entering an order. If the customer is not on file, the corresponding customer number on the order blinks.

```
[    ] SET     [TAR] [CUSTOMER NO          ] [  ] = [TAR] [ORDER CUSTOMER NO      ] [  ]
[    ] READ    [TAR] [CUSTOMER             ] HOLD [0] FT [0] BY [CUSTOMER NO      ]
[F   ] BLINK   [TAR] [CUSTOMER NO          ] [  ] (AT APPEARANCE # [  ])
[F   ] DISPLAY [TAR] [ORDER CUSTOMER NO    ] [  ] (AT APPEARANCE # [  ])
```

BOLD

BOLD is used to print an item with a higher density print attribute. Many printers achieve the bolded effect by the use of a multi-strike mechanism.

```
?????  BOLD  ??? ??????????????????????? ??? (AT APPEARANCE # ???)
(1)          (2) (3)                     (4)                 (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image. If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the **BOLD** statement affects all of the items painted on the associated image.

BOLD is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a **BOLD** statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

BOLD is a printed output display attribute only and therefore is not allowed in images in non-output processes.

Statement Ignored

The system ignores any **BOLD** statements specified in non-image-related event points.

Related Statements

BLANK, BLINK, BRIGHT, COLOR, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

```
       SET      TAR CUSTOMER NO           =  TAR ORDER CUSTOMER NO
       READ     TAR CUSTOMER            HOLD 0 FT 0 BY CUSTOMER NO
T      BOLD     TAR CUSTOMER NAME      (AT APPEARANCE #    )
T      DISPLAY  TAR CUSTOMER NAME      (AT APPEARANCE #)
```

BRIGHT

BRIGHT is used to display an item with high intensity.

```
[    ] BRIGHT [    ] [                    ] [    ] (AT APPEARANCE # [    ])
(1)            (2)  (3)                    (4)                    (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image. If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the **BRIGHT** statement affects all of the items painted on the associated image.

BRIGHT is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a **BRIGHT** statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that, because characteristic statements operate on items rather than fields, these statements are meaningful only in event points that are associated with an image.

BRIGHT is a terminal display attribute only and, therefore, is not allowed in images in output processes.

Statement Ignored

The system ignores any **BRIGHT** statements specified in non-image-related event points.

Related Statements

BLANK, BLINK, BOLD, COLOR, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

In the following example, if the customer number entered on an order is a valid customer, the customer name displays with high intensity.

```
     SET      TAR CUSTOMER NO          =  TAR ORDER CUSTOMER NO
     READ     TAR CUSTOMER          HOLD 0 FT 0 BY CUSTOMER NO
T    BRIGHT   TAR CUSTOMER NAME        (AT APPEARANCE #    )
T    DISPLAY  TAR CUSTOMER NAME        (AT APPEARANCE #    )
```

CALC

CALC (CA)

The **CALC** statement allows you to perform complex calculations in a single statement (refer to the COMPUTE statement for simpler calculations involving only two fields or a field and a constant). The result of the calculation is placed in any of the index predefined fields, A to Z or AI to ZI.

```
     CALC        =
(1)          (2)   (3)
```

(1) T/F execution conditions
(2) Receiver index PDF (A to Z, AI to ZI)
(3) Algebraic computation (59 characters max)

Using the Statement

The algebraic computation can contain index predefined fields A to Z and AI to ZI, numeric constants, operators (+, -, *, and /), and any number of levels of parentheses. The **CALC** statement performs operations according to the standard algebraic rules of precedence:

Unary negation (-) (i.e., reversing the signs on numbers),

Then, for the innermost pair of parentheses:

Multiplication (*) and division (/), which have precedence over

Addition (+) and subtraction (-)

Then, proceed to each succeeding layer of parentheses, if applicable.

Precision for the floating-point variables A to Z is a maximum of 15 total decimal positions. Precision for the integer variables AI to ZI is a maximum of 10 total decimal positions.

Standard Math Functions

APPX supports the use of several standard math functions in the **CALC** statement. To use one of these functions, specify the function name, followed by its arguments in parentheses. For instance:

```
     CALC     A  = @ABS(B)
```

In this case, the absolute value of *B* (the argument) is assigned to *A*.

The function arguments can be expressions that may contain other functions. For instance, the following **CALC** statements are legal:

```
CALC    A  = @POW(B,1/3)
```

... takes the cube root of *B*

```
CALC    A  = @SQRT(@POW(B-C,2)+@POW(D-E,2))
```

... computes the absolute distance between two Cartesian points

APPX does *not* check for illegal argument values (such as taking the square root of a negative number). In general, you should check arguments for validity before using them in certain functions. If an error occurs, standard OVERFLOW processing takes place (you can tell *where* an error occurred, but not *what* caused it). The math functions fall into three groups described in corresponding sections: basic functions, exponential functions, and trigonometric functions.

Restrictions

The fields referenced in a **CALC** statement are restricted to the index predefined fields (A to Z and AI to ZI). Therefore, you frequently precede a **CALC** statement with one or more SET statements to move values into such fields, as in the following example:

```
*
*       A = Unit price
*       B = Quantity ordered
*       C = Extension
*
SET     --- A                  =  TAR ORDER UNIT PRICE
SET     --- B                  =  TAR ORDER QUANTITY
CALC    C  = A*B
SET     TOE ORDER AMOUNT       =  --- C
```

> Note the use of comments to clarify the variable names used in the calculation. You may find it helpful to include comments whenever predefined variable names are used.

Compilation Errors

If the algebraic expression is invalid, a compilation error occurs. Invalid algebraic expressions include those with too few operands per operator and those with unbalanced parentheses.

Execution Errors

A runtime error can occur if an intermediate or final calculation results in overflow or division by zero.

Related Statements

COMPUTE, SET, OVERFLOW

Example

The following example demonstrates a calculation involving three index variables (B, C, and DI). The results are then placed in the receiver index variable (AI).

```
*
*       The following statements calculate the total estimated monthly
*       compensation (AI) for a salesperson.  This formula includes a
*       fixed monthly base salary ($1,800), an annual bonus (B), and a
*       commission based on the number of units sold (DI) over 100
*       times the average sale (C) less $50 per unit.  The bonus and
*       commission are annualized so they need to be divided by 12
*       to derive a monthly amount.
*
        SET     --- B                   =  TSA SALES ANNUAL BONUS
        SET     --- C                   =  TSA SALES AVG UNIT SALE
        SET     --- DI                  =  TSA SALES NO UNITS SOLD
        CALC    AI = 1800+(B+(C-50)*(DI-100))/12
        SET     TSA SALES MONTHLY SALARY   =  --- AI
*
```

In this example, the constant *50* is subtracted from the predefined field *C*, and the constant *100* is subtracted from the predefined field *DI*, before the two intermediate results are multiplied together. Next, *B* is added to the result of the multiplication, and that result is divided by 12. Finally, that result is added to 1800, rounded to an integer, and stored in *AI*.

In this example, note that only the predefined field *AI* is affected. The fields *B, C,* and *DI* remain unaltered.

CALC - Basic Functions)

Function

Description

Example

@ABS(X)	Returns the positive value of X, regardless of the sign of X.	@ABS(3) = 3 @ABS(-3) = 3
@CEIL(X)	Returns the smallest integer not less than X.	@CEIL(-2.1) =-2 @CEIL(-2.0) =-2 @CEIL(0) = 0 @CEIL(2.0) = 2 @CEIL(2.1) = 3

@FLOOR(X)	Returns the largest integer not greater than X.	**@FLOOR(-2.1) =-3** **@FLOOR(-2.0) =-2** **@FLOOR(0) = 0** **@FLOOR(2.0) = 2** **@FLOOR(2.1) = 2**
@MOD(X,Y)	Returns the remainder of X divided by Y. Y cannot be zero. The result has the same sign as X, regardless of the sign of Y.	**@MOD(5,2) = 1** **@MOD(-5,3) =-2** **@MOD(10,5) = 0** **@MOD(5,0) = ERROR**
@POW(X,Y)	Returns the value of X raised to the power of Y. An error occurs if zero is raised to the zero or a negative power, or if a negative number is raised to a non-integer power. Overflow and underflow errors are also possible, especially with large values of Y.	**@POW(5,2) = 25** **@POW(1.5,2.5) = 2.755676...** **@POW(25,-.5) = .2** **@POW(0,2) = 0** **@POW(0,0) = ERROR** **@POW(0,-2) = ERROR** **@POW(-.6,2.5) = ERROR** **@POW(12345,67890)=OVERFLOW** **@POW(.12345,67890)=UNDERFLOW**
@SQRT(X)	Returns the square root of X. An error occurs if X is negative. This function is equivalent to @POW(X,.5).	**@SQRT(9) = 3** **@SQRT(2) = 1.414...** **@SQRT(0) = 0** **@SQRT(-2) = ERROR**

CALC - Exponential Functions)

CALC - Exponential Functions

Function

Description

Example

`@LOG(X)`	Returns the natural log (base e) of X. An error occurs if X is zero or negative.	`@LOG(100) = 4.60517...`
		`@LOG(0 = ERROR`
		`@LOG(-2)= ERROR`

`@EXP(X)`	Returns the value of e raised to the power of X.	`@EXP(2) = 7.38905...`
		`@EXP(1) = 2.71828...`
		`@EXP(0) = 1`
		`@EXP(-2.5) = .08208...`

`@LOG10(X)`	Returns the base 10 log of X. An error occurs if X is 0 or negative. To compute the antilog, you can use @POW, such as @POW(10,X).	`@LOG10(100) = 2`
		`@LOG10(50) = 1.69897...`
		`@LOG10(.5) =-.30102...`
		`@LOG10(0) = ERROR`
		`@LOG10(-5) = ERROR`

CALC - Trigonometric - Functions)

CALC - Trigonometric - Functions

The standard trigonometric functions (sine, cosine, tangent, and the hyperbolic equivalents) take angle values expressed in radians. Large angles in excess of +/-2π may cause errors or return meaningless values.

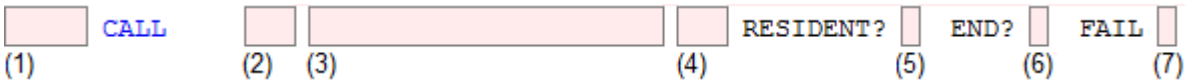
The inverse functions (arc sine, arc cosine, and arc tangent) return angles in radians. The arguments must be in the range generated by the standard function to prevent errors. Return values are in the range (-π/2, π/2), except for `@ATAN2`, which returns a normalized angle in the proper quadrant (between -π and π), based on the signs of its two arguments.

The following functions are available:

Function	Description
`@SIN(X)`	`sine of X`
`@SINH(X)`	`hyperbolic sine of X`
`@ASIN(X)`	`arc sine of X`
`@COS(X)`	`cosine of X`
`@COSH(X)`	`hyperbolic cosine of X`
`@ACOS(X)`	`arc cosine of X`
`@TAN(X)`	`tangent of X`
`@TANH(X)`	`hyperbolic tangent of X`
`@ATAN(X)`	`arc tangent of X`
`@ATAN2(X,Y)`	`normalized arc tangent of X/Y`

CALL

You use the **CALL** statement to invoke a program function or routine written in any non-APPX programming language (such as COBOL, 'C,' or assembler). Some systems require non-APPX code to be linked to APPX. You can pass values or parameters to the called routine, and share (receive back) them in the calling process. You do this by including one or more PASS statements before specifying the **CALL**. The sequence of PASS statements is very important, and controls which values are used and passed between the calling process and the called routine. The returned value from CALL functions is put into a four-byte binary predefined field called RETURN CODE.



(1) T/F execution conditions
(2) Application ID
(3) Program name (field/constant)
(4) Occurrence (constant/index)
(5) Resident? (Y/N)
(6) End? (Y/N)
(7) Fail action (0=nothing, 1=warning,

Sets True/False Status Indicator

If the called routine cannot be invoked, the next true/false status indicator is set to false. If the invocation completes successfully, the next true/false indicator is set to true. If the routine cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Resident

On machines that run dynamic loading, a *Y* in this field determines whether or not the non-APPX program will stay loaded for future use.

End

The *END?* parameter is currently ignored.

Fail

See the FAIL (or FT) Parameter section for a complete discussion of this parameter.

Using the Statement

You specify a program to be called by supplying the program as a constant or by supplying an application ID and a field name containing the program name. The format for the program/routine name is system-specific. See the APPX installation guide for your type of system for information on how to structure this field.

Passing Values

The CALL statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related Statements

PASS, RUN

Example

The following group of statements calls a routine (as named in TAR field INT CALCULATOR) which is used to compute the total interest on a loan. You need to pass the principal, annual rate of interest, and term of the loan in months.

```
PASS   TAR RATE PRINCIPAL      FIELD          SHARE? N
PASS   TAR RATE ANNL INT       FIELD          SHARE? N
PASS   TAR RATE TERM MONTHS    FIELD          SHARE? N
PASS   TAR RATE TOTAL INTEREST FIELD          SHARE? Y
CALL   TAR INT CALCULATOR      RESIDENT? Y  END? N  FAIL 3
```

Notice that the *SHARE?* specification is *Y* (yes) for the total interest field, so that the calling process can receive the computed value back.

Using the CALL Statement to Access User-Provided Functions

External routines linked in via call.c should be referenced by prefixing their names with a '.' in the CALL statement. For example, one might use

```
CALL        .myfunc          RESIDENT? Y  END? N  FAIL 3
```

to call a user-provided function named 'myfunc'.

The calling conventions used depend on the type of data passed to APPX, and whether or not you are passing the data as shared or not.

Alpha fields passed to a user-provided function, whether as shared or unshared data items, should be declared, and used, in the C function as 'char *'.

Binary fields are handled differently, based on a number of criteria. APPX will pass a BINARY field to a called C function as either a 1-byte, 2-byte or 4-byte integer, depending on how the field is defined. This is important to take into account, when declaring the parameters to your C function. If the parameter definitions don't match the sizes of fields sent to the function by APPX, you may notice that the values of your parameters are off by 256, 64 or some other multiple of 2, when your function runs. Guidelines used by APPX to determine how a binary field is passed to a called function include:

If the field, as defined in APPX, includes a range check to verify that it is within the size which can be stored in one byte, and the field includes 3 digits or less, then APPX will pass the field as a 1-byte integer. For signed APPX fields, the range check should be -127 <= x <= 127, and for unsigned APPX fields, the range check should be 0 <= x <= 256. The C declaration used to access this parameter would be 'char' (signed) or 'unsigned char' (unsigned), if it has been passed with SHARE?=N; 'char *' or 'unsigned char *' respectively, if passed with SHARE?=Y.

If the field, as defined in APPX, includes a range check to verify that it is within the size which can be stored in two bytes, and the field includes 5 digits or less, then APPX will pass the field as a 2-byte integer. For signed APPX fields, the range check should be -32767 <= x <= 32767, and for unsigned APPX fields, the range check should be 0 <= x <= 65535. The C declaration used to access this parameter would be 'short int' (signed) or 'unsigned short int' (unsigned), if it has been passed with SHARE?=N; 'short int *' or 'unsigned short int *' respectively, if passed with SHARE?=Y.

Otherwise, the field is passed as a 4-byte integer. The C declaration used to access this parameter would be 'int' (signed) or 'unsigned int' (unsigned), if it has been passed with SHARE?=N; 'int *' or 'unsigned int *' respectively, if passed with SHARE?=Y.

CANCEL

You use a **CANCEL** statement to cancel a process after detecting a serious processing problem. You can use **CANCEL** in any event point in any process to clear the screen, display the cancel message, and cancel the process. **CANCEL** provides an orderly termination of a process.

```
        CANCEL
(1)             (2)
```

(1) T/F execution conditions
(2) Cancel message (constant or TEMPn predefined field)

Using the Statement

Instead of displaying a fixed **CANCEL** message (as shown in the example), you can display a variable message. You do this by setting one of the TEMPn predefined fields to the desired message, and entering *TEMPn* in place of specific message text in the **CANCEL** statement.

Related PDFs

TEMPn

Related Statements

SET, SET TEMP

Example

The following example demonstrates a conditional execution of the CANCEL statement if a specified file is not available.

```
        IF EXIST TAR CUSTOMER          FAIL 0
F       CANCEL   Customer File Does Not Exist -- Contact designer for assistance!
```

CLOSE

The CLOSE statement closes the currently opened instance of a specified file (either disk or cache) when required processing is completed. Note that, while OPEN statements may be needed to switch between disk and cache versions of a file or used for performance reasons, CLOSE statements are normally not necessary since APPX takes care of closing files automatically.

```
        CLOSE        PHYSICAL?
(1)             (2)  (3)        (4)
```

(1) T/F execution conditions
(2) Application ID
(3) File name
(4)Physical close? (Y/N)

Using the Statement

The CLOSE statement applies only to the last OPEN operation for the file specified. If no preceding OPEN statement for the specified file is encountered, the file for the current database is closed.

The CLOSE statement closes the currently opened instance of a file, either disk or cache. Like memory files, there can be only a single instance of a cached file. There is not a separate instance of a cached file for each database.

Although a file cannot be physically opened again once it has already been opened, it may be logically opened many times, once for each process in the process family. In like manner, you can use the **CLOSE** statement to logically close the file in the current process or to physically close the file for all processes by specifying *N* or *Y*, respectively, in the *Physical?* parameter.

Regardless of whether a file is logically or physically closed, you must open it again before using it in the current process. However, the file may still be logically open in other processes in the process family, and those processes can continue to use the file without having to reopen it.

Restrictions

> Note that when a file is physically closed, all holds previously specified are lost, and all file-read positions are set to the beginning of the file or the beginning of the range in the file, if so specified.

Statement Ignored

If a file is not currently open, the **CLOSE** operation has no effect.

Related Statements

OPEN

Example

The following example performs a logical close on the ORDER file:

```
        CLOSE    TAR ORDER    PHYSICAL?      N
```

CNV BIN

The CNV BIN instruction converts an alpha field containing a binary number to or from a numeric field. This may be useful when operating on single characters of alpha-type fields, such as when you want to convert an alpha field from lower case to upper case.

```
[    ] CNV BIN [  ] [                    ] [  ] = [  ] [                    ] [  ]
(1)              (2) (3)                    (4)   (5) (6)                    (7)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Source application ID
(6) Source field name, PDF, or constant
(7) Source occurrence (constant/index)

Using the Statement

If the source field is an alpha field, it is evaluated as a one-, two-, or four-byte binary value, depending on its length, and converted to the numeric destination field.

If the source field is a numeric field, its numeric value is converted into a one-, two-, or four-byte binary number, depending on the length of the destination field. The source field will be rounded to a whole number.

Restrictions

For an alpha source field, a numeric overflow condition occurs if the destination field is not large enough to store the converted value. The destination field must be numeric.

For a numeric source field, the destination must be alpha and between one, two, or four bytes in size. Based on the size of the destination field and the sign, the numeric value of the second field used in the conversion must be within the range specified below, or a numeric overflow condition occurs:

one byte signed:	-128 through +127
two bytes signed:	-32,768 through +32,767
four bytes signed:	-2,147,483,648 through +2,147,483,647
one byte unsigned:	0 through 255
two bytes unsigned:	0 through 65,535
four bytes unsigned:	0 through 4,294,967,295

Overflow processing is dependent on the use of OVERFLOW statements within the current event point.

Compilation Errors

The alpha field must be one, two, or four characters in length or a compile error occurs.

Related Statements

OVERFLOW

Example

The following example demonstrates how to convert an ASCII letter from lower case to upper case:

```
CNV BIN   TAR WORK NUMBER        =  TAR ALPHA FIELD
COMPUTE   TAR WORK NUMBER        -      32
CNV BIN   TAR ALPHA FIELD        =  TAR WORK NUMBER
```

In this example, the alpha character is converted into a binary number (WORK NUMBER); then, the decimal value of *32* is subtracted from the field, producing the binary value of an uppercase letter. Finally, this value is converted back to its alpha representation.

CNV PORT

CNV PORT works like CNV TEXT except that the portable format is designed for import/export purposes and is immune to differences in numeric and date masks.

CNV PORT ensures that you can import anything that you export.

CNV TEXT

The CNV TEXT statement is bidirectional (data may be converted and then converted back to the original format) and reformats, or converts, data from one data type to another. The CNV TEXT statement sets the destination field equal to the sending field, but in the format of the destination field, including all display mask specifications. CNV TEXT also converts an entire APPX record to an alpha field consisting of a string of the original APPX fields converted to simple alpha fields, or vice-versa.

```
CNV TEXT                =
(1)       (2) (3)       (4)  (5) (6)       (7)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Source application ID
(6) Source field name, PDF, or constant
(7) Source occurrence (constant/index)

Sets True/False Status Indicator

If the conversion is successful, the next true/false status indicator is set to *T*; otherwise, it is set to *F*.

Using the Statement

When converting fields, both fields can be specified as either a field name or a predefined field. One of the fields (either the destination or source) must be of a simplified alpha type. A simplified alpha type is one that is not compressed, tokenized, word-wrapped, or masked.

When converting files, a file name must be entered as either the destination or source, and an alpha field name must be entered as the other. If needed, use Option 88 to save the statement.

Source Field Considerations

Either the source field or destination field can be any of the basic data types: alpha, date/time, logic, or numeric. The other field must be simplified alpha.

Converting to/from Alpha Fields

Alpha fields require no data conversion. The data is copied from the source field to the destination field or vice-versa. If the size of the data to be copied is larger than the destination area can contain, the excess is truncated. If the amount of data to be copied is smaller than the destination can contain, blank padding is added. The formatting characteristics of the destination field, such as justification, are imposed upon the converted destination data.

Converting to/from Date/Time Fields

Date/time fields are converted from their specific date/time types into an alpha date form during the conversion operation or vice-versa. This alpha form is either Gregorian or Julian (based on the source field's data type), and it uses the source field's display mask.

Converting to/from Logic Fields

If the sending field is a 'logical Yes' (a value of *1*), the destination field is set to a value of the uppercase *Y* (in the English language version), followed by pad spaces. If the value of the sending field is 'logical No'. the destination field is set to *N,* followed by pad spaces. If the value of the sending field is blank, the destination field is set to a value of blank. The conversion fails if the value of the sending field is something other than *1*, *0,* or ' '. Note these rules also work in reverse.

Converting to/from Numeric Fields' Numeric sending fields are converted from their packed or binary numeric types into an alpha form during the conversion operation. The alpha form is based on the source field's display mask. If the sending field is null-valued, the alpha form is set to blank. This conversion can also be performed in reverse.

When converting numeric fields to alpha, remember that a display mask on the numeric field can be used to control the format of the result. For example, a display mask can prevent producing negative trailing signs or integer results which may be undesirable in Excel.

Restrictions

When all occurrences of the sending field are selected as the **CNV TEXT** data (by entering occurrence number 000), all occurrences are treated as a single, rectangular alpha field. When the data is copied from the sending field, a check is made to ensure that soft spaces are compressed, ensuring that the next ?word? is separated from the previous one by just one space.

Compilation Errors

If either the source or destination field is not a simplified alpha type, a compilation error occurs. Attempting to convert invalid data is an unrecoverable error.

Invalid dates cannot be converted and cause **CNV TEXT** to fail.

Execution Errors

Numeric values that cannot be represented by their display masks cannot be converted, and cause the digit placeholders of the mask to be set to *?* to indicate a failed conversion.

Example

The following example moves the current date into an alpha field then converts an entire record into an alpha field:

```
SET DATE TAR ORDER DATE FIELD
CNV TEXT TAR WORK ALPHA FIELD  =  TAR ORDER DATE FIELD
CNV TEXT TAR WORK RECORD       =  TAR TERMS
```

The alpha fields will include all display formatting characters.

COLOR

The **COLOR** statement changes the color of a displayed field's foreground and/or background based on the contents of the predefined fields COLOR FOREGROUND and COLOR BACKGROUND. All fields displayed on the screen can be affected by using the global **COLOR** statement, as shown below, or a specific field's colors can be changed by identifying the field.

```
COLOR                                  (AT APPEARANCE #    )
(1)      (2)  (3)                  (4)                   (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on an image. If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the **COLOR** statement affects all of the items painted on the associated image using either default colors or the colors specified in the predefined fields COLOR FOREGROUND and COLOR BACKGROUND.

COLOR is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a **COLOR** statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced,

Restrictions

> Note that, because the **COLOR** statement operates on items rather than fields, this statement is meaningful only in event points that are associated with an image.

Statement Ignored

The system ignores any **COLOR** statements specified in non-image-related event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

The **COLOR** statement is used to cause the current foreground and/or background colors of a field to change on the image. In this example, the customer's credit status displays in red if the status is BAD. If the status is not BAD, it is displayed in blue.

```
      IF       TAR CUSTOMER CREDIT STATUS   EQ   BAD
T     SET      --- COLOR FOREGROUND         =    RED
F     SET      --- COLOR FOREGROUND         =    BLUE
      COLOR    TAR CUSTOMER CREDIT STATUS   (AT APPEARANCE #   )
      DISPLAY  TAR CUSTOMER CREDIT STATUS   (AT APPEARANCE #   )
```

COMMIT

The **COMMIT** statement causes an immediate commit of all changes made to the tables stored within an RDBMS. All record locks are forfeited.

```
      COMMIT
(1)
```

(1) T/F execution conditions

Using the Statement

The COMMIT MODE predefined field determines if and when APPX commits your changes automatically. It is initially set based on the Commit Mode specification from your process (in Additional Attributes) but can be modified. If you change COMMIT MODE, the change will take affect at the next COMMIT or ROLLBACK.

Based on the structure of your application, there may be other places where you want to COMMIT a transaction. That's what the COMMIT statement is for. One thing to keep in mind is that the frequency of COMMITs will affect performance. The more COMMITs you do, the slower your application will be. For interactive processes, you can probably ignore the performance issue, but for batch-mode operations, COMMITing too often can really slow things down.

Another issue to be aware of is that APPXIO files do not support transaction processing. If you ROLLBACK a change to an RDBMS-hosted file, any changes made to APPXIO will not be rolled back. Related to this is the issue of visibility. Changes made to an RDBMS-hosted file are invisible to other users until they are committed. Changes made to an APPXIO-hosted file are visible immediately.

Related PDFs

COMMIT MODE

Related Statements

ROLLBACK, SAVEPNT

Example

In the following example, if the flag indicates it is OK to commit, the COMMIT takes place and processing continues. Otherwise, changes made since the savepoint designated as TRX POINT 1 are discarded and the program branches to an applicable routine.

```
        SAVEPNT   TRX  POINT 1
        (Perform RDBMS processing)
        IF        TAR  WORK OK TO COMMIT      NE   Y
T       ROLLBACK  TRX  POINT 1
T       GOTO           :POINT 1 STATUS
        COMMIT
```

COMPUTE

COMPUTE (CO)

You can use the COMPUTE statement for simple arithmetic computations involving two fields, or one field and a constant. The COMPUTE statement adds to (+), hash-adds to (P), subtracts from (-), hash-subtracts from (M), multiplies (*), or divides (/) the first (or destination) operand by the value specified in the second (or source) operand.

```
        COMPUTE
(1)             (2)  (3)                    (4)  (5)  (6)  (7)                    (8)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF

(4) Destination occ (constant/index)
(5) Operator (+, -, *, /, P, M)
(6) Source application ID
(7) Source field name, PDF, or constant
(8) Source occurrence (constant/index)

Using the Statement

The destination field can be packed decimal or binary, and the source field can be packed decimal, binary, or alpha. The packed decimal fields can have either a fixed or variable decimal position, and binary fields always have a fixed decimal position.

If the second field is an alpha field type (valid only for *P* and *M* operators), characters other than *0* to *9*, except trailing spaces, are converted to *0*. Then, up to the first 31 characters are converted to a packed decimal integer before the computation is performed. Once converted, the remainder of the computation is identical to a computation that contains a packed decimal integer for the second field. The hash total operators ignore overflow.

If the result of a *P* or *M* calculation results in a value greater than the destination field can hold, the result 'wraps around' from zero. For example, if a destination field has a maximum of five digits, *99999 P 1* results in a value of *00000*. The most significant number is discarded. As another example, assuming that the packed decimal number could contain a value up to *999*, *996 P 8* results in a value of *4*.

Similarly, if the result of the *P* or *M* calculation results in a negative value, the result 'wraps around' from the largest value the destination field could hold plus *1*. For example, assuming that the packed decimal number could contain a value up to *9999*, then *3 M 6* results in a value of *9997*.

Restrictions

If there is a division by zero, or the result is too large to be stored in the destination field, an overflow situation occurs. Overflow processing is dependent on the use of the OVERFLOW statement.

For the *P* and *M* operators, the destination field must be a packed decimal numeric type.

Execution Errors

If OVERFLOW has not been specified, an overflow condition causes an unrecoverable processing error.

Statement Ignored

If either field contains a null value, no computation takes place, and the statement following the **COMPUTE** is executed.

Related Statements

OVERFLOW

Example

The following is an example of a COMPUTE statement:

```
        COMPUTE  TAR ORDER2 SUBTOTAL      +  TAR ORDER3 LINE AMOUNT
```

In this example, the value in the field ORDER3 LINE AMOUNT is added to the value in ORDER2 SUBTOTAL. Note that the value in ORDER3 LINE AMOUNT is not changed by the computation.

COPY

With the **COPY** statement, you can include an exact copy of the ILF statements in a subroutine process within the one containing the COPY statement. The copied statements are added to the current event point during compilation. There are two primary advantages to using COPY rather than simply re-entering the desired statements in the current ILF routine:

You can standardize certain routines, such as a calculation that is performed at several points in your application, and

If a change is required to a copied routine, you make the changes in only one place and they are automatically reflected where the routine has been copied.

```
        COPY
(1)             (2)  (3)
```

(1) T/F execution conditions
(2) Application ID
(3)Subroutine name

Using the Statement

You can use a related statement, SUBR, to execute a subroutine without actually copying it into the current process. This statement is particularly useful if a subroutine must be used in more than one event point in a process, or if the subroutine is very large and therefore extends the compilation time of a process.

Compilation Errors

An error is not generated if a statement references a non-existing application. A 'Missing Subroutine' error is generated if a non-existing subroutine process name is encountered within a valid application.

Recursive use of a COPY statement, by which a COPY statement attempts to copy itself, is not allowed. A 'Copy Used Recursively' error is generated in this case.

Related Statements

GOTO, GOSUB, LABEL, SUBR

Example

The following example copies a subroutine process that performs a common routine to verify general ledger account numbers:

```
      COPY      TGL VERIFY ACCOUNT
```

CREATE

The CREATE statement makes certain that a file exists and is opened for use. If the file does not already exist, this statement creates the file. CREATE is often used following a SCRATCH statement; the combination has the effect of clearing all records in a file.

```
      CREATE                SHARE?   FAIL   CACHE
(1)         (2)   (3)          (4)     (5)     (6)
```

(1) T/F execution conditions
(2) Application ID
(3) File name
(4) Share the file? (Y/N)
(5) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)
(6) Cache type (NONE, LOAD, AUTO, NOLOAD)

Sets True/False Status Indicator

The next level of the internal true/false status indicator is set to *T* if the file is successfully created. The indicator is set to *F* if creation fails for any reason other than the file already exists. In this case, the *FAIL* parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

You specify the application ID and file name for the file to be created in the statement. The *SHARE?* parameter determines whether or not other users are permitted to update the file while it is open. Additional information that can affect the location of the file may be contained in the predefined fields DATABASE or NEXT DATABASE.

You can use the NEXT DATABASE predefined field to specify in which database you want the file created. If NEXT DATABASE is blank, the current database (located in DATABASE) is used to create the file. Note that NEXT DATABASE is modifiable, whereas DATABASE is not, and that NEXT DATABASE is set to blank by the CREATE statement.

The CREATE statement can also create and open a cached instance of a file. Specifying a *CACHE* option other than *NONE* causes a cached instance of a file to be created in memory and opened instead of the normal disk instance of the file. This can result in significant reductions in File I/O during posting and reporting processes. Once you have created a cached instance of a file, all I/O that follows will

reference the cached instance of the file, not the disk instance, until you OPEN the disk version. If you rewrite, delete, or write records to the cached version of the file, the disk version of the file will not be updated. If the disk version of the file changes after you create and load the cached version of the file, the cached version of the file will not reflect those changes.

If NEXT DATABASE is specified for the CREATE statement which creates a cached file, then the value of NEXT DATABASE determines the source database for automatically loading the cache. Otherwise, the current database determines the source of the file used to load the cache.

After creating a cache, you can switch between the cache and disk versions by using the OPEN statement.

Valid values for the *CACHE* option are:

NONE creates and opens the file as a normal, non-cached file. This is the default value.

NOLOAD creates and opens the cached version of the file without loading any records into it. Records are added to cache via the WRITE statement.

LOAD creates and opens the cached version of the file and loads it from the disk version of the file.

AUTO creates and opens the cached version of the file and dynamically populates the cache from the disk version of the file as records are individually read.

Related PDFs

DATABASE, NEXT DATABASE

Related Statements

CLOSE, IF EXIST, OPEN, SCRATCH

Example

The following example scratches and then recreates and opens a file called MONTHTRX, allows it to be updated by other users, and generates an error message if the operation fails for any reason.

```
        SCRATCH  TGL MONTHTRX            FAIL 0 CACHE? N
        CREATE   TGL MONTHTRX  SHARE? Y  FAIL 0 CACHE NONE
F       ERROR    Unable to Create TGL MONTHTRX file!
```

DATE ADD

The DATE ADD statement adds (or subtracts by adding a negative value) a number of time units (years, months, days) to a specified date/time field, to determine a future (or past) date/time. For example, you may want to add 10 days to the DUE DATE field to determine when a 10-day discount period for prompt payment expires.

```
[    ] DATE ADD [  ] [                    ] [  ] [ ] [  ] [                    ] [  ]
(1)              (2) (3)                    (4)  (5) (6) (7)                    (8)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Unit (8:centuries, 7:years, 6:months, 5:days, 4:hours, 3:minutes, 2:seconds, 1:hundredths)
(6) Source application ID
(7) Source field name, PDF, or constant
(8) Source occurrence (constant/index)

Using the Statement

The *unit* (parameter 5) indicates the units of the source field. The result is returned in the destination field.

When you add 'months' to a date, the destination 'day' does not change unless the resulting date is beyond the end of the month. In other words, if you add one month to February 28, you get March 28; however, if you add one month to January 31, you get February 28 (except in leap years, when you get February 29). When you add 'years' to a date, the destination month and day do not change, even in leap years.

Restrictions

The destination field must be a date/time field type and the source field must be a numeric field type. Also, results can be unpredictable if you are using a date field without a century component. Confirm that your System Administrator has set up the *Pivot Year* environment variable to avoid unexpected results.

Execution Error

If the destination field is null, a runtime error occurs.

Related Statements

DATE BTW

Example

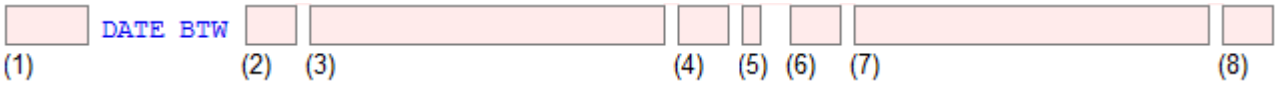
The following example calculates a discount date 10 days in the future and displays it on an image:

```
[    ] SET      [TAR] [WORK DISCOUNT DATE    ] [  ] = [TAR] [INVOICE DUE DATE    ] [  ]
[    ] DATE ADD [TAR] [WORK DISCOUNT DATE    ] [  ] [5] [  ] [10                  ] [  ]
[    ] DISPLAY  [TAR] [WORK DISCOUNT DATE    ] [  ] (AT APPEARANCE # [  ])
```

> Note that the INVOICE DUE DATE field is moved into a work field called DISCOUNT DATE before the computation is performed so that the INVOICE DUE DATE field is not modified.

DATE BTW

The DATE BTW statement calculates the number of date/time units (years, months, days), between two date/time fields. It can be used to generate aging categories for reports, by comparing a value for date due with the current date to determine which customers have balances of less than 30 days, 30 to 60 days, over 60 days, and so forth.



(1) T/F execution conditions
(2) From application ID
(3) From field name or PDF
(4) From occurrence (constant/index)
(5) Unit (8:centuries, 7:years, 6:months, 5:days, 4:hours, 3:minutes, 2:seconds, 1:hundredths)
(6) To application ID
(7) To field name, PDF, or constant
(8) To occurrence (constant/index)

Using the Statement

The *unit* (parameter 5) indicates the units of the result of the calculation. The result is returned in the predefined field BETWEEN.

If the 'from' date is greater than the 'to' date, BETWEEN is negative. If the 'from' date is less than the 'to' date, BETWEEN is positive.

When you use 'months' in **DATE BTW**, the result is zero if the 'from' month and year are the same as the 'to' month and year. In other words, if 'from' is February 1, 2000, and 'to' is February 28, 2000, BETWEEN is zero. If the 'from' month is different from the 'to' month, BETWEEN is zero unless there is at least a 28-day difference in the two dates. In other words, January 31 to February 5 is zero months, but January 31 to February 28 -- or January 1 to February 1 -- is one month.

Restrictions

Both fields in the statement must be date/time field types. Also, results can be unpredictable if you are using a date field without a century component. Confirm that your System Administrator has set up the *Pivot Year* environment variable to avoid unexpected results.

Execution Error

If either date is null, a runtime error occurs.

Related PDFs

BETWEEN

Related Statements

DATE ADD

Example

The following example uses the DATE BTW statement to compare the date due with the current date to determine categories of aging for an accounts receivable report:

```
     SET DATE  TAR  WORK CURRENT DATE
     DATE BTW  TAR  INVOICE DUE DATE     5   TAR  WORK CURRENT DATE
     IF        ---  BETWEEN              LT       30
T    SET       TAR  WORK CURRENT AMOUNT  =   TAR  INVOICE AMOUNT
F    IF        ---  BETWEEN              LT       60
FT   SET       TAR  WORK OVER 30 DAYS    =   TAR  INVOICE AMOUNT
FF   SET       TAR  WORK OVER 60 DAYS    =   TAR  INVOICE AMOUNT
```

DELETE

The DELETE statement deletes the current record from a specified file.

```
     DELETE
(1)          (2)  (3)
```

(1) T/F execution conditions
(2) Application ID
(3) File name

Using the Statement

For process types other than input, the current process control file record is implicitly read and held if a REWRITE or DELETE statement exists for the file in any event point in the process; thus, an explicit read with hold is generally not necessary. If, however, another file is read and held within the event point that contains the REWRITE or DELETE, and this READ occurs before the REWRITE or DELETE, the operating system loses the 'hold' on the process control file record. In this case, the record must then be explicitly reread and held or the rewrite/delete fails.

> Note that care should be taken when deleting the current process control file record in an input process. The normal file processing for the process control file assumes that the record still exists when it needs to rewrite or delete the record.

Restrictions

The record you want to delete from a specified file must have previously been read with the *Hold?* specification set to *1* (hold) or *2* (recover), or the delete must be done on the record currently being held in the process control file.

For input processes, a record from the process control file must be explicitly held by a statement to delete the record.

The DELETE statement cannot be used with sequential or one-record files.

Execution Errors

In an input process, if a record is rewritten or deleted with ILF statements, a non-recoverable runtime error occurs if the input processor also attempts to rewrite or delete the record.

The DELETE statement does not modify the current true/false status indicators. If the deletion fails, a non-recoverable runtime error occurs and the process will be canceled.

Related Statements

BEG READ, END READ, READ, READNEXT, REWRITE

Example

The following example reads the CUSTOMER file and, if the customer record exists (if the read succeeds), the routine deletes that customer record.

```
[   ] READ   [TAR] [CUSTOMER              ] HOLD [1] FT [0] BY [CUSTOMER NO          ]
[T  ] DELETE [TAR] [CUSTOMER]
```

DIM

DIM displays an item with low intensity.

```
[   ] DIM    [   ] [                      ] [   ] (AT APPEARANCE # [   ])
(1)          (2)   (3)                      (4)                    (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image.

If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the DIM statement affects all of the items painted on the associated image.

DIM is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a DIM statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that because characteristic statements operate on input items, they are only meaningful in event points that are associated with an input image.

DIM is a terminal display attribute only and, therefore, is not allowed on images in output processes.

Statement Ignored

The system ignores any DIM statements specified in non-image-related event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

In this example, the field CUSTOMER CREDIT STATUS is made dim on the image.

```
     IF      TAR CUSTOMER CREDIT STATUS   NE   BAD
T    DIM     TAR CUSTOMER CREDIT STATUS   (AT APPEARANCE #   )
```

DISABLE

DISABLE is used to conditionally make a button unavailable to users in input processes or on menus. This can be used to deactivate buttons when certain conditions or data entered dictate.

```
     DISABLE                                (AT APPEARANCE #   )
(1)          (2)  (3)                  (4)                  (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

DISABLE is used in input or menu processes to make a button unavailable for user selection. This can be used for buttons that are conditionally unavailable depending on prior entries, user qualities, databases, interactive phase, and so forth.

The application ID must be left blank if a button reference name (assigned when the button is painted on the image) is used. Otherwise, use an application ID and field name that contains the name of an alpha field containing the button reference name.

Restrictions

DISABLE statements are only valid in image-related event points.

Related Statements

ENABLE

Example

The following example disables the SUBMIT ORDER button if a valid approval code has not been entered.

```
     IF       TOE APPROVAL CODE VALID     NE   1
T    DISABLE      SUBMIT ORDER            (AT APPEARANCE #  )
```

DISPLAY

The DISPLAY statement converts the contents of the field associated with the specified item(s) from internal to external format and displays them to the user.

```
     DISPLAY                                (AT APPEARANCE #  )
(1)          (2)  (3)                  (4)                   (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on an image. If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the DISPLAY statement affects all of the items painted on the associated image.

DISPLAY is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a DISPLAY statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced,

Restrictions

> Note that, because the **DISPLAY** statement operates on items rather than fields, this statement is meaningful only in event points that are associated with an image.

Statement Ignored

The system ignores any **DISPLAY** statements specified in non-image-related event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

The DISPLAY statement is used to cause the current contents of a field to appear on the image. In this example, the customer's credit status displays as *BAD* if the customer's balance exceeds the credit limit. If it does not, *OK* displays.

```
     IF      TAR CUSTOMER BALANCE        GT TAR CUSTOMER CREDIT LIMIT
T    SET     TAR CUSTOMER CREDIT STATUS  =      BAD
F    SET     TAR CUSTOMER CREDIT STATUS  =      OK
     DISPLAY TAR CUSTOMER CREDIT STATUS  (AT APPEARANCE #  )
```

ENABLE

ENABLE is used to conditionally make a button available to users in input processes or on menus. This can be used to activate buttons when certain conditions or data entered dictate.

```
     ENABLE                                  (AT APPEARANCE #  )
(1)          (2)  (3)                   (4)                  (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

ENABLE is used in input or menu processes to make a button available for user selection. This can be used for buttons that are conditionally available depending on prior entries, user qualities, databases, interactive phase, and so forth.

The application ID must be left blank if a button reference name (assigned when the button is painted on the image) is used. Otherwise, use an application ID and field name that contains the name of an alpha field containing the button reference name.

Restrictions

ENABLE statements are only valid in image-related event points.

Related Statements

DISABLE

Example

The following example enables the SUBMIT ORDER button only if a valid approval code has already been entered.

```
     IF      TOE APPROVAL CODE VAL     EQ  1
T    ENABLE      SUBMIT ORDER          (AT APPEARANCE #  )
```

END

The END statement terminates the ILF routine that it is contained in, and returns control to APPX.

```
     END
(1)
```

(1) T/F execution conditions

Using the Statement

Although an END statement can be used at any point in the ILF routine, it is not necessary at the end of an event point.

Related Statements

CANCEL, END PROC, EXIT, LOGOUT

Example

In this example, if the customer has a zero balance, the ILF routine terminates and control is returned to APPX.

```
     IF      TAR CUSTOMER BALANCE      EQ  0
T    END
```

END AT

END AT (EA or END A)

The END AT statement is used in conjunction with a BEG READ/END READ loop, or a READNEXT statement, and may optionally be used in conjunction with a BEG AT statement. END AT specifies the ending key value for a range of records to be read.

```
     END AT
(1)        (2)  (3)        (4) (5) (6)                    (7)
```

(1) T/F execution conditions
(2) File application ID
(3) File name

(4) Relation (IN,EX)
(5) Field application ID
(6) Field name
(7) Occurrence (constant/index)

Using the Statement

The key used to access records in the file is specified in the subsequent BEG READ or READNEXT statement if the file is an indexed file. If the file is sequential, the key field for BEG READ or READNEXT must be blank, and the field used in the END AT statement must be numeric.

The END AT statement specifies an application ID and file name to identify the file upon which the range is being specified, and which is read in the subsequent BEG READ or READNEXT. The field specified by END AT must contain the ending value of the key of the last record that is to be read or, if the file is a sequential file, the record number of the last record to be read.

A relation is specified to indicate whether to end at a record with a key that includes (IN) or excludes (EX) the specified value.

END AT temporarily saves the contents of the specified field and, if the file is indexed, its length. If this length is less than the key length used in a subsequent BEG READ or READNEXT statement, only the leading portion of the key is constrained. In other words, the field value is padded with HEX FFs if the relation is IN, or with HEX 00s if the relation is EX. If this length is longer than the key specified in the subsequent BEG READ or READNEXT, the extra characters are ignored.

Since END AT saves the contents of the specified field regardless of field type or format, the field must exactly match the field type and format of the field used to access the file in a subsequent BEG READ or READNEXT statement. For example, if the key in the subsequent BEG READ statement is a binary numeric field with nine digits, you should not use a seven-digit numeric field or a packed decimal numeric field in the END AT statement to set the starting value. Again, this applies only to indexed files; sequential files can specify any valid record number.

> Note that any field, including non-key fields, can be used with the END AT statement. This statement uses the contents of the field as an end marker. Unless the file is sequential, constant fields are assumed to be alphanumeric; for sequential files, constants are assumed to be numeric. The length of the alphanumeric constant is determined by discarding all trailing blanks; hence, an all-blank constant results in a length of zero and causes a subsequent BEG READ or READNEXT to include all of the records through the end of the file, regardless of the relation (IN or EX).

Restrictions

If an END AT is not executed before a BEG READ statement, records are read through the end of the file. If an END AT is not executed before a READNEXT statement, the READNEXT is successful unless an end-of-file condition is encountered.

If an END AT is followed by a BEG AT for the same file, the ending key value is lost.

The END AT statement cannot be used with one-record files.

Related Statements

BEG AT, BEG READ, END READ, READNEXT

Example

The following example uses END AT (with BEG AT) to specify a range of records to be read in the file specified in the subsequent BEG READ statement. The example includes a transaction file of records to be posted to the master (CUSTOMER) file. The first part of the key to the transaction file is the customer ID. You want to restrict the reading of the transaction file to only the range of record keys that includes a specific customer ID.

```
        BEG AT    TAR TRANFILE IN TAR CUSTOMER ID
        END AT    TAR TRANFILE IN TAR CUSTOMER ID
        BEG READ  TAR TRANFILE                HOLD 0 KEY IS  TRANFILE KEY
        (Process each TRANFILE record for specified customer)
        END READ  TAR TRANFILE
```

The preceding example processes records on the TRANFILE file with a key value within the range specified by the BEG AT/END AT pair of statements. If the END AT is not included, the processing continues until the end of the file is reached. When used with BEG READ, and there are no records on the file that meet the specified ending range, no statements within the BEG READ, END READ are executed.

The next example shows END AT used preceding a READNEXT statement:

```
        *
        BEG AT    TAR ORDERIN  IN TAR TRANFILE CUSTOMER ID
        END AT    TAR ORDERIN  IN TAR TRANFILE CUSTOMER ID
        LABEL     :NEXT ORDER RECORD
        READNEXT  TAR ORDER                   HOLD 0 FT 0 BY ORDER CUST ID
T       (Process each ORDER record for specified customer)
T       GOTO      :NEXT ORDER RECORD
        *
        (Terminate order processing for specified customer)
```

In this example, if the ORDER file contains one or more records matching the specified customer ID, the true/false status indicator is set to *T* by the READNEXT statement.

END LOOP

END LOOP (EL or END L)

The **END LOOP** statement marks the end of loop execution.

```
[      ] END LOOP [ ] = [   ] TO [   ]  STEP [   ]
(1)               (2)   (3)     (4)         (5)
```

(1) T/F execution conditions
(2) Loop index, (A to Z, AI to ZI)

Using the Statement

The parameter entered is a predefined field A to Z or AI to ZI that corresponds to the index counter specified in the matching BEG LOOP statement.

If the index counter plus the step value is outside the ?to? range set in the BEG LOOP statement, the index counter is left unchanged, and execution continues with the statement following the **END LOOP**.

Otherwise, the index counter is incremented by the step value, and execution continues with the statement immediately following the corresponding BEG LOOP statement.

Restrictions

A BEG LOOP statement must come before the **END LOOP** statement. There must be an **END LOOP** statement for each BEG LOOP statement. See the BEG LOOP section for additional information.

Execution Errors

An error occurs if a BEG LOOP statement does not get executed.

Related Statements

BEG LOOP

Example

The following example is a simple loop that increments the current monthly budgets by 5 percent for all 12 months:

```
[      ] BEG LOOP [AI] = [001] TO [012]  STEP [001]
[      ] COMPUTE  [TGL] [BUDGET AMOUNT          ] [AI] [*] [   ] [1.05                    ] [   ]
[      ] END LOOP [AI]
```

After the twelfth repetition (where AI=12), control is passed to the next statement following the END LOOP statement.

The next example presents a nested loop that repeats its processing logic within each occurrence of the main loop. This loop also incorporates a conditional check to see if the value of field C equals that of field D, at which point the internal loop terminates and returns control to the main loop.

```
        BEG LOOP A = 001 TO 010  STEP 001
        (Perform processing if needed)
        BEG LOOP B = 001 TO 005  STEP 001
        (Perform processing)
        IF      --- C                    EQ --- D
T       SET     --- B                    =      5
        END LOOP B
        *
        END LOOP A
```

There can be more BEG LOOP statements in an ILF routine than END LOOP statements. For example:

```
T       BEG LOOP A = 001 TO 010  STEP 001
F       BEG LOOP A = 001 TO 005  STEP 001
        (Perform processing)
        END LOOP A
```

In the preceding example, only one of the BEG LOOP statements can execute.

END PROC

The END PROC statement allows you to end the current process and return control to APPX. For example, after a child process has an END PROC statement executed, control may be returned to the parent process. The END PROC statement has the same effect as a user selecting the end option while in a process.

```
        END PROC
(1)
```

(1) T/F execution conditions

Using the Statement

There are no restrictions as to where you can insert the **END PROC** statement within a process. You can control if it is to be executed by setting appropriate true/false execution conditions.

Related Statements

CANCEL, END, EXIT, LOGOUT

Example

In this example, if the customer has a zero balance, the current process terminates and control is returned to APPX.

```
        IF      TAR CUSTOMER BALANCE     EQ     0
T       END PROC
```

END READ

END READ (ER or END R)

The **END READ** statement indicates the end of a BEG READ 'Read Next Record' loop.

```
[    ] END READ [  ] [                              ]
(1)             (2)  (3)
```

(1) T/F execution conditions
(2) Application ID
(3) File name (or field name for RDBMS)

Using the Statement

When using this statement in conjunction with an RDBMS table, you can specify a field name instead of a file name to limit the volume of data being passed between APPX and the RDBMS. See the Partial-Record I/O section in Specifying Statementsfor more information.

The **END READ** statement acts as a GOTO and a placeholder; the **END READ** 'goes to' the statement after the corresponding BEG READ. The **END READ** statement is also used by the BEG READ statement as a placeholder, to know where to continue execution when the loop is finished.

Restrictions

The application ID and file name must match those specified in a previous BEG READ statement.

The **END READ** statement cannot be used with one-record files.

Execution Errors

A non-recoverable file processing error occurs if an **END READ** statement executes without, or before, the corresponding BEG READ statement. A non-recoverable error also occurs if, once loop termination has taken place, the **END READ** is re-executed without or before another corresponding BEG READ statement. All loops are considered terminated when an event point ends.

Related Statements

BEG AT, BEG READ, END AT, READNEXT

Example

The following example demonstrates a common use of the END READ statement where a range is specified:

```
[    ] BEG AT   [TAR] [TRANFILE] [IN] [TAR] [CUSTOMER ID              ] [  ]
[    ] END AT   [TAR] [TRANFILE] [IN] [TAR] [CUSTOMER ID              ] [  ]
[    ] BEG READ [TAR] [TRANFILE                ] HOLD [0] KEY IS [TRANFILE KEY                ]
       (Process each TRANFILE record for specified customer)
[    ] END READ [TAR] [TRANFILE                ]
```

In this example, the system reads the TRANFILE file, beginning with the first record where the TRANFILE CUSTOMER ID is equal to or greater than the first one found in the TRANFILE (TRANFILE CUSTOMER ID must be the first part of TRANFILE KEY). The BEG READ 'Read Next Record' loop terminates when the key in TRANFILE exceeds the one specified in the END AT statement. If no BEG AT is present, the read begins with the first record in the file.

ERROR

ERROR can be used in any event point in an input process to display an error message, or to print an error message in an output or action process.

```
[    ] ERROR  [                                                  ]
(1)           (2)
```

(1) T/F execution conditions
(2) Error message (constant or TEMPn predefined field)

Using the Statement

Variable error messages can be displayed or printed by setting the predefined field TEMPn to the required message and entering TEMPn in place of a message in the ERROR statement.

When an error occurs, the image is redisplayed to the user with the error message blinking on line two of the status surface, and the terminal beeps. If more than one ERROR, WARNING, or MESSAGE statement is executed, the user can display the additional messages. The user must correct the problem before processing can continue with the next image.

In output processes, errors are printed on the report; in update, status, and subroutine processes errors are sent to the associated log. Each time an ERROR statement executes, the value of the predefined field ERRORS is incremented by one.

Related PDFs

ERRORS

Related Statements

WARNING, MESSAGE

Example

In this example, an ERROR statement followed by a BLINK statement are used to alert a user that the customer has exceeded their credit limit.

```
[    ] IF     [TAR] [CUSTOMER BALANCE      ] [   ] [GT] [TAR] [CUSTOMER CREDIT LIMIT] [   ]
[T   ] ERROR  [Cusomer's balance exceeds credit limit!                                      ]
[T   ] BLINK  [TAR] [CUSTOMER BALANCE      ] [   ] (AT APPEARANCE # [   ])
```

EXIT

The EXIT statement ends the current subprocess family and returns control to the previous related or detached process.

```
[      ] EXIT
(1)
```

(1) T/F execution conditions

Related Statements

CANCEL, END, END PROC, LOGOUT

Example

In this example, if the customer has a zero balance, the current subprocess family terminates and control is returned to the previous related or detached process.

```
[      ] IF      [TAR] [CUSTOMER BALANCE      ] [  ] [EQ] [  ] [0                    ] [  ]
[T     ] EXIT
```

FONT

The FONT statement changes a field's font based on the contents of the predefined field FONT. All fields displayed on the screen can be affected by using the global FONT statement as shown below, or a specific field's font can be changed by identifying the field.

> Note: The FONT Statement is not supported using the Appx HTML Client.

```
[      ] FONT    [  ] [                    ] [  ] (AT APPEARANCE # [  ])
(1)              (2) (3)                    (4)                   (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on an image. If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the FONT statement affects all of the items painted on the associated image using either the default font or the font specified in the predefined field FONT.

The operation of a FONT statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced,

Restrictions

> Note that, because the **FONT** statement operates on items rather than fields, this statement is meaningful only in event points that are associated with an image.

Statement Ignored

The system ignores any **FONT** statements specified in non-image-related event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE, SET, ULINE

Example

The FONT statement is used to cause the current font on a field to change on the image. In this example, the customer's credit status displays in Courier font while all other fields are displayed in the default font designated by the System Administrator.

```
        SET     --- FONT                  =   COURIER
        FONT    TAR CUSTOMER CREDIT STATUS    (AT APPEARANCE #   )
        DISPLAY TAR CUSTOMER CREDIT STATUS    (AT APPEARANCE #   )
```

GOSUB

GOSUB (G)

The GOSUB statement transfers processing control to the statement immediately following the referenced label or subroutine. Execution of a subsequent RETURN statement transfers control to the statement following the GOSUB.

```
        GOSUB
(1)             (2) (3)
```

(1) T/F execution conditions
(2) Application ID (optional)
(3) Label or subroutine name

Sets True/False Status Indicator

The **GOSUB** statement stores the current values of the internal true/false status indicators, clears the values before executing the subroutine, and restores them upon returning from the subroutine. In addition, **when implemented**, GOSUB will set the next status indicator to the value indicated in the RETURN statement, if any. (Note: when designing subroutines, be sure that no true/false levels are expected upon entering the subroutine.)

Using the Statement

The **GOSUB** statement specifies a label name or subroutine process. The **GOSUB** statement first tries to locate a corresponding LABEL within the event point being executed. If no such LABEL exists, APPX attempts to locate a subroutine process with that name in the specified application. If the application ID in the **GOSUB** statement is blank, it is assumed to be the current application.

If the GOSUB reference is to a label within the event point, the application ID should be blank or the current application.

If the reference is to a subroutine process, the following statements are generated automatically at process compile time, at the end of the event point:

```
        *
        END
        *
        LABEL   (label from GOSUB statement)
        COPY    (application ID and label from GOSUB statement)
        RETURN
```

This allows subroutine processes to be invoked by GOSUB as well as by COPY or SUBR.

Passing Values

The GOSUB statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Compilation Errors

If there is no corresponding LABEL and no subroutine process with the name identified in the **GOSUB** for the referenced application, and if the referenced application is a valid application in System Administration, a non-recoverable error occurs at runtime.

Statement Ignored

If there is no corresponding LABEL and the application ID refers to a nonexistent application, the statement is ignored.

Related Statements

COPY, END, GOTO, LABEL, PASS, RECEIVE, RETURN, SUBR

Example

```
        *
        *       On Account or Regular posting?
        *
        IF      TAR RECEIPTS3 APPLY TYPE    NE  1
T       GOSUB       :REGULAR POST
F       GOSUB       :ON ACCOUNT POST
        *
        END
        *
        LABEL   :REGULAR POST
        (Perform regular posting)
        RETURN
        *
        LABEL   :ON ACCOUNT POST
        (Perform on account posting)
        RETURN
```

Notice that, in this example, the subroutine does not use the values of the true/false status indicators established before the GOSUB. Instead, APPX stores the current values of those indicators, executes the subroutine, and then restores the original values upon completion of the subroutine. This allows you to have the use of the full range of true/false values within a subroutine.

GOTO

The **GOTO** statement transfers processing control to the statement immediately following the referenced label.

```
        GOTO
(1)             (2)
```

(1) T/F execution conditions
(2) Label

Using the Statement

The LABEL to which the **GOTO** statement transfers processing control can be anywhere in the same event point as the **GOTO**.

Compilation Errors

A process compile error occurs if the referenced LABEL is not defined within the same event point as the **GOTO** statement, and also not defined in any ILF subroutines copied into the event point with the COPY statement.

Related Statements

COPY, GOSUB, LABEL, OVERFLOW, RETURN, TIMEOUT

Example

In the following example, 'on account' payments are processed by invoice until no more payment amount is left to apply.

```
        LABEL   :GET NEXT APPLY TO
        *       Any more to apply?
        IF      TAR WORK ON ACCOUNT AMOUNT  EQ  0
T       GOTO    :END PROCESS ON ACCOUNT
        (Process 'on account' payment)
        GOTO    :GET NEXT APPLY TO
        (Perform other processing)
        LABEL   :END PROCESS ON ACCOUNT
```

IF

IF (I)

The **IF** statement compares the contents of two fields, or compares the contents of a field with a constant, and sets the next level of the internal true/false flag.

```
        IF
(1)     (2)  (3)                  (4)  (5)  (6)  (7)                  (8)
```

(1) T/F execution conditions
(2) 1st application ID
(3) 1st field name or PDF
(4) 1st occurrence (constant/index)
(5) Relation (LT,GT,LE,GE,EQ,NE,IN,EX, RI, RS)
(6) 2nd application ID
(7) 2nd field name, PDF, or constant
(8) 2nd occurrence (constant/index)

Sets True/False Status Indicator

In comparing the contents of two fields, or a field with a constant, the next level of the true/false status indicators is set to *T* if the condition is true, or *F* if the condition is false. See True/False Status Indicators for details on using these indicators.

Using the Statement

The **IF** statement specifies a relationship between two values. The valid relational operators are:

less than (LT), greater than (GT), less than or equal to (LE), greater than or equal to (GE) equals (EQ), not equal to (NE), includes (IN), excludes (EX), regular expression case insensitive (RI) and regular expression case sensitive (RS) .

The relation *IN* means 'includes'. The relation is true if the value in the second field is included in the first field, and false otherwise. If the relation is true, the predefined field TEXT AT POSITION is set to the starting position of the second field within the first field. The first field must be an alpha field; the second can be either an alpha field or a constant. Trailing blanks are ignored if the second field is a constant; however, you may specify fixed spaces (by entering underscores) to include one or more trailing spaces as part of a character string that is being searched.

RI and RS require a search string in the 2nd field name. The syntax of the search string may depend on the operating system where Appx is installed. Consider the following examples. All will check for 9 digits in the TEMP 30 field. All of these IF statements will work on a Windows server, but only the first (using character groups) or last (using Posix character classes) will work on Linux.

```
      IF     ---  TEMP 30          RI   ^[0-9](9)$
      IF     ---  TEMP 30          RI   ^\d(9)$
      IF     ---  TEMP 30          RI   ^[[:digit:]](9)$
```

Restrictions

The **IF** statement supports comparisons between like data types only (alpha-to-alpha, numeric-to-numeric, date-to-date, logic-to-logic). When comparing two date fields, results can be unpredictable if you are using a date field without a century component. Confirm that your System Administrator has set up the *Pivot Year* environment variable to avoid unexpected results.

Related PDFs

TEXT AT POSITION

Related Statements

AND, OR

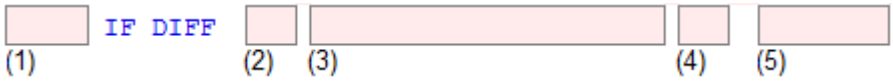
Example

In this example, if the customer's balance is greater than his credit limit, an error message is given and the balance field blinks; otherwise, no action is taken.

```
      IF     TAR CUSTOMER BALANCE        GT TAR CUSTOMER CREDIT LIMIT
T     ERROR  Customer's balance exceeds credit limit!
T     BLINK  TAR CUSTOMER BALANCE        (AT APPEARANCE #    )
```

IF DIFF

The IF DIFF statement compares the current contents of a record (file name), field, group, or predefined field with its stored, default, or original value.



(1) T/F execution conditions
(2) Application ID
(3) File name, field name, or predefined field
(4) Occurrence (constant/index)
(5) Comparison type (STORE, DEFAULT, or ORIGINAL)

Sets True/False Status Indicator

If the two values compared are different, the next level of the true/false status indicators is set to *T; otherwise, it is set to F.* See *True/False Status Indicators* for details on using these indicators.

Using the Statement

The IF DIFF statement allows you to determine if the contents of the operand have changed from the comparison type value. The operand can identify a record (file name), an individual field or a group (field name), or a PDF. Valid comparison types are STORE, DEFAULT, and ORIGINAL and can be selected via Scan.. IF DIFF will compare the current value of the operand against the STORE/RESTORE area (STORE), the default record (DEFAULT), or the original (on-disk) buffer (ORIGINAL).

ORIGINAL is only valid for the PCF since APPX does not store the original on-disk values for other files (see notes below). To make it easier to use IF DIFF in a subroutine, you can omit the operand name if the comparison type is ORIGINAL (since that implies the PCF record).

IF DIFF will also populate the --- COMPARE memory file with a list of differences. If no differences are found, this file will be empty. If differences are found, the COMPARE file will hold one record for each changed field, composed of the following fields:

COMPARE FIELD NAME X(22), primary key

COMPARE DESCRIPTION X(30)

COMPARE CURRENT VALUE X(80)

COMPARE OTHER VALUE X(80)

COMPARE OFFSET 9(5)

COMPARE LENGTH 9(5)

The COMPARE FIELD NAME field will contain the name of the changed field. COMPARE DESCRIPTION will contain the descriptive name of the changed field. COMPARE CURRENT VALUE will contain the value of the field in the current record buffer, as converted by CNV TEXT. COMPARE OTHER VALUE will contain the value of the field in the other record buffer (store, default, or original) as converted by CNV TEXT. The COMPARE OFFSET and COMPARE LENGTH fields will contain the offset of the field within the record buffer and the length of the field, respectively

The following notes may provide a better understanding of how to use the ORIGINAL comparison type in this statement:

Any process that has a PCF can compare to the original-record buffer.

Since file-level event points have a PCF, they can compare to the original-record buffer.

The original-record buffer is now shared between the file-level event points and the foreground process. Prior to the implementation of the IF DIFF statement in Release 4.2, you could modify a record in the file-level Post Read event point and the foreground input process would not notice that the record had changed.

For file-level event points, each stream maintains its own original-record buffer.

For release 4.2, APPX only keeps an original-record buffer for PCF files. However, this restriction may be lifted in a future release.

The original-record buffer is managed in the manner described below:

In Add mode, the default-record buffer is copied to the original-record buffer just before the Set Run-Time Defaults event point.

In Inquire, Delete, or Change mode, the original-record buffer is copied from disk just before the Post PCF Read event point.

For file-level event points, the original-record buffer is copied from disk just before the Post Read event point.

In Change mode, the current-record is copied to the original-record buffer just before the Post PCF Update event point.*

In Add mode, the current-record is copied to the original-record buffer just before the Post PCF Update event point.*

*Note: For process types other than Input, APPX never updates the PCF automatically, so rules 6.d and 6.e only apply to Input processes.

IF EXIST

The **IF EXIST** statement determines the existence of a specified file.

```
[    ] IF EXIST [  ] [        ]                FAIL [ ]
(1)             (2) (3)                          (4)
```

(1) T/F execution conditions
(2) Application ID
(3) File name
(4) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next true/false status indicator is set to *T* if the file exists, and to *F* if it does not. If the file does not currently exist, the FAIL parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

The application ID and file name to locate are specified in the statement. Additional information that can affect the location of the file may be contained in the predefined fields DATABASE or NEXT DATABASE.

The file name references a file that is defined in the data dictionary of the specified application ID. You can set the NEXT DATABASE predefined field to the database ID of the database in which the file should be located.

If NEXT DATABASE is blank, the DATABASE predefined field is used. The NEXT DATABASE field is set to blank by the IF EXIST statement, regardless of whether or not the file was successfully located.

Execution Errors

Serious problems encountered while trying to open the file, such as a file structure/data dictionary mismatch, cause a non-recoverable runtime error to occur, regardless of the *FAIL* parameter.

Related PDFs

DATABASE, NEXT DATABASE

Related Statements

CLOSE, CREATE, OPEN, SCRATCH

Example

In the example below, the General Ledger Parameters file is accessed to determine if it exists. If it does not exist, an error is displayed or printed; if it does exist, the record is read; and if the record does not exist, an error is displayed or printed.

```
      IF        TAR PARAM KEEP HIST CALEND    EQ    0
T     IF EXIST  TGL PARAM              FAIL 0
TF    ERROR     General Ledger Parameter file does not exist
TT    READ      TGL PARAM                  HOLD 0 FT 0 BY
TTF   ERROR     General Ledger Parameter record not on file
```

INPUT

The INPUT statement allows you to alter the flow of processing by invoking an APPX input process from within an ILF routine.

```
      INPUT                                                END?   FAIL
(1)         (2)  (3)                          (4)            (5)    (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Input process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and input process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the input process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the input process. The input process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the input process returns to the current process (beginning with the first statement after the INPUT statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The INPUT statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDFs

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INQUIRY, JOB, MENU, OUTPUT, PASS, QUERY, STATUS, SUBR, UPDATE

Example

The following example checks to see if it is the last processing day in the month. If so, the INPUT statement is executed, invoking an end-of-month data entry operation.

```
     IF      TAR WORK END OF MONTH       EQ   Y
T    INPUT   TAR END OF MONTH ENTRY      SUBPROCESS   END? Y  FAIL 3
```

INQUIRY

The INQUIRY statement allows you to alter the flow of processing by invoking an APPX inquiry process from within an ILF routine.

```
     INQUIRY                                          END?   FAIL
(1)          (2)  (3)                     (4)            (5)    (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Inquiry process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and inquiry process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the inquiry process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the inquiry process. The inquiry process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the inquiry process returns to the current process (beginning with the first statement after the INQUIRY statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The INQUIRY statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDFs

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INPUT, JOB, MENU, OUTPUT, PASS, QUERY, STATUS, SUBR, UPDATE

Example

The following example checks to see if it is the last processing day in the month. If so, the INQUIRY statement is executed, invoking an end-of-month file inquiry operation.

```
     IF        TAR WORK END OF MONTH        EQ   Y
T    INQUIRY   TAR END OF MONTH INQUIRY          SUBPROCESS   END? Y  FAIL 3
```

INVERSE

Items are usually displayed in normal video mode on an image. INVERSE displays an item in an inverse video mode.

> Note: The INVERSE Statement is not supported using the Appx HTML Client.

```
     INVERSE                                  (AT APPEARANCE #     )
(1)          (2)  (3)                     (4)                  (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image.

If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the INVERSE statement affects all of the items painted on the associated image.

INVERSE is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of an INVERSE statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that because characteristic statements operate on items rather than fields, they are only meaningful in event points that are associated with an image.

INVERSE is a terminal display attribute only and therefore is not allowed on images in output processes.

Statement Ignored

The system ignores any INVERSE statements specified in non-image event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, FONT, NO BOLD, NO ULINE, NORMAL, PICTURE, ULINE

Example

In the following example, if the customer's credit status is *BAD*, it displays in inverse video.

```
     IF       TAR CUSTOMER CREDIT STATUS   EQ   BAD
T    INVERSE  TAR CUSTOMER CREDIT STATUS   (AT APPEARANCE #   )
```

JOB

The JOB statement allows you to alter the flow of processing by invoking an APPX job process from within an ILF routine.

```
     JOB
(1)      (2)  (3)                    (4)          END?  FAIL
                                                   (5)   (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Job process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and job process name to be invoked, you specify the invocation type (subprocess, related or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the job process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the job process. The job process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the job process returns to the current process (beginning with the first statement after the JOB statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The JOB statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDFs

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INPUT, INQUIRY, MENU, OUTPUT, PASS, QUERY, STATUS, SUBR, UPDATE

Example

The following example checks to see if it is the last processing day in the month. If so, the JOB statement is executed, invoking an end-of-month file update operation.

```
        IF      TAR WORK END OF MONTH       EQ      Y
T       JOB     TAR END OF MONTH UPDATE             SUBPROCESS   END? Y  FAIL 3
```

LABEL

The **LABEL** statement defines a position in an ILF routine that may be referenced by GOTO, GOSUB, OVERFLOW, or TIMEOUT statements.

```
        LABEL
(1)             (2)
```

(1) Label

Using the Statement

The LABEL statement defines a position in an ILF routine that may be referenced by a GOTO, GOSUB, OVERFLOW, or TIMEOUT statement. Each label must be unique within the event point that contains it.

Compilation Errors

A process compile error occurs if multiple labels of the same name are defined within the same event point or in any ILF subroutines copied into that event point with the COPY statement.

Related Statements

COPY, GOSUB, GOTO, OVERFLOW, TIMEOUT

Example

In the following example, 'on account' payments are processed by invoice until no more payment amount is left to apply.

```
        LABEL   :GET NEXT APPLY TO
        *       any more apply?
        IF      TAR WORK ON ACCOUNT AMOUNT  EQ  0
T       GOTO    :END PROCESS ON ACCOUNT
        (Process 'on account' pament)
        GOTO    :GET NEXT APPLY TO
        *
        LABEL   :END PROCESS ON ACCOUNT
        (Perform other processing)
```

LOCAL

A new LOCAL statement allows fields to be declared to be LOCAL to the current context.

LOCAL saves the named field's value. When the current context completes, it restores the saved value before returning to the invoking context.

LOCAL works in subroutines called via a GOSUB, and in Start of Process event points.

Description:

A LOCAL statement is (nearly) equivalent to a RECEIVE statement that executes without a matching PASS statement (such a RECEIVE statement will set the next T/F to F, but a LOCAL statement doesn't change the T/F flags).

When you execute a LOCAL (or RECEIVE) statement, the engine decides the point in time that the original value should be restored according to the following rules:

1. If you execute a LOCAL (or RECEIVE) while there is a GOSUB active (in the current event point), the original value is restored when you execute a RETURN statement.
2. If there is no GOSUB active, the original value is restored when the event point ends (with one exception described in the next rule). That means that you can add LOCAL statements to the beginning of an event point to protect variables that you want to use in that event point.
3. If you execute a LOCAL statement (and there is no active GOSUB) in the Start of Process event point, you are protecting a variable for the life of the process (the original value is restored when the process ends).

LOGOUT

The **LOGOUT** statement causes APPX to end and returns control to the host operating system.

```
[    ] LOGOUT    SYSTEM? [ ]
(1)                      (2)
```

(1) T/F execution conditions
(2) Log off operating system

Using the Statement

If SYSTEM is specified as *Y*, the user is logged off of the system if the operating system provides this capability.

Related Statements

CANCEL, END, END PROC, EXIT

MENU

The MENU statement allows you to alter the flow of processing by invoking an APPX menu process from within an ILF routine.

```
[    ] MENU  [  ] [                                  ] [            ]  END? [ ]  FAIL [ ]
(1)          (2)  (3)                                  (4)              (5)       (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Input process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and menu process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the menu process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the menu process. The menu process will return to the parent of the current process when it is finished. If *END?* is set to *N,* the menu process returns to the current process (beginning with the first statement after the MENU statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

If the application ID is supplied but the menu name is left blank, the menu is obtained from the Application Parameters [reference unavailable in the source] file for the specified application.

If both the application ID and the menu name are blank, the application used is the Startup Application for the current database (specified in the Database file in System Administration), and the menu name is then obtained from the Application Parameters [reference unavailable in the source] file for that application.

Passing Values

The MENU statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDF's

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INPUT, INQUIRY, JOB, OUTPUT, PASS, QUERY, STATUS, SUBR, UPDATE

Example

The following example checks to see if it is the last processing day in the month. If so, the **MENU** statement is executed, invoking an end-of-month file menu.

```
        IF      TAR WORK END OF MONTH       EQ  Y
T       MENU    TAR END OF MONTH MENU           SUBPROCESS   END? Y  FAIL 3
```

MESSAGE

MESSAGE can be used to display a message in an input process, or to print a message in an output, update or status process.

```
        MESSAGE
(1)             (2)
```

(1) T/F execution conditions
(2) Error message (constant or TEMPn predefined field)

Using the Statement

Variable messages can be displayed or printed by setting a predefined field TEMPn to the required message and entering *TEMPn* in place of a message in the MESSAGE statement.

When a message occurs, the image is redisplayed to the user with the message on line two of the status surface. If more than one ERROR, WARNING, or MESSAGE statement is executed, the user can display the additional messages.

In output processes, messages are printed on the report; in update, status, and subroutine processes they are printed to a log.

Related Statements

ERROR, WARNING

Example

In the example below, the application designer is advising the user to use a different transaction entry process to enter invoices for miscellaneous customers.

```
     MESSAGE  Use Standard Invoice Entry for Miscellaneous Customers!
```

NO BOLD

NO BOLD is used to print an item with normal print density (the reverse of BOLD).

> Note: The NO BOLD Statement is not supported using the Appx HTML Client.

```
    ????? NO BOLD  ??? ??????????????????????? ??? (AT APPEARANCE # ???)
    (1)            (2) (3)                     (4)                  (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image.

If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the NO BOLD statement affects all of the items painted on the associated image.

NO BOLD is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a NO BOLD statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that, because characteristic statements operate on items rather than fields, these statements are meaningful only in event points that are associated with an image.

NO BOLD is a printer attribute only and therefore has no effect on images displayed on a terminal screen.

Statement Ignored

The system ignores any NO BOLD statements specified in non-image-related event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, FONT, INVERSE, NO ULINE, NORMAL, PICTURE, ULINE

Example

In the following example, if the customer's credit status is not **BAD**, it is printed with normal intensity on the report.

IF TAR CUSTOMER CREDIT STATUS NE BAD
T NO BOLD TAR CUSTOMER CREDIT STATUS (AT APPEARANCE #)
DISPLAY TAR CUSTOMER CREDIT STATUS (AT APPEARANCE #)

NO INPUT

NO INPUT is used in input processes to prevent a user from modifying a particular field.

```
[    ] NO INPUT [  ] [                    ] [  ] (AT APPEARANCE # [  ])
(1)             (2) (3)                    (4)                   (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The NO INPUT statement can be used to make fields conditionally unmodifiable, depending on prior entries. The appearance number can be used if the same field appears more than once on the image.

The application ID, field name, occurrence, and appearance may all be left blank, in which case the statement is applied to all items on the image.

When NO INPUT is executed for an item, it is dimmed on the image.

Restrictions

NO INPUT statements are only valid on image-related event points.

Related Statements

OK INPUT

Example

The example below prevents the operator from entering a General Ledger account number into a customer's record if the General Ledger Chart of Accounts file does not exist.

```
     IF EXIST TGL BALANCE            FAIL 0
F    NO INPUT TAR CUSTOMER ACCOUNT        (AT APPEARANCE #    )
```

NO ULINE

Items can be displayed with an accompanying underline on the image. NO ULINE is used to reverse an underline.

> Note: The NO ULINE Statement is not supported using the Appx HTML Client.

```
     NO ULINE                                (AT APPEARANCE #    )
(1)          (2)  (3)                   (4)                  (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image.

If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the NO ULINE statement affects all of the items painted on the associated image.

NO ULINE is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a NO ULINE statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that because characteristic statements operate on items rather than fields, they are only meaningful in event points that are associated with an image.

Statement Ignored

The system ignores any NO ULINE statements specified in non-image event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NORMAL, PICTURE, ULINE

Example

The following example erases an underline from beneath the 2nd appearance of the customer?s name.

```
     NO ULINE TAR CUSTOMER NAME          (AT APPEARANCE # 002)
     DISPLAY  TAR CUSTOMER NAME          (AT APPEARANCE # 002)
```

NORMAL

Items can be displayed in an inverse video mode on an image. In contrast, NORMAL is used to display an item in a NORMAL video mode.

> Note: The NORMAL Statement is not supported using the Appx HTML Client.

```
     NORMAL                                (AT APPEARANCE #    )
(1)          (2)  (3)                  (4)                    (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image.

If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the NORMAL statement affects all of the items painted on the associated image.

NORMAL is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a NORMAL statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that because characteristic statements operate on items rather than fields, they are only meaningful in event points that are associated with an image.

NORMAL is a terminal display attribute only and therefore is not allowed on images in output processes.

Statement Ignored

The system ignores any NORMAL statements specified in non-image event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, PICTURE, ULINE

OK INPUT

OK INPUT is used in input processes to make an item modifiable. This can be used for fields that are conditionally modifiable depending on prior entries.

```
[    ] OK INPUT [  ] [                    ] [  ] (AT APPEARANCE # [  ])
(1)            (2) (3)                    (4)                   (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

OK INPUT is used in input processes to make an item modifiable. This can be used for fields that are conditionally modifiable, depending on prior entries. The appearance number can be used if the same field appears more than once on the image.

The application ID, field name, occurrence, and appearance may all be left blank, in which case the statement is applied to all items on the image.

Restrictions

OK INPUT statements are only valid in image-related event points.

Related Statements

NO INPUT

Example

The following example allows a user to enter a General Ledger account number into a customer?s record if the General Ledger Chart of Accounts file exists.

```
     IF EXIST TGL BALANCE1            FAIL 0
T    OK INPUT TAR CUSTOMER ACCOUNT        (AT APPEARANCE #    )
```

OPEN

The OPEN statement logically and physically opens a specified file immediately. Normally, files are not opened until an I/O operation is performed on the file, such as a READ or a WRITE, and are handled by APPX automatically. However, OPEN statements may be necessary to switch between disk and cache versions of a file. Also, OPEN statements may be desirable for performance reasons, for example, by checking certain conditions before requiring a file to be opened.

```
     OPEN      SHARE?   FAIL   CACHE
(1)       (2)  (3)  (4)    (5)    (6)
```

(1) T/F execution conditions
(2) Application ID
(3) File name
(4) Share the file? (Y/N)
(5) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)
(6) Cache? (Y=cache version, N=disk version)

Sets True/False Status Indicator

The next true/false status indicator is set to *T* if the file exists and was successfully opened, and to *F* if it cannot be opened. If the process cannot be invoked successfully, the FAIL parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

A file is *physically* opened only once for each user, but may be *logically* opened in several different processes for each user. For example, if a user is entering sales orders, the customer file may be logically opened both for the process that enters the order itself and the related child process that enters the sales line items. Additionally, the OPEN statement allows you to open either the cached version of a file or the disk version of a file.

The *SHARE?* parameter determines whether other users should be permitted to update the file while it is open. If some other user has opened the file already in a restrictive sharing mode, the current user is presented with an 'In Use' display, unless a TIMEOUT statement with a nonblank label was executed before the OPEN statement. In this case, processing control transfers to the label specified.

The application ID and file name for the file to open are specified in the statement. Additional information that can affect the location of the file may be contained in the predefined fields DATABASE and NEXT DATABASE.

The file name references a file that is defined in the data dictionary of the application ID. You can set the NEXT DATABASE predefined field to the database ID of the database containing the file that you want opened.

If NEXT DATABASE is blank, the DATABASE predefined field is used. Note that the NEXT DATABASE field is modifiable, whereas the DATABASE field is not.

The NEXT DATABASE field is set to blank by the **OPEN** statement, regardless of whether or not the file is successfully opened.

If NEXT DATABASE is specified in conjunction with a cache file, then NEXT DATABASE is cleared and ignored. Like memory files there is only one instance of a cached file, not one for each database.

Execution Errors

Serious problems encountered while trying to open a file, such as a file structure/data dictionary mismatch, cause a non-recoverable runtime error to occur, regardless of the *FAIL* parameter.

If *CACHE?* has been set to *Y* and a cached version of the file does not exist, then the OPEN statement will fail. Therefore, a CREATE statement must be used to create the cached version of a file before the OPEN statement can be used to open it.

Related PDFs

DATABASE, NEXT DATABASE

Related Statements

BEG READ, CLOSE, CREATE, END READ, READ, READNEXT, SCRATCH, TIMEOUT, WRITE

Example

The following example opens the Customer file in the database labeled ARC. Other users are allowed access to the file. If the OPEN fails, a warning message is generated.

```
      SET     --- NEXT DATABASE          =   ARC
      OPEN    TAR CUSTOMER  SHARE? Y  FAIL 1 CACHE? N
```

OR

The OR statement adds a second or subsequent conditional check to a preceding statement, such as the series 'IF A is true OR B is true, then...'. The OR statement itself compares the contents of two fields, or compares the contents of a field with a constant, to determine if a condition is true.

	OR							
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)

(1) T/F execution conditions
(2) 1st application ID
(3) 1st field name or PDF
(4) 1st occurrence (constant/index)
(5) Relation (LT,GT,LE,GE,EQ,NE,IN,EX)
(6) 2nd application ID
(7) 2nd field name, PDF, or constant
(8) 2nd occurrence (constant/index)

Sets True/False Status Indicator

The OR statement may modify the current value of the next internal true/false status indicator. If the preceding statement is false and the OR statement is true, the current status of the next indicator is changed to *T*. See Using AND and OR Statements for more information.

Using the Statement

The OR statement specifies a relationship between two values. The valid relational operators are:

less than (LT), greater than (GT), less than or equal to (LE), greater than or equal to (GE)

equals (EQ), not equal to (NE), includes (IN), and excludes (EX).

The relation *IN* means 'includes'. The relation is true if the value in the second field is included in the first field, and false otherwise. If the relation is true, the predefined field TEXT AT POSITION is set to the starting position of the second field within the first field. The first field must be an alpha field; the second can be either an alpha field or a constant. Trailing blanks are ignored if the second field is a constant; however, you may specify fixed spaces (by entering underscores) to include one or more trailing spaces as part of a character string that is being searched.

Normally, an OR statement is used immediately after an IF statement. However, the OR statement will operate successfully when used after any statement that sets the true/false status indicator. See AND and OR with Statements Other Than IF.

An OR statement may also be used in conjunction with one or more AND statements. For example:

	IF	---	A		EQ			
	AND	---	B		EQ			
	OR	---	C		EQ			
	AND	---	D		EQ			

Another example is:

```
        IF      ---  A                    EQ
        OR      ---  B                    EQ
        AND     ---  C                    EQ
        OR      ---  D                    EQ
```

Each of these examples could be expanded to add more AND and OR statements in various sequences but, no matter how many there are, the rules are always the same:

Each AND or OR statement performs only two checks at most: it checks the current value of the next true/false status indicator, and it evaluates its own condition. It does not matter how many statements preceded the AND/OR statement, nor what other statements follow the AND/OR statement.

If the current status of the next indicator is already false, the AND statement is bypassed since it is no longer relevant. If the current status is true and the AND statement is true, the current status is left unchanged as *T*. However, if the AND statement is false, the current status of the next indicator is changed to *F*.

Conversely, for an OR statement, if the current status of the next indicator is already true, the OR statement is bypassed since it is no longer relevant. If the current status is false and the OR statement is false, the current status is left unchanged as *F*. However, if the OR statement is true, the current status of the next indicator is changed to *T*.

Restrictions

The OR statement supports comparisons between like data types only (alpha-to-alpha, numeric-to-numeric, date-to-date, logic-to-logic). When comparing two date fields, results can be unpredictable if you are using a date field without a century component. Confirm that your System Administrator has set up the *Pivot Year* environment variable to avoid unexpected results.

Related PDFs

TEXT AT POSITION

Related Statements

AND, IF

Example

This example shows how to bypass statement processing if the customer is a miscellaneous customer or has a zero balance.

```
        IF      TAR  CUSTOMER MISC CUSTOMER    EQ   1
        OR      TAR  CUSTOMER BALANCE          EQ   0
T       GOTO         :NO STATEMENT
        (Processing to print customer statements)
        LABEL        :NO STATEMENT
```

OUTPUT

The OUTPUT statement allows you to alter the flow of processing by invoking an APPX output process from within an ILF routine.

(1) T/F execution conditions
(2) Application ID
(3) Output process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the FAIL parameter determines what additional action to take.

Using the Statement

In addition to the application ID and output process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the output process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the output process. The output process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the output process returns to the current process (beginning with the first statement after the OUTPUT statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The OUTPUT statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDF's

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INPUT, INQUIRY, JOB, MENU, PASS, QUERY, STATUS, SUBR, UPDATE

Example

The following example checks to see if it is the last processing day in the month. If so, the **OUTPUT** statement is executed, invoking an end-of-month report.

```
     IF      TAR WORK END OF MONTH     EQ   Y
T    OUTPUT  TAR END OF MONTH REPORT        SUBPROCESS   END? Y  FAIL 3
```

OVERFLOW

The OVERFLOW statement provides a means for intercepting numeric overflow conditions which can be caused by division by zero or by a result too large to be stored in a numeric destination field. The OVERFLOW statement specifies a label in much the same manner as a GOTO statement.

```
     OVERFLOW
(1)          (2)
```

(1) T/F execution conditions
(2) Label

Using the Statement

If a statement subsequent to the OVERFLOW statement references a numeric field and causes an overflow condition, processing control is transferred to the statement immediately following the specified label. The LABEL statement referenced by the OVERFLOW statement can be anywhere in the same event point as the OVERFLOW.

The OVERFLOW statement may be respecified at any time with another label, or the intercept may be disabled by an OVERFLOW statement with no label specified. Intercepts are automatically disabled when the event point that they are contained in is complete.

Compilation Errors

A process compile error occurs if the referenced LABEL is not defined within the same event point as the OVERFLOW statement, and also not defined in any ILF subroutines copied into the event point with the COPY statement.

Related Statements

CALC, COMPUTE, COPY, LABEL, SET, SET TOT

Example

In the following example, the OVERFLOW statement prevents the event point from failing with an overflow condition caused either by WORK AVG SALES not being large enough to store the integer component of WORK TOTAL SALES or by a division by zero error should the number of salesreps be zero.

```
        OVERFLOW  :WORK AVG SALES OVERFLOW
        SET       TAR WORK AVG SALES      =  TAR WORK TOTAL SALES
        COMPUTE   TAR WORK AVG SALES      /  TAR WORK NO SALESREPS
        *
        LABEL     :WORK AVG SALES OVERFLOW
        SET       TAR WORK AVG SALES      =  0
        WARNING   Numeric Overflow - WORK AVG SALES set to zero!
        *
        LABEL     :DISPLAY RESULTS
        DISPLAY   TAR WORK AVG SALES      (AT APPEARANCE #  )
```

PASS

The PASS statement causes the indicated area to be passed to the next subroutine, process, or external program that is executed via a GOSUB, CALL, RUN, or process-type statement (i.e., INPUT, INQUIRY, JOB, MENU, OUTPUT, QUERY, STATUS, SUBR, UPDATE), or to the next automatic or optional child process that is run. See the next section, PASS Lists, for a discussion of how PASS lists are maintained and cleared.

```
        PASS
(1)     (2)  (3)                  (4)  (5)              SHARE?
                                                                (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Area type (FIELD)
(6) Share? (Y/N)

Using the Statement

The PASS statement has two uses:

To explicitly pass an area from one process to another that would not otherwise be passed using implicit interprocess communication specifications.

To pass areas to an external program written in another programming language.

In the first case, the receiving program must explicitly receive the area with a RECEIVE statement, unless it receives the passed area based on implicit IPC specifications.

In the second case, the order areas are passed in is significant. Areas are passed in the order that the PASS statements are executed in.

Area type should be FIELD until such time other values have been implemented.

If *SHARE?* is *Y*, the PASS statement sends a pointer to the area value. Any changes made to this area in the receiving process or external program are available to the calling process.

If *SHARE?* is *N*, the PASS statement sends a copy of the area value. Changes made to the area in the receiving process (or program) do not modify the value in the calling process.

Related Statements

CALL, GOSUB, INPUT, INQUIRY, JOB, MENU, OUTPUT, QUERY, RECEIVE, RUN, STATUS, SUBR, UPDATE

Example

In this example, the initial value of CUSTOMER NAME is returned following the subroutine. Even if the subroutine altered the value of this field, it would still be returned in its initial state because the PASS statement does not share the field. The WORK STRING LENGTH field (paired with the value of the AI field), however, is modified to contain the length of the value in the CUSTOMER NAME field. This new value is returned following the subroutine because the WORK STRING LENGTH field was passed as a shared field.

```
      PASS    TAR WORK STRING LENGTH     FIELD          SHARE? Y
      PASS    TAR CUSTOMER NAME          FIELD          SHARE? N
      GOSUB   --- .TEXT GET LENGTH
```

PASS Lists

As discussed in the previous section, the PASS statement allows an area to be passed to the next subroutine, process, or external program that is executed via a GOSUB, CALL, RUN, or process-type statement (i.e., INPUT, INQUIRY, JOB, MENU, OUTPUT, QUERY, STATUS, SUBR, UPDATE), or to the next automatic or optional child process that is run. Prior to APPX 4.1, there was only one PASS list which was cleared upon completion of a CALL or RUN statement. Now it is possible to have a series of PASS lists. Each PASS statement adds its area to a single list until the execution of a GOSUB, CALL, RUN, or process-type statement, or the invocation of a automatic or optional child process. Upon such execution, only the values in the current PASS list are passed. However, if executing an APPX subroutine or process, it can in turn execute PASS statements. These statements then build another PASS list until terminated in the same manner. Each PASS list is cleared when execution returns to the routine or level which established it.

The following code provides an example of the use of three separate PASS lists. The first PASS list holds values for CUSTOMER NAME and CUSTOMER ADDRESS. The second PASS list contains the value for AREA MAIL CODE, and this is the only value passed to the :PROCESS MAIL CODE subroutine. The second PASS list is then cleared upon return from this subroutine while the first PASS list remains intact until the return from the :PROCESS NAME & ADDRESS subroutine. As illustrated in our example,

values from the first PASS list do not have to be RECEIVE'd before initiating another PASS list. Finally, a third PASS list is established for the CUSTOMER BALANCE value, which is finally cleared upon return from the :PROCESS BALANCE subroutine.

```
        PASS      TAR CUSTOMER NAME        FIELD        SHARE? N
        PASS      TAR CUSTOMER ADDRESS     FIELD        SHARE? N
        GOSUB         :PROCESS NAME & ADDRESS
        PASS      TAR CUSTOMER BALANCE     FIELD        SHARE? N
        GOSUB         :PROCESS BALANCE
        END
        *
        LABEL         :PROCESS NAME & ADDRESS
        RECEIVE   TAR WORK NAME            FIELD          REQ? N
                  (Code to process name)
        PASS      TAR AREA MAIL CODE       FIELD        SHARE? N
        GOSUB         :PROCESS MAIL CODE
        RECEIVE   TAR WORK ADDRESS         FIELD          REQ? N
                  (Code to process address)
        RETURN
        *
        LABEL         :PROCESS MAIL CODE
        RECEIVE   TAR WORK MAIL CODE       FIELD          REQ? N
                  (Code to process mail code)
        RETURN
        *
        LABEL         :PROCESS BALANCE
        RECEIVE   TAR WORK BALANCE         FIELD          REQ? N
                  (Code to process balance)
        RETURN
```

PICTURE

The PICTURE statement has been replaced with a Alpha Control Type defined in the WIDGET file. See *Using GUI Features of the Image Editor* for more information on this Control Type.

POSITION

POSITION can be used in the image event points (Pre-Display, Option Intercept, Pre-Display/Verify) to position the cursor to either a specific item or a specific row and column position.

```
        POSITION                                (AT APPEARANCE #    )
(1)     (2)      (3)                    (4)                        (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

To position the cursor to a specific row and column, the designer must leave the application ID, field name, occurrence number, and appearance number blank. If all of the fields are left blank, the POSITION statement positions the cursor to the row and column specified by the CURSOR ROW and CURSOR COLUMN predefined fields, respectively. Note that the CURSOR ROW and CURSOR COLUMN predefined fields refer to the physical row and column of the terminal, rather than to a relative position within the image, window, region, or surface. If the CURSOR ROW or CURSOR COLUMN fields contain a value larger than the size of the terminal, the POSITION statement substitutes the terminal limit for that coordinate. If the CURSOR ROW or CURSOR COLUMN fields contain a negative value, the POSITION statement substitutes *1* for the negative coordinate.

Restrictions

The POSITION statement only affects the cursor position if the image is redisplayed within the same image execution cycle (i.e., if the same image is redisplayed for a higher entry level, or because of a change to the image).

Statement Ignored

If the POSITION statement appears in an invalid event point, it is ignored at runtime. This means that no errors or warnings are generated at compile or runtime because of an invalid context.

Related PDFs

CURSOR COLUMN, CURSOR ROW

Example

In the following example, if the customer's credit limit is zero, the cursor is positioned on this field.

```
     IF       TAR CUSTOMER CREDIT LIMIT     EQ    0
T    POSITION TAR CUSTOMER CREDIT LIMIT     (AT APPEARANCE #    )
```

POP

The POP statement pops a field or record value from an internally maintained stack and sets it as the current value of the indicated field or record. The structure of the statement is:

```
     POP
(1)      (2) (3)                    (4) (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Data item type (FIELD, RECORD)

The POP statement is used to pop (retrieve) a value that was saved with a PUSH statement.

A distinct stack is associated with each field name and with each file name.

The stack has the internal structure of a LIFO list, i.e. the last value pushed onto the stack for a field or record is the first value popped from the stack. There is no predefined limit as to how many field or record values may be pushed onto a stack.

You may execute a POP statement for a specific field or file more than once. Each time that you execute a POP statement, the value from the "top" of the stack of the referenced field or record is saved as the current value of the referenced field or record and the value is removed from the stack. The POP statement also sets the True/False indicator. If the stack for the referenced field or file contains a value, then the stack is popped and the next level of the true/false status indicator is set to T (true). If the stack is empty, then the referenced field is set to its default value and the next level of the true/false indicator is set to F (false).

Predefined fields may be referenced by a PUSH or POP statement. However, it is invalid to use the PUSH or POP statement for predefined fields that are non-modifiable.

The scope of a stack is the same as the scope of the associated field or file. For example, if the scope of the referenced field is RELATED, then the scope of the associated stack will also be RELATED.

When a POP statement references a field with an occurrence, the next value from the stack is popped into the specified occurrence of the reference field.

A sub-string field and a synonym field will each have their own stack since they have field names that are distinct from the field that they are derived from.

The following example shows how PUSH and POP can be used to swap the values of occurrences 1 and 2 of a field.

```
      PUSH    TOE  ORDER1 SALESPERSON   001  FIELD
      PUSH    TOE  ORDER1 SALESPERSON   002  FIELD
      POP     TOE  ORDER1 SALESPERSON   001  FIELD
      POP     TOE  ORDER1 SALESPERSON   002  FIELD
```

One use for PUSH and POP is to load virtual keystrokes (user options) into a stack, and have them executed automatically and sequentially.

PUSH

The PUSH statement saves a field or record value on an internally maintained stack for the indicated field or record. The structure of the statement is:

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Data item type (FIELD, RECORD, DEFAULT FIELD, DEFAULT RECORD, ORIGINAL FIELD, ORIGINAL RECORD)

A distinct stack is associated with each field name and with each file name.

The PUSH statement is used to add field and record values to a stack.

The POP statement is used to retrieve field and record values from a stack.

The stack has the internal structure of a LIFO list, i.e. the last value pushed onto the stack for a field or record is the first value popped from the stack. There is no predefined limit as to how many field or record values may be pushed onto a stack.

The value of the source field or record is not changed when a PUSH statement is executed.

You may execute a PUSH statement for a specific field or file more than once before you execute a POP statement to retrieve a value from the stack. Each time that you execute a PUSH statement, the value of the referenced field or record is "pushed" onto the top of the stack associated with that field or file. Each time that you execute a POP statement, the next value is retrieved from the stack of the referenced field or record, stored as the current value of the referenced field or record, and removed from the top of the stack.

The contents of predefined fields can also be saved using the PUSH statement. However, it is invalid to use the PUSH statement for predefined fields that are non-modifiable, since the POP command is invalid for those fields.

The scope of a stack is the same as the scope of the associated field or file. For example, if the scope of the referenced field is RELATED, then the scope of the associated stack will also be RELATED.

The Data item type specification identifies which field value or record is to be pushed onto the stack. If FIELD or RECORD is specified, then the ***current*** value of the field or record is pushed onto the stack. If DEFAULT FIELD or DEFAULT RECORD is specified, then the ***default*** value of the field or record is pushed onto the stack. If ORIGINAL FIELD or ORIGINAL RECORD is specified, then the ***original*** value

of the field or record is pushed onto the stack. ORIGINAL FIELD and ORIGINAL RECORD may only be specified if the referenced field is a field in the PCF or if the referenced file is the PCF of the currently executing process.

Since there is only one stack for each field name and one stack for each file name, FIELD, DEFAULT FIELD, and ORIGINAL FIELD all push the indicated value onto a common (shared) stack for the specified field name and RECORD, DEFAULT RECORD, and ORIGINAL RECORD all push the indicated record buffer onto a common (shared) stack for the specified record (file) name.

Multiple occurrences of a field also share a common stack.

A sub-string field and a synonym field each have their own stack since they have field names that are distinct from the field that they are derived from.

The following example shows how PUSH and POP can be used to swap the values of occurrences 1 and 2 of a field.

```
PUSH   TOE  ORDER1 SALESPERSON   001  FIELD
PUSH   TOE  ORDER1 SALESPERSON   002  FIELD
POP    TOE  ORDER1 SALESPERSON   001  FIELD
POP    TOE  ORDER1 SALESPERSON   002  FIELD
```

One use for PUSH and POP is to load virtual keystrokes (user options) into a stack, and have them executed automatically and sequentially.

QUERY

The QUERY statement allows you to alter the flow of processing by invoking an APPX query process from within an ILF routine.

```
QUERY   (1)   (2)   (3)   (4)   END? (5)   FAIL (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Query process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and query process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the query process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the query process. The query process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the query process returns to the current process (beginning with the first statement after the QUERY statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The QUERY statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDFs

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INPUT, INQUIRY, JOB, MENU, OUTPUT, PASS, STATUS, SUBR, UPDATE

Example

The following example checks to see if it is the last processing day in the month. If so, the **QUERY** statement is executed, invoking an end-of-month query process.

```
     IF     TAR WORK END OF MONTH      EQ   Y
T    QUERY  TAR END OF MONTH QUERY     DETACHED    END? Y  FAIL 3
```

READ

READ (R)

The READ statement reads a record from a specified file, using the specified key.

```
     READ   |    |                    HOLD |  FT |  BY |
(1)         (2)  (3)                   (4)   (5)   (6)
```

(1) T/F execution conditions
(2) Application ID
(3) File name or field name
(4) Hold type (0=do not hold, 1=hold, 2=hold with potential recovery)
(5) Fail Type (0=nothing, 1=warning, 2=error, 3=cancel)
(6) Access key field name (blank if one-record file)

Sets True/False Status Indicator

The next status indicator is set to *T* if the record is read successfully, and to *F* if the record is not found. If the record is not on file, the *FAIL* (or *FT*) parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

When using this statement in conjunction with an RDBMS table, you can specify a field name instead of a file name to limit the volume of data being passed between APPX and the RDBMS. See the Partial-Record I/O section in Specifying Statements for more information.

The READ statement allows a record to be read as 'held' for update. While a record is held, no other user may update or delete that record. If the record is to be rewritten or deleted, the *HOLD* parameter must be set to *1* (hold) or *2* (recover). Otherwise, it should be set to *0* (no). The recover specification holds the record and internally saves a copy of the record so that a subsequent rewrite or delete can be performed, even if the hold is lost (by reading another record with hold before completing the rewrite or delete). 'Recover' can rehold the record for update, as long as the saved copy is identical to the original record that was read. Note that performance is improved with hold type *1*.

> Note also that the READ statement does not generate an 'In Use' message if the record to be read as 'held' is currently being held by another user. The READ statement simply waits until the record to read has been freed up by the other user, unless a TIMEOUT statement with a nonblank label was previously encountered. If a TIMEOUT statement is used, processing control transfers to the specified label.

The keypath and position established by the process interpreter for the process control file is not affected by a 'Read Next Record' loop.

Restrictions

The contents of a specified key field must be set before executing a READ. For one-record files, the key field specification must be left blank. For consecutive files, the key field specification must contain a numeric field that must be set to the relative record number of the record to be read, or a numeric constant indicating that record number. For indexed files, the key field specification must identify a key field in the file to be read.

Compilation Errors

If any of the above restrictions fail, an error is generated at compile time.

Related Statements

BEG READ, CLOSE, DELETE, END READ, OPEN, READNEXT, REWRITE, TIMEOUT

Example

In the following example, the original transaction date is set from the Unpaid Invoices file if a record exists for that invoice, or from the Cash Receipts file if no such record is found.

```
      *       Set original transaction date so post can compute days to pay
      SET     TAR UNPAID CUSTOMER NO      =  TAR RECEIPT2 CUSTOMER NO
      SET     TAR UNPAID APPLY TO         =  TAR RECEIPT3 PAID INVOICE
      READ    TAR UNPAID                  HOLD 0 FT 0 BY UNPAID KEY
T     SET     TAR POST ORIGINAL TRX DATE  =  TAR UNPAID INVOICE DATE
F     SET     TAR POST ORIGINAL TRX DATE  =  TAR RECEIPT2 DATE RECEIVED
```

In the second example below, the Accounts Receivable Parameters record is read for update and the process is canceled if the record is not found (no key is specified because Parameters is a one-record file).

```
      READ    TAR PARAM                   HOLD 0 FT 0 BY
F     CANCEL  Account Receivable Parameter Record Not on File
```

READNEXT

READNEXT (READN)

The READNEXT statement reads the next record in a specified file.

```
      READNEXT                            HOLD   FT   BY
(1)           (2)  (3)                    (4)    (5)  (6)
```

(1) T/F execution conditions
(2) Application ID
(3) File name or field name
(4) Hold type (0=do not hold, 1=hold, 2=hold with potential recovery)
(5) Fail Type (0=nothing, 1=warning, 2=error, 3=cancel)
(6) Access key field name (blank if consecutive file)

Sets True/False Status Indicator

Normally, the READNEXT statement sets the next status indicator to *F* or *T* depending on whether the end of the file is or is not reached, respectively.

If an END AT statement is executed before a READNEXT, the status indicator is also set to *F* if the record read has a key value beyond the one specified in the END AT statement. Note that the current record area contains the record that is beyond the END AT range and that, unlike an end-of-file condition, the position in the key path does not become undefined.

If the READNEXT sets the next status indicator to *F*, the *FAIL* or (*FT*) parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

When using this statement in conjunction with an RDBMS table, you can specify a field name instead of a file name to limit the volume of data being passed between APPX and the RDBMS. See the Partial-Record I/O section in Specifying Statements for more information.

Â

If a BEG AT statement for this file is executed before the READNEXT, the position in the file is modified before executing the READNEXT, based on the value and relation specified in the BEG AT statement and the keypath identified by the READNEXT statement.

If the READNEXT identifies a key path that is different than the key path used in the most recently encountered READ or READNEXT statement for the same file, and no subsequent BEG AT is encountered, the file position is reset to the first record in the key path specified in the READNEXT statement.

The key path and position established by the process interpreter for the process control file has no effect on, and is not affected by, the READNEXT position, nor does the key path and position established for a 'Read Next Record' loop have any effect.

The READNEXT statement allows a record to be read and held for update. While a record is held, no other user may update or delete that record. If the record is to be rewritten or deleted, the *HOLD* specification must be set to *1* (hold) or *2* (recover). Otherwise, it should be set to *0* (no). The recover specification holds the record and internally saves a copy of the record so that a subsequent rewrite or delete can be performed, even if the hold is lost (by reading another record with hold before completing the rewrite or delete). 'Recover' can rehold the record for update, as long as the saved copy is identical to the original record that was read. Note that performance is improved with hold type *1*.

> Note also that the READNEXT statement does not generate an 'In Use' message if the record to be held is currently being held by another user. The READNEXT statement waits until the record to be read is freed up by the other user, unless a TIMEOUT statement with a nonblank label was previously encountered. In that case, processing control transfers to the specified label.

Restrictions

For consecutive files, the key field must be left blank because there is only one path (the relative record number) for accessing consecutive files.

The READNEXT statement cannot be used with one-record files.

Execution Errors

Once the end of the file is reached, the current position within the file becomes undefined, and a subsequent READNEXT will result in a non-recoverable runtime error unless a position is re-established (see the *Sets True/False Status Indicator* section above).

Related Statements

BEG AT, END AT, READ, TIMEOUT

Example

In the following example, a range of records is read from the Transaction file and summed into the field, WORK CUSTOMER BALANCE. When the range of records is exhausted, the predefined field *A* is then set to the balance.

```
        BEG AT    TAR TRANSACT IN TAR WORK APPLY TO KEY
        END AT    TAR TRANSACT IN TAR WORK APPLY TO KEY
        LABEL     :NEXT TRANSACTION RECORD
        READNEXT  TAR TRANSACT                HOLD 0 FT 0 BY TRANSACT KEY
T       COMPUTE   TAR WORK CUSTOMER BALANCE     + TAR TRANSACT AMOUNT
T       GOTO      :NEXT TRANSACTION RECORD
        SET       --- A                       = TAR WORK CUSTOMER BALANCE
```

READPREV

READPREV (READP)

Read records in reverse order.

```
        READPREV                          HOLD   FT   BY
(1)     (2)     (3)                       (4)    (5)  (6)
```

(1) T/F execution conditions
(2) Application ID
(3) File name or field name
(4) Hold type (0=do not hold, 1=hold, 2=hold with potential recovery)
(5) Fail Type (0=nothing, 1=warning, 2=error, 3=cancel)
(6) Access key field name

Normally, the READPREV statement sets the next status indicator to F or T depending on whether the beginning of the file is or is not reached, respectively.

If an BEG AT statement is executed before a READPREV, the status indicator is also set to F if the record read has a key value less than the one specified in the BEG AT statement. Note that the current record area contains the record that is beyond the BEG AT range.

If the READPREV sets the next status indicator to F, the FAIL or (FT) parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

When using this statement in conjunction with an RDBMS table, you can specify a field name instead of a file name to limit the volume of data being passed between APPX and the RDBMS. See the Partial-Record I/O section in *Specifying Statements* for more information.

If a END ATstatement for this file is executed before the READPREV, the position in the file is modified before executing the READPREV, based on the value and relation specified in the END AT statement and the keypath identified by the READPREV statement.

The key path and position established by the process interpreter for the process control file has no effect on, and is not affected by, the READPREV position.

The READPREV statement allows a record to be read and held for update. While a record is held, no other user may update or delete that record. If the record is to be rewritten or deleted, the HOLD specification must be set to 1 (hold) or 2 (recover). Otherwise, it should be set to 0 (no). The recover specification holds the record and internally saves a copy of the record so that a subsequent rewrite or delete can be performed, even if the hold is lost (by reading another record with hold before completing the rewrite or delete). Recover can re-hold the record for update, as long as the saved copy is identical to the original record that was read. Note that performance is improved with hold type 1.

> Note also that the READPREV statement does not generate an 'In Use' message if the record to be held is currently being held by another user. The READPREV statement waits until the record to be read is freed up by the other user, unless a TIMEOUT statement with a nonblank label was previously encountered. In that case, processing control transfers to the specified label.

Restrictions

The READPREV statement cannot be used with one-record or consecutive files.

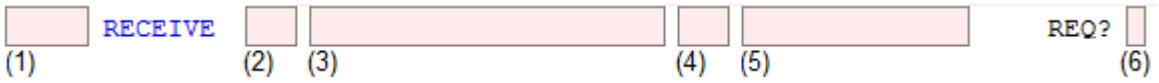
Example

```
     SET      1EX VENDOR NUM                 =   1
     BEG AT   1EX VENDOR   IN 1EX VENDOR NUM
     SET      1EX VENDOR NUM                 =   100
     END AT   1EX VENDOR   IN 1EX VENDOR NUM
     LABEL    :READ PREVIOUS RECORD
     READPREV 1EX VENDOR                     HOLD 0 FT 0 BY VENDOR NUM
T    DISPLAY  1EX VENDOR NUM                 (AT APPEARANCE #   )
T    GOTO     :READ PREVIOUS RECORD
```

This example will read the 1EX VENDOR file starting at vendor 100, ending with vendor 1. Note that you define the BEG AT/END AT in the same way as you would for a READNEXT, the READPREV just determines the order in which the designated range of records will be returned.

RECEIVE

The RECEIVE keyword can be used for different purposes. The RECEIVE statement works with the PASS statement to implement true subroutines. Or, it works without the PASS statement to essentially declare a local variable (a field that is automatically restored to its initial value when the subroutine, event point, or process ends).



(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Area type (FIELD)
(6) Required (Y or N)

Sets True/False Status Indicator

The RECEIVE statement sets the next status indicator to T if a matching PASS statement was found and to F if not. If you RECEIVE without a PASS statement, you are simply declaring a local variable that is restored to its initial value when the subroutine, event point, or process ends.

Using the Statement

The RECEIVE statement can be used in three locations:

Inside a subroutine marked by the LABEL statement. Field values are restored when the RETURN is executed.

Inside an event point. Field values are restored when the event point ends.

Inside the Start of Process event point. Field values are restored when the process ends.

Data types of related PASS and RECEIVE statements do not have to match. The same rules that are used for SET statements convert the PASS field into the RECEIVE field (and back again). Fields are received in the same order they are passed so passing and receiving the same field names is not required.

Related Statements

PASS

Example

In this example, the initial value of CUSTOMER NAME is returned following the subroutine. Even if the subroutine altered the value of this field, it would still be returned in its initial state because the PASS statement does not share the field. The WORK STRING LENGTH field (paired with the value of the AI field), however, is modified to contain the length of the value in the CUSTOMER NAME field. This new value is returned following the subroutine because the WORK STRING LENGTH field was passed as a shared field.

```
        PASS      TAR CUSTOMER LAST NAME     FIELD          SHARE? N
        PASS      TAR CUSTOMER FIRST NAME    FIELD          SHARE? N
        GOSUB         :COMBINE FIRST AND LAST NAMES
                  (Continue processing)
        LABEL         :COMBINE FIRST AND LAST NAMES
        RECEIVE   TAR WORK FIRST NAME        FIELD            REQ? N
        RECEIVE   TAR WORK LAST NAME         FIELD            REQ? N
                  (Coding to process names)
```

REFRESH

REFREsh can be used to immediately redisplay the image in an input process without waiting for it to be redisplayed normally in accordance with the process cycle.

```
        REFRESH
(1)             (2)
```

(1) T/F execution conditions

Using the Statement

The REFRESH statement instantly redisplays the current image without waiting for the processing cycle to complete.

This statement is useful when changes to the display must be shown immediately. Normally, an image is redisplayed only when the user initiates the processing cycle by pressing enter. By using the REFRESH statement, however, the image can be redisplayed prior to the execution of the processing cycle. This is especially useful, as shown in the following example, when a user's idle scrolling display must be updated to reflect any new records added by other users.

Related Statements

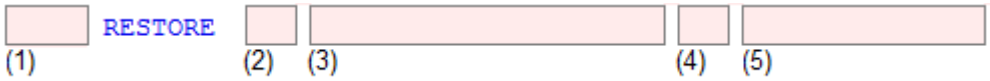
DISPLAY

Example

```
        IF        TAR WORK 30 SECONDS ELAPED   EQ   Y
T       REFRESH
```

RESTORE

The RESTORE statement restores the contents of a field or a record from the area assigned as the store or default area for the field or record.



(1) T/F execution conditions
(2) Application ID
(3) File name, field name, or predefined field
(4) Occurrence (constant/index)
(5) Area type (RECORD, FIELD, DEFAULT RECORD, DEFAULT FIELD, ORIGINAL RECORD, ORIGINAL FIELD)

Using the Statement

The RESTORE statement can recover data values from the store, default, or original record area. The contents of the store record area are established by the STORE command. If no STORE command was executed, the store record area contains the default values, which are defined in the data dictionary. The RESTORE statement does not alter the contents of the store, default, or original area.

Fields that are part of a record do not have an independent store or default area. All fields that are part of a record are restored from their proper location in the area assigned for the record. Therefore, it is possible to store an entire record and then restore specific fields, or to store only some fields and then restore the entire record. A field or record can be stored any number of times, and can also be restored any number of times, independently. These statements only cause the contents of the specified field or record to be stored in, or restored from, the store or default area assigned to the field or record. The store and default areas are allocated if a STORE or RESTORE statement is present. They are initialized to the default value and, therefore, a RESTORE statement can be executed even if no STORE statement is present for the field or record.

The contents of predefined fields can also be restored using the RESTORE statement.

No editing or justification is performed. All data is copied unchanged.

Restrictions

If the FIELD option is specified as the data item type, the data item to be restored must be a field name in the data dictionary. If the RECORD option is specified, the data item to be restored must be a file name in the data dictionary.

Related Statements

STORE

Example

In the following example, the record MTDPOST is filled with its default values from the data dictionary, so that you only have to supply those values that are different for this particular routine.

```
        RESTORE  TAR MTDPOST                  DEFAULT RECORD
        SET      TAR MTDPOST ACCOUNT          =   TAR ADJUST2 ACCOUNT
        SET      TAR MTDPOST YEAR             =   TAR ADJUST2 POST YEAR
        SET      TAR MTDPOST MONTH            =   TAR ADJUST2 POST MONTH
```

RETURN

The RETURN statement transfers execution to the statement following the most recent GOSUB statement.

```
        RETURN
(1)             (2)  (3)                    (4)
```

(1) T/F execution conditions
(2) Optional application ID
(3) Optional logic field name, logic PDF, or constant
(4) Optional occurrence (constant/index)

Restores True/False Status Indicators

When you invoke a subroutine using the keyword GOSUB, APPX temporarily stores the true/false status indicators and then clears them so that all five indicators are available for use within the subroutine. When RETURN transfers control back to the statement following the GOSUB, the system restores the indicators to the values that existed at the time the GOSUB was invoked. In addition, **when implemented**, GOSUB will set the next status indicator to the value indicated by the logic field or constant in the RETURN statement, if any.

Execution Errors

If a RETURN is encountered with no previous GOSUB, a non-recoverable error occurs at runtime.

Related Statements

GOSUB

Example

In this example, the same routine is used to post to both the adjustment account and the receivable account. The actual code is copied into the event point from a subroutine process.

```
        *          Post Adjustments
        GOSUB      :POST MTDPOST RECORD
        *
        COMPUTE    TAR MTDPOST AMOUNT      * -1
        SET        TAR MTDPOST ACCOUNT     = TAR ADJUST2 RECEIV ACCOUNT
        GOSUB      :POST MTDPOST RECORD
        *
        END
        *
        LABEL      :POST MTDPOST RECORD
        COPY       TAR POST MTDPOST RECORD
        RETURN
```

REWRITE

REWRITE (REW)

The REWRITE statement rewrites the current record to the specified file.

```
        REWRITE                    FAIL
(1)     (2)  (3)                   (4)
```

(1) T/F execution conditions
(2) Application ID
(3) File name or field name
(4) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

If the record is rewritten successfully, the next level of the true/false status indicator is set to *T*. The status indicator is set to *F* if the rewrite fails (for example, a unique alternate key is already on file). If the record is not rewritten successfully, the FAIL parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

When using this statement in conjunction with an RDBMS table, you can specify a field name instead of a file name to limit the volume of data being passed between APPX and the RDBMS. See the Partial-Record I/O section in Specifying Statements for more information.

Once a record is rewritten, the hold on that record is released. If another rewrite (or a delete) is to be attempted, the record must be read again with *HOLD?* equal to *1* or *2*.

Restrictions

The record must have been previously read with the *HOLD?* specification set to *1* or *2*, or the rewrite must be done on the record currently being held by the process control file.

Because of the nature of various file systems, only one record may be held for update at a time. If a designer does not take this into consideration, the hold on a record may be lost without notice because of multiple reads with hold. If the record is read with HOLD equal to *1*, and the hold on the record is subsequently lost, the rewrite will fail. If the record is read with HOLD equal to 2 (hold for recovery), and the hold is subsequently lost, APPX attempts to reread the record and hold it for update. If the record that is reread is changed in any way from the original record read, the rewrite will fail.

> Note also that a designer should not rewrite a record held by the process control file in an input process. APPX assumes that the process control file record is still held when it needs to rewrite or delete the record. If you need to modify the process control file record in an input process, you can do so in the Pre-PCF Update event point for that process. If the record must be rewritten before the *Pre-PCF Update* event point, you must reread it with hold or a non-recoverable file processing error will occur.

Execution Errors

A non-recoverable file processing error occurs if a rewrite of a record is attempted without having read the record with hold.

Related Statements

BEG READ, DELETE, END READ, READ, READNEXT, WRITE

Example

In this example, a record is read and updated.

```
      READ      TAR ADJUST1                 HOLD 1 FT 0 BY ADJUST1 KEY
F     ERROR     Unexpected Error READ TAR ADJUST1
T     SET       TAR ADJUST1 JOURNAL OK      =  0
T     REWRITE   TAR ADJUST1                 FAIL 0
TF    ERROR     Unexpected Error REWRITE ADJUST1
```

ROLLBACK

Executing a **ROLLBACK** causes the RDBMS to discard all changes made during the current transaction or, if the ROLLBACK statement includes a savepoint name, to discard only changes made since that savepoint. As with the COMMIT statement, all record locks are forfeited. However, APPX never automatically issues a ROLLBACK.

```
      ROLLBACK
(1)   (2)  (3)                    (4)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or constant
(4) Occurrence (constant/index)

Using the Statement

The ROLLBACK statement can refer to a savepoint established by a previous SAVEPNT statement. If you include a savepoint name (either as a constant or as a field value) in a ROLLBACK statement, changes made since that savepoint are discarded but changes made prior to the savepoint are not. Without a savepoint, the entire transaction is discarded.

> Note, however, that APPXIO files do not support transaction processing. If you ROLLBACK a change to an RDBMS-hosted file, any changes made to APPXIO will not be rolled back. Related to this is the issue of visibility. Changes made to an RDBMS-hosted file are invisible to other users until they are committed. Changes made to an APPXIO-hosted file are visible immediately.

Related PDFs

COMMIT MODE

Related Statements

COMMIT, SAVEPNT

Example

In the following example, if the flag indicates it is OK to commit, the COMMIT takes place and processing continues. Otherwise, changes made since the savepoint designated as TRX POINT 1 are discarded and the program branches to an applicable routine.

```
        SAVEPNT  TRX POINT 1
                 (Perform RDBMS processing)
        IF       TAR WORK OK TO COMMIT    NE  Y
T       ROLLBACK TRX POINT 1
T       GOTO     :TRX POINT 1 STATUS
        COMMIT
```

RUN

The RUN statement transfers processing control from the current process to an external program.

```
        RUN
(1)             (2)  (3)                 (4)        END?  FAIL
                                                    (5)   (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Program name or field containing it
(4) Occurrence (constant/index)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

If the designer specifies that a RUN is not required and the invocation fails, the next true/false flag is set to *F*. If the invoked process completes successfully, the next true/false flag is set to *T*. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

RUN is used to invoke an external program in the same way that it would be invoked from the operating system command processor. As parameters are passed using the PASS statement, they are assigned a number. Each parameter can be referred to in the command line by using dollar sign ($) plus the parameter number. Using dollar sign ($) plus * refers to any unused remaining parameters. If no dollar signs ($) are used, APPX ignores all parameters. If you need to use a dollar sign ($) in the command line, precede it with a backslash (\). On the DOS platform, use ~ (tilde).

The *END?* parameter is presently ignored.

If you PASS a file to the RUN statement, APPX supplies the full operating system path name.

The value returned from a RUN function is put in the four-byte binary predefined field RETURN CODE.

Passing Values

The RUN statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDFs

RETURN CODE

Related Statements

CALL, PASS

Example

In the following example, RUN is used to invoke the operating system's 'display' utility. The name of this program is stored in the field OS DISPLAY UTILITY in application ABC.

```
        RUN     ABC OS DISPLAY UTILITY                  END? Y  FAIL 3
```

SAVEPNT

The SAVEPNT statement allows you to establish a savepoint within a transaction.

```
[   ] SAVEPNT [   ] [                    ] [   ]
(1)           (2) (3)                    (4)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or constant
(4) Occurrence (constant/index)

Using the Statement

The SAVEPNT statement provides for rolling back a partial transaction; it marks a point within a transaction and establishes a savepoint name, either as a constant or as a value within the field specified. A subsequent ROLLBACK statement can then refer to the savepoint, discarding changes made after the savepoint but keeping changes made prior to the savepoint. Without a savepoint, the entire transaction is discarded.

> Note, however, that APPXIO files do not support transaction processing. If you ROLLBACK a change to an RDBMS-hosted file, any changes made to APPXIO will not be rolled back. Related to this is the issue of visibility. Changes made to an RDBMS-hosted file are invisible to other users until they are committed. Changes made to an APPXIO-hosted file are visible immediately.

Related PDFs

COMMIT MODE

Related Statements

COMMIT, ROLLBACK

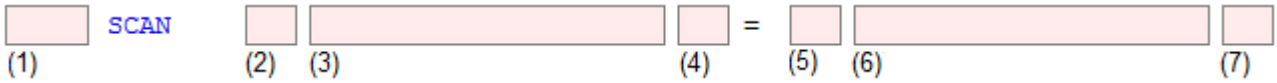
Example

In the following example, if the flag indicates it is OK to commit, the COMMIT takes place and processing continues. Otherwise, changes made after the savepoint designated as TRX POINT 1 are discarded and the program branches to an applicable routine.

```
[   ] SAVEPNT [TRX] [POINT 1                ] [   ]
              (Perform RDBMS processing)
[   ] IF      [TAR] [WORK OK TO COMMIT      ] [   ] [NE] [   ] [Y                    ] [   ]
[T  ] ROLLBACK [TRX] [POINT 1               ] [   ]
[T  ] GOTO    [:TRX POINT 1 STATUS                ]
[   ] COMMIT
```

SCAN

The SCAN statement provides a means for extending the functionality of the scan option during input processes. (See the User Manual for a full discussion of the scan option.)



(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Source application ID
(6) Source field name, PDF, or constant
(7) Source occurrence (constant/index)

Using the Statement

The SCAN statement becomes effective only when the user has selected the scan option, or when the predefined field OPTION is set to SCAN with statements.

The scan option permits the user to select a record in a referenced file, and then automatically moves the key for that file into the corresponding fields of the input record. The SCAN statement provides a more general capability for moving fields from a user-selected record into corresponding fields of another record.

The source field of the SCAN statement must be a field in an indexed file. Multiple SCAN statements may be executed. When the user selects the scan option, the names of the files containing the source fields of the SCAN statement(s), as well as the name of the file containing the data lookup field on which the cursor is positioned (if data lookup is defined), are displayed to the user for selection. If there is only one such file, that file is selected automatically.

If the user scans and selects a record from the selected file, the values in the source field of each SCAN statement (for source fields in the selected file only) are moved into the destination field of the SCAN statement. If any of these destination fields are defined as input items, the new values for these fields are displayed on the image.

The SCAN statement can be used to handle situations in which a field is both a key to the referenced file and part of a key to another referenced file. It can also be used to automatically set fields other than the key field when the user selects a record in the referenced file. Lastly, the SCAN statement can be used to access the process control file.

Restrictions

The SCAN statement can be used only in image-related event points in input processes.

Related PDFs

OPTION

Related Statements

AT FIELD

Example

In the following example, if the scan option is selected when the cursor is positioned at the substitute product ID field, the SCAN statement is executed to enable the user to scan the PRODUCT file.

```
     IF        --- OPTION                  EQ   SCAN
T    AT FIELD  TIC SUBSTITUTE PRODUCT ID        (AT APPEARANCE #   )
TT   SCAN      TIC SUBSTITUTE PRODUCT ID        =    TIC PRODUCT ID
```

SCRATCH

The SCRATCH statement closes a file if it is open, and then deletes the file.

```
     SCRATCH                          FAIL   CACHE
(1)          (2)  (3)                     (4)    (5)
```

(1) T/F execution conditions
(2) Application ID
(3) File name
(4) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)
(5) Cache? (Y=cache version, N=disk version)

Sets True/False Status Indicator

The SCRATCH statement modifies the current status indicators by setting the next indicator to *T* if the file does not exist following the SCRATCH, and to *F* if the file still exists. If the next indicator is set to *F*, the *FAIL* parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

> Note that the next indicator is set to *T* if the file does not exist when the SCRATCH statement executes. Scratching a nonexistent file is considered successful because the file does not exist following the SCRATCH statement.

Using the Statement

The SCRATCH statement allows you to indicate whether to scratch the cached version of a file or the disk version.

When scratching a file, you can specify a database other than the current one by setting the predefined field NEXT DATABASE. If NEXT DATABASE is blank, the current database (contained in DATABASE) is used. If NEXT DATABASE is specified in conjunction with *CACHE?=Y*, then NEXT DATABASE is cleared and ignored as cache files, like memory files, have only one version.

> Note that NEXT DATABASE is modifiable, whereas DATABASE is not, and that NEXT DATABASE is set to blank by the SCRATCH statement.

It is possible to have several versions of a file open at the same time by using the OPEN statement on different databases. The version of a file that is scratched is the last database accessed with the OPEN statement for that file. Refer to the OPEN statement for additional explanation.

Restrictions

If a file is scratched, it must be created again before it can be used.

Statement Ignored

A SCRATCH statement can fail when the file is physically open for use by another user, or when the current user has insufficient privileges to scratch the file.

Related PDFs

DATABASE, NEXT DATABASE

Related Statements

CLOSE, CREATE, IF EXIST, OPEN

Example

In the example below, a work file called TEMP is initialized by using the SCRATCH and CREATE statements.

```
        SCRATCH  TAR  TEMP                 FAIL 0 CACHE? N
        CREATE   TAR  TEMP    SHARE? Y     FAIL 0 CACHE NONE
```

SELECT

The SELECT statement allows the access path of in input process to be changed dynamically. The structure of the statement is:

```
        SELECT                                    KEY IS
(1)             (2)  (3)                                  (4)
```

(1) T/F execution conditions
(2) Application ID
(3) File Name
(4) Access leu field name

The application and file name must be specified and must be the same as the Process Control File (PCF) of the input process.

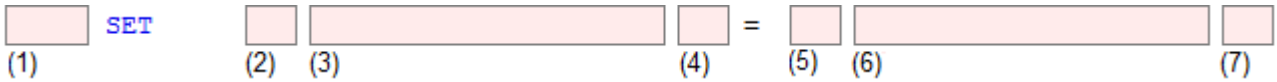
The Access Key Field name must be a valid key for the specified file. SCAN is available during entry of the key field name and only defined keys are presented as choices.

Execution of a SELECT statement effectively instructs the input process to use the specified access path (key) the next time that the input process enters KEY ENTRY. At that point, the user will be prompted to enter a key value for the specified access path.

SET

SET (S)

SET copies the contents of a source field to a destination field.



(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Source application ID
(6) Source field name, PDF, or constant
(7) Source occurrence (constant/index)

Using the Statement

The contents of the source field are not modified. If the source and destination fields are of different types, conversion is performed automatically. The destination field must be either a field name or a modifiable predefined field. The source field can be a field name, a predefined field, or a constant. Constants are considered to be the same field type as the destination.

Specific information regarding the SET statement is provided in the following sections:

When the SET Destination is Alpha

When the SET Destination is a Number

When the SET Destination is a Date

When the SET Destination is a Logic Field

Restrictions

The destination field must be either a field name or a modifiable predefined field.

For an alpha destination, if the source field is null, the intermediate alpha form is set to blank. If the converted value is too large to fit in the destination, it is truncated.

For a numeric destination, if the destination field is not large enough to hold the integer part of the source field value, a numeric overflow condition results. Overflow processing is dependent on the use of OVERFLOW statements within the event point containing the SET statement. If the source field is null or blank, the destination field is set to its null value. In addition, a valid source field must contain only digits, an optional decimal point, an optional leading or trailing sign, and optional leading and/or trailing spaces.

For a date destination, unless the source field is null, it must contain exactly 16 decimal digits. A date constant must be exactly 16 characters in length, without leading or embedded blanks, and with trailing blanks. Only those characters of the date constant that are within the range of the date parts of the destination date field must be valid date values.

Execution Errors

For numeric and date destinations, a non-recoverable error occurs at runtime if a restriction (as described in the appropriate section) is not complied with.

Related Statements

CNV TEXT, OVERFLOW

Example

The following subroutine is an example of the use of the SET statement. Note that some fields are alpha, some are numeric, some are dates, and some are constants. The example includes both alpha and numeric constants (since constants are deemed to be the same field type as the destination field).

```
        LABEL    DEFAULT MTDPOST
        SET      TAR MTDPOST FULL          =  TAR ADJUST2 FULL
        SET      TAR MTDPOST AMOUNT        =  TAR ADJUST2 AMOUNT
        COMPUTE  TAR MTDPOST AMOUNT        *     -1
        IF       TAR PARAM POST TO GL      EQ    1
T       IF       TAR MTDPOST AMOUNT        GE    0
TT      SET      TGL POST ADJUSTMENT       =     0
TF      SET      TGL POST ADJUSTMENT       =     1
        SET      TAR MTDPOST DATE          =  TAR ADJUST2 TRX DATE
        SET      TAR MTDPOST APPLY TO      =  TAR ADJUST2 APPLY TO
        RETURN
```

When SET Destination is Alpha

The data dictionary record for an alpha destination field contains formatting characteristics that affect the results of the SET statement. These characteristics include justification, pad character, and word wrap.

Source alpha

Alpha source fields require no conversion before the beginning of the copying operation.

Source date

The destination field is set to blank if the date is null or blank; otherwise, it is set to 16 digits representing century, year, month, etc. If necessary, the destination is padded with blanks. A non-recoverable error occurs if the destination is less than 16 characters long.

Source dates are converted to an intermediate Gregorian alpha date form before the copy operation, with a mask value of *0807060504030201*.

Source number

The source is converted from its packed or binary form into an intermediate alpha form before the copy operation. The intermediate alpha form is in the format *xxxxxxxx.yyy-*, with the number of *x* and *y* digits, and the existence of the sign, determined by the source field. If the source field is null, the intermediate alpha form is set to blank. If the converted value is too large to fit in the destination, it is truncated. You can use the CNV TEXT statement if formatting is desired.

Source logic

If the value of the source field is *1* (yes), the destination field is set to a value of *Y*. If the value of the source field is *0* (no), the destination field is set to a value of *N*. If the value of the source is blank, the destination field is set to blank.

When SET Destination is a Number

The numerical value of the source field, determined as described below, is copied to the destination field. No formatting is performed on the destination field, which is stored in the binary or packed form appropriate to the destination field's definition in the data dictionary. The source field value is rounded to the decimal positions of the destination field. If the destination field is not large enough to hold the integer part of the source field value, a numeric overflow condition results. Overflow processing is dependent on the use of OVERFLOW statements within the event point that contains the SET statement.

Source number

Number source fields are copied using conversion routines appropriate to the type and decimal positions of the source and destination fields. If the source field is null, the destination field is set to the destination field's null value.

Source alpha

The source field is tested for a valid numeric value. To be valid, the source field must contain only digits, an optional decimal point, an optional leading or trailing sign, and optional leading and/or trailing spaces. If the source field is blank, the destination field is set to the destination field's null value. If the source field does not contain a number, a non-recoverable error occurs.

Source date

The source field is converted to a packed decimal Gregorian date intermediate form, if necessary, before the copy operation. The integer packed decimal number representing the date is then copied to the destination field, ignoring the decimal positions of the destination field. For example, if the source field contains the value for January 1, 1988, and the destination field is defined with four digits to the left of the decimal point and two digits to the right of the decimal point, the destination field receives the value *880101.00*.

Source logic

If the value of the source field is *1* (yes), the destination field is set to a value of *1*. If the value of the source field is *0* (no), the destination field is set to a value of *0*. If the value of the source field is blank, the destination field is set to null, according to the destination field's definition in the data dictionary.

When SET Destination is a Date

If the source field is null, the destination date field is set to the null value for the date storage type of the destination field.

Source date

Date source fields are copied using conversion routines appropriate to the date type of the source and destination fields. The value of the source field is then copied to the corresponding common date parts of the destination field. For example, if the destination field contains date parts of century, year, month, day, and hour, and the source field contains date parts of day, hour, and minute, the copy operation copies only the day and hour parts of the source field to the day and hour parts of the destination field. The remaining parts are filled with null values.

Source alpha

Unless the source field is null, it must contain exactly 16 decimal digits, which are then converted into a packed decimal number intermediate form. The packed decimal number is then treated as a packed decimal Gregorian date with all date parts present, and the intermediate form is copied using a conversion routine appropriate to the date type of the destination field. A source field that contains something other than 16 digits causes a non-recoverable error to occur.

Source number

If the source field is negative, the destination field is set to the null value for the date type of the destination field.

Otherwise, the number is converted to an intermediate form, packed decimal number, padded with leading zeros or truncation on the left, so that the number of digits in the intermediate form matches the number of digits in the date parts of the destination field. The intermediate form is then treated as

a Gregorian packed decimal date and is copied using a conversion routine appropriate to the date type of the destination field. Any assumed decimal positions in the source field are ignored, and the packed decimal number is processed as if it were an integer value.

Source logic

A Gregorian packed decimal date intermediate form is used. If the value of the source field is *1* (yes), the intermediate form is set to a value of all *1*s. If the value of the source field is *0* (no), the intermediate form is set to a value of *0.* If the value of the source field is blank, the intermediate form is set to a value of *-1* (the null value for packed decimal dates). The intermediate form is then copied using a conversion routine appropriate to the date type of the destination field.

Source constant

A date constant must be exactly 16 characters in length, without leading or embedded blanks, and with trailing blanks. The 16 characters are treated as if they were a Gregorian alpha date of the form *ccyymmddhhmmssth*. However, only those characters of the date constant that are within the range of the date parts of the destination date field must be valid date values. For readability, the 'unused' components of the date constant may be set to '-.' For example, if the destination field is a *yymmdd* field, a valid date constant representing March 15, 1988, would be --*880315*--------.

Date constants are copied using conversion routines appropriate to a Gregorian alpha date and the date type of the destination field.

When SET Destination is a Logic Field

The destination field is set to blank, 1 (yes), or 0 (no), based on the value of the source field.

Source logic

The source field is copied directly to the destination field.

Source alpha

If the value of the first position of the source field is *0, N*, or *n*, the destination field is set to a value of *0* (no). If the value of the first position of the source field is blank, the destination field is set to a value of blank. Otherwise, the destination field is set to a value of *1* (yes).

Source number

If the source field is null, the destination field is set to blank. Otherwise the destination field is set to *0* (no) if the source field is equal to *0*, or *1* (yes) if the source field is not equal to *0*.

Source date

If the source field is null, the destination field is set to blank. If the source field is a Gregorian binary date and has a value of *0*, the destination field is set to *0* (no). Otherwise, the destination field is set to a value of *1* (yes).

SET DATE

The SET DATE statement places the current date/time in the destination field.

```
        SET DATE
(1)             (2)  (3)                    (4)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occurrence (constant/index)

Using the Statement

> Note that to set a date/time field to a constant value, you use the SET command.

Restrictions

The destination field must be a date/time field type.

Related Statements

SET, SET DAY, SET MNTH

Example

In the example below, the current date is supplied for the user if a date is blank.

```
        *
        *       If blank, set adjustment date to system date.
        *
        IF      TAR ADJUST2 ADJ DATE        EQ
T       SET DATE TAR ADJUST2 ADJ DATE
```

SET DAY

The SET DAY statement extracts the day of the week from a date/time field.

```
        SET DAY
(1)             (2)  (3)                    (4)  (5)  (6)  (7)                    (8)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Type (S=short name, L=long name)

(6) Source application ID
(7) Source field name, PDF, or constant
(8) Source occurrence (constant/index)

Using the Statement

If the type (item 5) is *S* (short), the result is returned in the destination field as three characters (for example, 'Wed'). If the type is *L* (long), the result is returned in the destination field as up to nine characters (for example, 'Wednesday'). If the source field is blank, the destination field is set to blank.

Restrictions

The destination must be an alpha field type and the source must be a date/time field type containing at least year, month, and day.

Execution Errors

If the source field is one of the Gregorian date/time field types, a non-recoverable error occurs if it does not contain the year, month, and day parts. If the source field is one of the Julian date/time field types, a non-recoverable error occurs if it does not contain the year and day parts.

Related Statements

SET, SET DATE, SET MNTH

Example

The following example begins with an adjustment date, and retrieves and displays all of the days of the week, beginning with that day.

```
*
*       Set and display days of the week.
*
        SET       TAR WORK DATE                  =  TAR ADJUST2 ADJ DATE
        BEG LOOP  X  = 001 TO 007  STEP 001
        SET DAY   TAR WORK DAY DESCRIPT      X  S  TAR WORK DATE
        DATE ADD  TAR WORK DATE              5     1
        DISPLAY   TAR WORK DAY DESCRIPT      X  (AT APPEARANCE #  )
        END LOOP  X
```

SET MNTH

The SET MNTH statement extracts the month of the year from a date/time field.

```
        SET MNTH
(1)             (2) (3)                    (4) (5) (6) (7)                    (8)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Type (S=short name, L=long name)
(6) Source application ID
(7) Source field name, PDF, or constant
(8) Source occurrence (constant/index)

Using the Statement

If the type (item 5) is *S* (short), the result is returned in the destination field as three characters (for example, 'Sep'). If the type is *L* (long), the result is returned in the destination field as up to nine characters (for example, 'September'). If the source field is blank, the destination field is set to blank.

Restrictions

The destination must be an alpha field type and the source must be a Gregorian date/time field type with at least the month part.

Execution Errors

A non-recoverable error occurs at runtime if the source field does not include the month part.

Related Statements

SET, SET DATE, SET DAY

Example

The following example with TAR WORK FISCAL MONTH set to the first month of the accounting year. The routine then retrieves and displays all the months in a year beginning with that start month.

```
*
*         Set and display calendar months.
*
SET       TAR WORK MM                  =  TAR WORK FISCAL MONTH
BEG LOOP  X  = 001 TO 012  STEP 001
SET MNTH  TAR WORK MONTH DESCRIPT   X  S  TAR WORK MM
DATE ADD  TAR WORK MM                  6  1
DISPLAY   TAR WORK MM               X  (AT APPEARANCE #  )
END LOOP  X
```

SET TEMP

The SET TEMP statement copies the contents of a field to or from the selected predefined TEMP field. The statement identifies substrings of the selected predefined TEMP field and the field specified in the statement.

```
[   ] SET TEMP [   ] AT [   ] FOR [   ] [   ] [   ] OF [   ] [                    ] [   ]
(1)            (2)     (3)       (4)   (5)   (6)      (7)  (8)                    (9)
```

(1) T/F execution conditions
(2) TEMP length (constant/index)
(3) TEMP start (constant/index)
(4) Length to copy (constant/index)
(5) Direction (FROM or INTO)
(6) Field start (constant/index)
(7) Field application ID
(8) Field name, PDF, or constant
(9) Field occurrence (constant/index)

Using the Statement

The TEMPn field to be used is specified by the length supplied; all predefined TEMP fields have the same characteristics except for their length. The user specifies which TEMP field is to be used by entering the appropriate length.

The TEMP length, starting character, and length to copy can be either predefined fields (A through Z or AI through ZI), or they can be specified as constant positive integer values. Note that the best performance can be obtained by specifying the TEMP starting length and length to copy as constants, or by using the integer AI through ZI fields as parameters.

The direction 'from/into' indicates which field is the source and which field is the destination. If it specifies the FROM option, data is copied from the field specified in the statement to the selected predefined TEMP field. If the direction specifies the INTO option, data is copied from the selected predefined TEMP field into the field specified in the statement. This field must be alphanumeric.

The TEMP starting parameter identifies the starting position for the selected predefined TEMP field. Characters are copied to or from the selected predefined TEMP field beginning with this position. This can either be a constant or an index (predefined fields A through Z or AI through ZI). If this parameter is a fraction, its value is rounded to the nearest integer. (The contents of the actual predefined field, A through Z or AI through ZI, remain unchanged.)

The length parameter identifies the number of characters to be copied. This can either be a constant or an index. If this parameter is a fraction, its value is rounded to the nearest integer. (The contents of the actual predefined field, A through Z or AI through ZI, remain unchanged.) If, after rounding, the length

parameter is greater than the maximum length available in the source field, the latter is used as the length parameter. This maximum length is determined by calculating the number of bytes that remain in the source field from its specified start position to the end of the field.

The field starting parameter determines the location in the field where copying begins. This can either be a constant or an index. If this parameter is a fraction, its value is rounded to the nearest integer. (The contents of the actual predefined field, A through Z or AI through ZI, remain unchanged.) The number of characters to copy is determined by the length parameter described above, and can be constrained by the length of the destination field. In other words, characters are copied up to the number specified by the length parameter, or until the destination field is filled, whichever comes first.

The justification type and pad character are ignored. The characters copied are always stored left justified in the destination field. If padding is required, the space character is used. Ending spaces are copied unchanged. The word-wrap option is ignored. No formatting takes place.

Restrictions

The INTO option is invalid for constants and for predefined fields that are defined to be non-modifiable. It is valid to use the selected predefined TEMP field also as the field specified in the statement. The copy performs the same as it would if the source field were a different field.

Execution Errors

If, after rounding, the value of the TEMP starting parameter is less than *1*, or greater than the length of the selected predefined TEMP field, a non-recoverable runtime error occurs.

If, after rounding, the value of the length parameter is less than *1*, a non-recoverable runtime error occurs.

If, after rounding, the value of the field starting parameter is less than *1*, or greater than the size of the field specified in the statement, a non-recoverable error occurs.

Related PDFs

A thru Z, A1 thru Z1, TEMPn

Related Statements

SET

Example

In the following example, SET TEMP is used to obtain characters 2, 3, and 4 of WORK CHECK.

```
SET TEMP 79   AT 001 FOR 003 FROM 002 OF  TAP WORK CHECK
```

In this next example, the fifth and sixth characters of TEMP 80 are moved into the seventh and eighth character positions of WORK CHECK.

```
SET TEMP 80   AT 005 FOR 002 FROM 007 OF  TAP WORK CHECK
```

SET TOT

The SET TOT statement is used to obtain the value of an end-of-range total that was accumulated automatically or using the TOTAL statement. SET TOT retrieves the total value and places it in the destination field. The value is dependant on the current sort level. Refer to the TOTAL statement for additional information.

```
[    ] SET TOT [  ] [                    ] [  ] = [  ] [                    ] [  ]
(1)              (2) (3)                  (4)    (5) (6)                  (7)
```

(1) T/F execution conditions
(2) Destination application ID
(3) Destination field name or PDF
(4) Destination occ (constant/index)
(5) Source application ID
(6) Source field name, PDF, or constant
(7) Source occurrence (constant/index)

Using the Statement

SET TOT is used in *End-of-Rang*e frames in output and update processes.

The source and destination fields can be the same. In this case, the total for that field is moved from the total area into the current area for that field.

Restrictions

Both the source and destination fields must be numeric.

Execution Errors

If the destination field is not large enough to hold the integer portion of the totaled field, a non-recoverable error occurs, unless overflow processing is present in the event point.

Related Statements

OVERFLOW, TOTAL

Example

In the following example, the value in the WORK CASH RECEIVED work field is placed in the WORK AMOUNT work field.

```
[    ] SET TOT [TAR] [WORK AMOUNT          ] [  ] = [TAR] [WORK CASH RECEIVED   ] [  ]
```

STATUS

The STATUS statement allows you to alter the flow of processing by invoking an APPX status process from within an ILF routine.

(1) T/F execution conditions
(2) Application ID
(3) Status process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and status process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the status process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the status process. The status process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the status process returns to the current process (beginning with the first statement after the STATUS statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The STATUS statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDFs

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INPUT, INQUIRY, JOB, MENU, OUTPUT, PASS, QUERY, SUBR, UPDATE

Example

The following example checks to see if it is the last processing day in the month. If so, the **STATUS** statement is executed, invoking an end-of-month file status operation.

```
     IF      TAR WORK END OF MONTH     EQ   Y
T    STATUS  TAR END OF MONTH STATUS        SUBPROCESS   END? Y  FAIL 3
```

STORE

The STORE statement saves the contents of a field or record in the area assigned as the store area for the field or record. These contents can later be restored into the field or record with the RESTORE statement.

```
     STORE
(1)        (2)  (3)                  (4)  (5)
```

(1) T/F execution conditions
(2) Application ID
(3) File name, field name, or predefined field
(4) Occurrence (constant/index)
(5) Data item type (RECORD, FIELD, DEFAULT RECORD, DEFAULT FIELD)

Using the Statement

The STORE statement allows the designer to store the values in a field or record so that temporary use of the field or record for accessing other data records or some other processing does not cause the contents of the field or record to be lost permanently.

The data item type specification can specify *FIELD, RECORD, DEFAULT FIELD*, or *DEFAULT RECORD*. If the *FIELD* or *DEFAULT FIELD* option is specified, the data item to be saved must be a field in the data dictionary. If the *RECORD* or *DEFAULT RECORD* option is specified, the data item to be saved must be specified as a file name. In this case, the current contents of the file?s record area are saved. The occurrence number has no meaning for the STORE statement with the *RECORD* option.

Fields that are part of a record do not have an independent store or default area. All fields that are part of a record are saved in their proper location in the area assigned for storing the record. Therefore, it is possible to store an entire record and then restore specific fields, or to store only some fields and then restore the entire record. A field or record can be stored any number of times, and it can also be restored any number of times, independently. These statements only cause the contents of the specified field or record to be stored in, or restored from, the store or default area assigned to the field or record. The store area and default area are allocated if a STORE or RESTORE statement is present. They are initialized to the default value; therefore, a RESTORE statement can be executed even if no STORE statement exists for the field or record.

No editing or justification is performed. All data is copied unchanged, and a subsequent RESTORE statement restores the contents of a field or record to the state it was in when the most recent STORE statement was executed.

You can alter the default values of a field or record by using the STORE statement to move current field or record values into the *DEFAULT FIELD* or *DEFAULT RECORD* area.

Restrictions

If the *FIELD* or *DEFAULT FIELD* option is specified, the data item to be saved must be a field in the data dictionary. If the *RECORD* or *DEFAULT RECORD* option is specified, the data item to be saved must be specified as a file name. The occurrence number has no meaning for the STORE statement with the *RECORD* option.

Because fields that are part of a record do not have a separate store or default area assigned to them, storing a record causes any previously saved contents of fields that are part of that record to be lost. Executing a STORE statement for a field that is part of a record after the record is saved with a STORE statement causes the stored record to be modified.

The contents of predefined fields can also be saved using the STORE statement. Therefore, it is invalid to use the STORE statement for predefined fields that are non-modifiable, since the RESTORE command is invalid for those fields.

Related Statements

RESTORE

Example

In the following example, the amount field RECEIPT2 CHECK AMOUNT is saved, presumably because its contents may be affected during the processing of unpaid invoices. After invoice processing is completed, the field is restored.

```
        STORE     TAR RECEIPT2 CHECK AMOUNT     FIELD
        SET       TAR WORK COUNT APPLY TO     = 0
        BEG AT    TAR UNPAID   IN TAR RECEIPT2 CUSTOMER NO
        END AT    TAR UNPAID   IN TAR RECEIPT2 CUSTOMER NO
        BEG READ  TAR UNPAID                  HOLD 0 KEY IS UNPAID ALTERNATE KEY
                  (Process unpaid invoices)
        END READ  TAR UNPAID
        RESTORE   TAR RECEIPT2 CHECK AMOUNT     FIELD
```

SUBR

The SUBR statement allows you to alter the flow of processing by invoking an APPX subroutine process from within an ILF routine.

```
        SUBR                                                    END?   FAIL
(1)     (2)  (3)                                   (4)          (5)    (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Subroutine process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and subroutine process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the subroutine process invoked.

If *END?* is set to *Y*, the current process will end before invoking the subroutine process. The subroutine process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the subroutine process returns to the current process (beginning with the first statement after the SUBR statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The SUBR statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDF's

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

COPY, GOSUB, INPUT, INQUIRY, JOB, MENU, OUTPUT, PASS, QUERY, STATUS, UPDATE

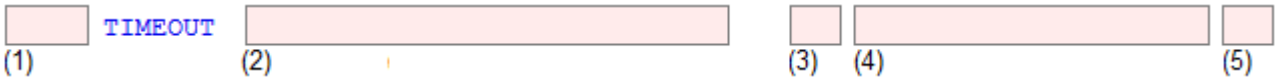
Example

The following example checks to see if it is the last processing day in the month. If so, the SUBR statement is executed, invoking an end-of-month calculation routine.

```
      IF    TAR WORK END OF MONTH      EQ   Y
T     SUBR  TAR END OF MONTH CALCULATION     SUBPROCESS   END? Y  FAIL 3
```

TIMEOUT

The TIMEOUT statement provides a means for intercepting file-handling statements. The TIMEOUT statement specifies an amount of time and a label.



(1) T/F execution conditions
(2) Label
(3) Application ID
(4) Numeric field name, PDF, or constant
(5) Occurrence (constant/index)

Using the Statement

If any of the read statements take longer than the amount of time specified, processing control is transferred to the statement immediately following the specified label.

Statements that can cause a TIMEOUT condition are BEG READ/END READ, READNEXT, and READ.

The numeric field or constant represents an amount of time in hundredths of a second. If the amount of time is zero and the requested record is being held by another user, the TIMEOUT condition occurs immediately. If the amount of time is not zero, a TIMEOUT condition occurs if the requested record remains held for the specified length of time. Note, however, that although APPXIO honors TIMEOUT values, other data access methods such as Oracle may not. In this case, the amount of time specified will be treated as if it were zero.

The TIMEOUT statement may be respecified at any time with another label, or the intercept may be disabled by a TIMEOUT statement with no label specified. If the intercept is disabled, the statements BEG READ/END READ, READ, and READNEXT will wait indefinitely for the requested record to become available.

Compilation Errors

A process compile error occurs if the referenced label is not defined within the same event point as the TIMEOUT or in a subroutine copied into the event point with the COPY statement.

Related Statements

BEG READ, END READ, READ, READNEXT

Example

In the following example, if the READ on the customer file takes longer than the amount of time defined in WORK WAIT COUNTER, processing control transfers to the statement following the label :CUST RECORD NOT AVAILABLE.

```
        TIMEOUT  :CUST RECORD NOT AVAILABLE      TAR WORK WAIT COUNTER
        READ     TAR CUSTOMER                 HOLD 0 FT 0 BY CUSTOMER NO
                 (Process customer record)
                 (Branch or END to avoid executing customer not available code)
        LABEL    :CUST RECORD NOT AVAILABLE
                 (Handle customer record not available condition)
```

TOTAL

The TOTAL statement accumulates subtotals and grand totals in output and update processes.

```
        TOTAL
(1)             (2)  (3)                    (4)  (5)  (6)  (7)                    (8)
```

(1) T/F execution conditions
(2) 1st application ID
(3) 1st field name or PDF
(4) 1st occurrence (constant/index)
(5) Operator (+, -, P, M)
(6) 2nd application ID
(7) 2nd field name, PDF, or constant
(8) 2nd occurrence (constant/index)

Using the Statement

TOTAL adds to (+), hash-adds to (P), subtracts from (-), or hash-subtracts from (M) the first operand using the amount indicated in the second operand. However, rather than storing the result in the the first operand, the total is accumulated internally within APPX.

TOTAL is a special use of a numeric field that occurs only in output and update processes. TOTAL maintains running totals that can be retrieved and used in *End of Range* frames. Totaled fields can also be automatically displayed on end of range images.

APPX dynamically maintains a numeric field for each sort level of a totaled field. It does not alter the contents of the field being totaled. As each level is subtotaled, the corresponding value of the totaled field is added to the next level and then cleared. In a subtotal image, a user can define the field being totaled on the image and request a display of the 'range' value. This causes APPX to display the value that was totaled for that sort level.

Using the sample code in the *Example* section below, assume that a cash receipts report is being printed with subtotals by account number and date, as well as grand totals. In this case, APPX allocates three work fields for total receipts. When the TOTAL statement is executed, APPX adds to the account number subtotal. When the account number subtotal prints, APPX adds the account number subtotal

to the date subtotal and then zeros the account number subtotal. When the date subtotal prints, APPX adds the date subtotal to the grand total and then zeros the date subtotal. At the end of the report, APPX prints the grand total.

A user can retrieve a totaled value by using the SET TOT statement at the subtotal or grand total level. Thus, in our example, you can retrieve the value of WORK CASH RECEIVED in any subtotal or grand total image with the following statement:

```
[    ] SET TOT [TAR] [WORK AMOUNT          ] [    ] = [TAR] [WORK CASH RECEIVED    ] [    ]
```

Related Statements

SET TOT

Example

In the following example, the TOTAL statement is used to accumulate daily cash receipts. Subtotals or grand totals can be printed on reports, or extracted using the SET TOT statement.

```
[    ] TOTAL   [TAR] [WORK CASH RECEIVED    ] [    ] [+] [TAR] [RECEIPT2 CHECK AMOUNT] [    ]
```

TRAP

TRAP (T)

The TRAP statement temporarily halts execution at runtime to permit debugging. Debugging permits 'browsing' through the statements in an ILF routine, setting and clearing TRAP statements in those event points, stepping through the statements or event points,and inspecting and/or modifying variables.

```
[    ] TRAP
(1)
```

(1) T/F execution conditions

Using the Statement

A TRAP statement can be used in any ILF routine in any event point in any process. The true/false indicators can be used to make a TRAP conditional. See The Debugger for details on using the debugger.

Restrictions

TRAP is executed only when the application is invoked from 'Test Application' within the application design utilities, or when invoked from the Toolbox there.

Statement Ignored

TRAP is ignored if the application is invoked from 'Select Database.'

Example

In the following example, the TRAP statement allows the designer to explore and observe the execution of this routine, which assigns a batch control number to a group of adjustments.

```
        LABEL    :CHECK TRXCNTRL
        TRAP
        IF       TAR PARAM TRXCNTRL                EQ      1
T       SET      TAR TRXCNTRL CONTROL NO           =   TAR PARAM ADJUST CONTROL
T       COMPUTE  TAR PARAM ADJUST CONTROL          +       1
T       SET      TAR TRXCNTRL APPLICATION          =       TAR
T       SET      TAR TRXCNTRL FILE POSTED          =       ADJUSTMENTS
T       SET      TAR TRXCNTRL OPERATOR ID          =   --- USER ID
T       READ     TAR TRXCNTRL                HOLD 1 FT 1 BY TRXCNTRL KEY
TT      GOTO     :CHECK TRXCNTRL
```

ULINE

Items are normally displayed without being underlined on the image. ULINE displays an item with an underline.

> Note: The ULINE Statement is not supported using the Appx HTML Client.

```
        ULINE                                  (AT APPEARANCE #     )
(1)     (2)     (3)                      (4)                         (5)
```

(1) T/F execution conditions
(2) Application ID
(3) Field name or predefined field
(4) Occurrence (constant/index)
(5) Appearance (constant/index)

Using the Statement

The appearance number can be used if the same field appears more than once on the image.

If the application ID, field name, occurrence number, and appearance number are not specified (left blank), the ULINE statement affects all of the items painted on the associated image.

ULINE is one of the *characteristic-type* statements. Refer to the common attributes of all the statements in this category in the Characteristic-Type Statements section of this manual.

The operation of a ULINE statement affects only the next generation of an image. In other words, the item characteristics are reset each time an image is produced.

Restrictions

> Note that, because characteristic statements operate on items rather than fields, the characteristic statements are only meaningful in event points that are associated with an image.

Statement Ignored

The system ignores any ULINE statements specified in non-image event points.

Related Statements

BLANK, BLINK, BOLD, BRIGHT, COLOR, DIM, DISPLAY, FONT, INVERSE, NO BOLD, NO ULINE, NORMAL, PICTURE

Example

In the example below, the customer?s name is underlined on the image.

```
[    ] ULINE   [TAR] [CUSTOMER NAME          ] [  ] (AT APPEARANCE # [  ])
[    ] DISPLAY [TAR] [CUSTOMER NAME          ] [  ] (AT APPEARANCE # [  ])
```

UPDATE

The UPDATE statement allows you to alter the flow of processing by invoking an APPX update process from within an ILF routine.

```
[    ] UPDATE [  ] [                                  ] [              ] END? [ ] FAIL [ ]
(1)           (2) (3)                                  (4)              (5)      (6)
```

(1) T/F execution conditions
(2) Application ID
(3) Update process name
(4) Invocation type (SUBPROCESS, RELATED, DETACHED)
(5) End current process first? (Y/N)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next status indicator is set to *T* if the process is invoked successfully, and to *F*, otherwise. If the process cannot be invoked successfully, the *FAIL* parameter determines what additional action to take.

Using the Statement

In addition to the application ID and update process name to be invoked, you specify the invocation type (subprocess, related, or detached). As with all other child invocations, this parameter controls the level of data sharing between the parent and the update process that is invoked.

If *END?* is set to *Y*, the current process will end before invoking the update process. The update process will return to the parent of the current process when it is finished. If *END?* is set to *N*, the update process returns to the current process (beginning with the first statement after the UPDATE statement).

If the application ID is blank, the value in the predefined field NEXT APPLICATION is used. If the process name is blank, the value in the predefined field NEXT PROCESS NAME is used.

Passing Values

The UPDATE statement passes the current PASS list, if any. Refer to the PASS Lists section for details.

Related PDF's

NEXT APPLICATION, NEXT PROCESS NAME

Related Statements

INPUT, INQUIRY, JOB, MENU, OUTPUT, PASS, QUERY, STATUS, SUBR

Example

The following example checks to see if it is the last processing day in the month. If so, the UPDATE statement is executed, invoking an end-of-month file update operation.

```
        IF      TAR WORK END OF MONTH       EQ      Y
T       UPDATE  TAR END OF MONTH UPDATE     SUBPROCESS   END? Y  FAIL 3
```

USE CC

The USE CC statement takes the child constraints placed on the current process by the parent process, and applies them to the specified file.

```
        USE CC
(1)             (2)  (3)
```

(1) T/F execution conditions
(2) Application ID
(3) File name

Using the Statement

A USE CC statement applies the child constraints in force on the current process to the file specified.

Restrictions

USE CC is only allowed?

Statement Ignored

USE CC is ignored if there are no child constraints in force for the current process.

Example

In the following example,

```
     IF      TAR WORK END OF MONTH     EQ   Y
T    USE CC  TAR CUSTOMER
```

VERIFY

The VERIFY statement causes various functions from the Database Management?s Verify File Menus to be executed from within a process.

```
     VERIFY                                TYPE                FAIL
(1)          (2)  (3)                  (4)       (5)                (6)
```

(1) T/F execution conditions
(2) Application ID
(3)File name or field name
(4) Occurrence (constant/index)
(5) Verify type (FIELD, RECORD)
(6) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

The next level of the internal true/false status indicator is set to *T* if the VERIFY operation is successful; otherwise, the indicator is set to *F*. If the VERIFY fails, the *FAIL* parameter determines what additional action to take.

Using the Statement

A file can be verified to insure that it is structurally sound and that each field (or a specific field) contains data that corresponds to the field type (number, date, etc.).

The *TYPE* parameter indicates what component of the file to verify. The only valid choices, among those presented in a drop-down list, are:

- FIELD to verify the contents of a particular field within every record of the file (field name required).
- RECORD to verify the contents of all fields within the current record (file name required).

The application ID and file name for the file (or field) to verify are specified in the statement. Additional information that can affect the location of the file may be contained in the predefined field DATABASE.

The file name references a file that is defined in the data dictionary for the selected application ID. You can set the NEXT DATABASE predefined field to the database ID of the database containing the file that you want verified if it is different than the current database.

Execution Errors

Serious problems encountered while trying to verify a file or its contents, such as a file structure/data dictionary mismatch, cause a non-recoverable runtime error to occur, regardless of the *FAIL* parameter.

Related PDFs

DATABASE, NEXT DATABASE

Related Statements

OPEN, CLOSE

Example

The following example verifies the contents of the *CUSTOMER BALANCE* field and returns an error if an inconsistency is found between the Data Dictionary field type and the actual contents of the field in all CUSTOMER file records.

```
        VERIFY   TAR CUSTOMER BALANCE     TYPE FIELD          AIL  0
F       CANCEL   Verification of TAR CUSTOMER BALANCE Field Failed!
```

WARNING

WARNING can be used to display a warning message in an input process, or to print a warning message in an output or action process.

```
        WARNING
(1)             (2)
```

(1) T/F execution conditions
(2) Warning message (constant or TEMPn predefined field)

Using the Statement

Variable warning messages can be displayed or printed by setting the predefined field TEMPn to the required message, and entering *TEMPn* in place of a message in the WARNING statement.

When a warning occurs, the image is redisplayed to the user with the warning message blinking on line two of the status surface. If more than one ERROR, WARNING, or MESSAGE statement is encountered, the user can display the additional messages.

In output processes, errors and warnings are printed on the report and in update, status, and subroutine processes, they are printed to a log.

Related PDFs

TEMPn

Related Statements

ERROR, MESSAGE

Example

In the following example, a warning is issued if the user does not enter a tax code on a customer's record.

```
     IF        TAR CUSTOMER TRX CODE      EQ
T    WARNING   No sales tax will be collected for this customer.
```

WRITE

WRITE (W)

The WRITE statement writes a new record to the specified file.

```
     WRITE                                FAIL
(1)          (2)  (3)                      (4)
```

(1) T/F execution conditions
(2) Application ID
(3) File name or field name
(4) Fail action (0=nothing, 1=warning, 2=error, 3=cancel)

Sets True/False Status Indicator

If a record is written successfully, the current true/false status indicators are modified by setting the next indicator to *T*. If a write fails because of an ?Already on File? condition for a unique key in the file, the next indicator is set to *F*. In this case, the *FAIL* parameter determines what additional action to take. In addition, on a false condition, the predefined field STATUS CODE returns a token indicating the reason for an I/O command failure. This token can be used as a key to read the system message file to obtain a descriptive I/O error message (see STATUS CODE for details).

Using the Statement

When using this statement in conjunction with an RDBMS table, you can specify a field name instead of a file name to limit the volume of data being passed between APPX and the RDBMS. See the Partial-Record I/O section in Specifying Statements for more information.

Execution of the WRITE statement does not modify the position in the file for subsequent BEG READ/END READ or READNEXT operations.

Related Statements

DELETE, REWRITE

Example

In the following example, invoice batch control information is transferred to a file called EDIT.

```
      CREATE   TAR EDIT        SHARE? Y  FAIL 0 CACHE NONE
      BEG READ TAR INVOICE1                HOLD 0 KEY IS  INVOICE1 KEY
      SET      TAR EDIT KEY                  =  TAR INVOICE1 KEY
      SET      TAR EDIT FILE NAME            =    INVC
      WRITE    TAR EDIT                    FAIL 0
F     CANCEL   Unexpected Error WRITE TAR EDIT
      END READ TAR INVOICE1
```

CHAPTER 4-7

Predefined Fields

Runtime Application

APPX includes a component called the *runtime application*.This application provides a number of predefined fields (PDFs) and predefined processes that are described in detail in this chapter.You can make use of the features provided in this application as you develop your own applications.

To refer to the runtime application, you designate the application ID with three hyphens (---) which APPX interprets as the runtime application.(The actual application ID is *0LA*.)

Predefined Fields (PDFs)

In the runtime application, there are a number of fields that contain various 'points of reference', such as who the current user is and the company address. Although the names of these fields are pre-specified, you can use them as you would any other fields in your own applications.You can reference predefined fields in statements, for example, and set the values of some of them (such as ALTERNATE IMAGE NUMBER) to control processing flow. APPX keeps track of the values of predefined fields at all times, and maintains their values automatically.

When you use a predefined field, you designate the application ID with three hyphens (---).APPX interprets the three hyphens as the runtime application. (The actual application ID is *0LA*.)

Using Predefined Fields (PDFs)

You can make use of predefined fields in three ways:

You can display and optionally allow a user to modify the value of a predefined field by painting it on an image. For example, you may want to display the value of COMPANY NAME on an input screen for the user's information.

Using statements, you can check the value of any predefined field and, based on the result, control the flow of processing For example, you may want to determine if there were any errors encountered during an output process and, if there were errors, perform a special error-handling routine. You can examine the value of the ERRORS predefined field and, if it is greater than zero, pass control to the error-handling routine.

You can use statements to set the value of certain predefined fields and control how a process operates. For example, you may want to control which alternate image is to appear on the screen by examining a user's response to a preliminary question. Depending on the response, you can set the value of ALTERNATE IMAGE NUMBER to the appropriate value, and cause the proper image to be displayed.

Categories of PDFs

There are five categories of predefined fields:

Current status PDFs, which provide information about the current runtime environment, such as the current user ID.

Process control PDFs, which limit or affect an operation within the application.

Terminal management PDFs, which can be used to control and provide information about the current cursor position.

Report management PDFs, which can be used to control and provide information about the disposition and production of reports, such as the print destination.

General purpose PDFs are used as index work variables or work fields in ILF statements.

Current Status PDFs

Current status PDFs provide information about the current runtime environment, such as the current user ID. The current status PDFs are:

APPLICATION

BILLING CODE

COLOR BACKGROUND

COLOR FOREGROUND

COMPANY ADDRESS 1

COMPANY ADDRESS 2

COMPANY ADDRESS 3

COMPANY NAME

DATABASE

DISPOSITION OPTIONS*

ENTRY LEVEL

ERRORS

FONT

INTERACTIVE PHASE

KEYMAP NAME

LANGUAGE ID

MODE

NEXT LANGUAGE ID

OPERATIONAL PHASE

PROCESS NAME

PROCESS TYPE

RECORD NUMBER

SELECTED APPLICATION

SELECTED DATABASE

SELECTED VERSION

Process Control PDFs

Process control PDFs limit or affect an operation within the application. The process control PDFs are:

ACCESS PATH

ALTERNATE IMAGE NUMBER

AUTO READNEXT

CANCEL OK

CHILD ID

COMMIT MODE

DEFAULT MODE

EXACT KEY REQUIRED

INCLUDE CHILDREN

INCLUDE RECORD

NEXT APPLICATION

NEXT CHILD ID

NEXT DATABASE

NEXT PROCESS NAME

NEXT VERSION

OPTION

PROCESS CODE

RETURN CODE

SCROLL TO END

SUBMIT DATE

SUBMIT MODE

SUBMIT NOTIFY USER

SUBMIT PRIORITY

SUBMIT PROCESS

SUBMIT QUEUE

Terminal Management PDFs

Terminal management PDFs can be used to control and provide information about the current cursor position. The terminal management PDFs are:

CURSOR AT APPEARANCE

CURSOR AT OCCURRENCE

CURSOR COLUMN

CURSOR ROW

PAN COLUMN

PAN ROW

Report Management PDFs

Report management PDFs can be used to control and provide information about the disposition and production of reports, such as the print destination. The report management PDFs are:

FORM LENGTH

FORM WIDTH

LINES LEFT ON PAGE

LOG BANNER

LOG FILE DISPOSITION

LOG FILE PATHNAME

LOG FORM ID

LOG FORMAT

LOG HARD COPY

LOG MODE

LOG NOTIFY USER

LOG ON SCREEN

LOG PRINTER ID

LOG PRIORITY

LOG REPORT OPTIONS

LOG SPOOL DATE

NEW PAGE AFTER

NEW PAGE BEFORE

PAGE NUMBER

PRINT BANNER

PRINT COPIES

PRINT FILE BROWSABLE

PRINT FILE DISPOSITION

PRINT FILE PATHNAME

PRINT FORM ID

PRINT FORMAT

PRINT HARD COPY

PRINT MODE

PRINT NOTIFY USER

PRINT ON SCREEN

PRINT PAGE ESTIMATE

PRINT PRINTER ID

PRINT PRIORITY

PRINT RECORD LIMIT

PRINT REPORT OPTIONS

PRINT SPOOL DATE

PRINT SUMMARY ONLY

SKIP AFTER

SKIP BEFORE

SUBHEADING

SUBMIT OPTIONS

General Purpose PDFs

General purpose PDFs are used as index work variables or work fields in ILF statements. The general purpose PDFs are:

A, B, C...Z

Temporarily stores floating point number.

AI, BI, CI...ZI

Temporarily stores inter numbers

BETWEEN

Temporarily stores the results of date math instructions.

TEMP n

Temp fields variy from 1 to 32k in size (x). Temp fields temporarily store alpha numeric characters. Left/Right/Center justification with and without zero fill variations can be specified on all --- TEMP fields. The suffix designates the type of justification:

L - Left Justified
R- Right Justified
L0 - Left Justified, zero fill
R0 - Right Justified, zero fill
C - Centered.

For example:

--- TEMP 128 - no justification, no fill (same as always)
--- TEMP 128L - left justification, no fill
--- TEMP 128L0 - left justification, zero fill
--- TEMP 128R - right justification, no fill
--- TEMP 128R0 - right justification, zero fill
--- TEMP 128C - centre justification, no fill

Valid TEMP x sizes are;
1,2,3,4,5,6,7,8,9,10,11,12,16,20,22,24,30,32,40,50,60,64,79,80,128,32,256,512,1k,2k,8k, and 32k

Information Headings for PDF's

Part II provides a detailed description of each PDF. The following is a brief description of the possible headings for each PDF.

Description explains in as much detail as necessary how the PDF is used.

Example gives a brief example of the usage of the PDF.

Domain describes the domain characteristics of the PDF.

Process Sharing describes how the PDF is shared between processes, if at all.

Modifiable? Yes/No, either the PDF can be modified, or it cannot.

Initial Value is the value to which the PDF is initialized by APPX.

Default Value is the value that is assigned to the field by the system at runtime, if the value is different from the *Initial Value.*

Valid Values describes the valid options for each PDF, if a table of valid values is used.

Related PDFs lists any other PDFs that may be related to, or similar to, this one.

Key to Table 4-7-1: Predefined Fields Attributes

The following table specifies the attributes of each APPX predefined field (PDF). The following items are included in the table:

The PDF name, which is the exact name of the PDF as you would specify it in a statement.

The size of the PDF.

The sign, indicating if the PDF is a signed value.

The storage type, or how the PDF value is stored.

The IPC characteristics, provided in the following three columns:

Pass, the extent to which the PDF value is *passed* to other processes.

Rec, the extent to which the PDF value is *received* by other processes.

Share, the extent to which the PDF value is *shared* with parent processes.

The following abbreviations are used to describe the IPC Characteristics:

sub, communicated with subprocess invocations.

manual, must be manually communicated with statements.

prohib, communication is prohibited.

rcv, communicated with any fully or partially receptive process.

rel/sub, communicated with all subprocess and related invocations.

all, communicated with all invocations regardless of the receptivity level.

Modifiable?, tells whether the PDF value can be changed with statements.

Initial value?, (how the PDF is initialized). When this column contains an asterisk (*), the PDF initial value is controlled by values entered in system administration or at runtime by a user.

Table 4-7-1: Predefined Fields Attributes (Part 1)

```
| Domian Info | IPC Characteristics
Predefined Field | Size Sign Store | Pass Rec Share Modify Init Val
```

```
A, B, C...Z 15 N var dec sub rcv sub yes 0
AI, BI, CI...ZI 10.0 N binary sub rcv sub yes 0
ACCESS PATH 30 alpha rel/sub all rel/sub no *
ALTERNATE IMAGE NUMBER 3.0 binary sub rcv sub yes 0
APPLICATION 3 alpha man probit sub no *
AUTO READNEXT 1 logic all man sub yes *
BETWEEN 15.0 N pack dec sub rec sub yes 0
BILLING CODE 30 alpha rel/sub all rel/sub yes null
CANCEL OK 1 logic alpha all rel/sub yes *
CHILD ID 4 alpha man prohib sub no *
COLOR BACKGROUND 12 alpha rel/sub all rel/sub yes *
COLOR FOREGROUND 12 alpha rel/sub all rel/sub yes *
COMMIT MODE 20 alpha rel/sub all rel/sub yes *
COMPANY ADDRESS 1 30 alpha all all sub no *
COMPANY ADDRESS 2 30 alpha all all sub no *
COMPANY ADDRESS 3 30 alpha all all sub no *
COMPANY NAME 15 alpha all all sub no *
```
Table Key

```
* Controlled in System Administration or at runtime.
```

Table 4-7-1. Predefined Field Attributes (Part 1)

Table 4-7-1: Predefined Fields Attributes (Part 2)

| Domian Info | IPC Characteristics
Predefined Field | Size Sign Store | Pass Rec Share Modify Init Val

CURSOR AT APPEARANCE 5.0 binary sub rcv sub no 0
CURSOR AT OCCURRENCE 5.0 binary sub rcv sub no 0
CURSOR COLUMN 7.0 N binary sub rcv sub yes 1
CURSOR ROW 7.0 N binary sub rcv sub yes 1
DATABASE 3 alpha all all sub no *
DEFAULT MODE 22 token all all prohib yes *
ENTRY LEVEL 1.0 binary man prohib prohib no 0
ERRORS 10.0 binary sub rcv sub yes 0
EXACT KEY REQUIRED 1 logic rel/sub all rel/sub yes *
FONT 12 alpha rel/sub all rel/sub yes *
FORM LENGTH 5.0 binary sub rcv sub no *
FORM WIDTH 5.0 binary sub rcv sub no *
INCLUDE CHILDREN 1 logic sub rcv sub yes 1
INCLUDE RECORD 1 logic sub rcv sub yes null
INTERACTIVE PHASE 22 token man prohib prohib no null
KEYMAP NAME 80 alpha rel/sub all rel/sub yes *
LANGUAGE ID 3 alpha all all sub no *
LINES LEFT ON PAGE 10.0 N binary binary rcv sub no 0
LOG BANNER 1 logic rel/sub all rel/sub yes 0
LOG COPIES 5.0 binary rel/sub all rel/sub yes *
LOG FILE DISPOSITION 10 token rel/sub all rel/sub yes *
LOG FILE PATHNAME 256 alpha rel/sub all rel/sub yes
LOG FORM ID 10 alpha rel/sub all rel/sub yes *
LOG FORMAT 10 alpha rel/sub all rel/subl yes Table Key

* Controlled in System Administration or at runtime.

Table 4-7-1. Predefined Field Attributes (Part 2)

Table 4-7-1: Predefined Fields Attributes (Part 3)

| Domian Info | IPC Characteristics
Predefined Field | Size Sign Store | Pass Rec Share Modify Init Val

LOG HARD COPY 1 logic rel/sub all rel/sub yes *
LOG MODE 10 token rel/sub all rel/sub yes *
LOG NOTIFY USER 1 logic rel/sub all rel/sub yes *
LOG ON SCREEN 1 logic rel/sub all rel/sub yes *

```
LOG PRINTER ID 10 alpha rel/sub all rel/sub yes *
LOG PRIORITY 10 alpha rel/sub all rel/sub yes *
LOG REPORT OPTIONS 256 alpha rel/sub all rel/sub yes null
LOG SPOOL DATE C-th greg-bin rel/sub all rel/sub yes *
MODE 7 token man prohib prohib no null
NEW PAGE AFTER 1 logic sub rcv sub yes N
NEW PAGE BEFORE 1 logic sub rcv sub yes N
NEXT APPLICATION 3 alpha sub rcv sub yes null
NEXT CHILD ID 4 alpha sub rcv sub yes null
NEXT DATABASE 3 alpha sub rcv sub yes null
NEXT LANGUAGE ID 3 alpha sub rcv sub yes null
NEXT PROCESS NAME 30 alpha sub rcv sub yes null
NEXT VERSION 2 alpha sub rcv sub yes null
OPERATIONAL PHASE 22 token all all sub no *
OPTION 22 token sub all sub yes null
PAGE NUMBER 10.0 binary sub all sub yes N
PAN COLUMN 7.0 N binary sub all sub yes Y
PAN ROW 7.0 N binary sub all sub yes Y
PRINT BANNER 1 logica rel/sub all rel/sub yes N
PRINT COPIES 5.0 binary rel/sub all rel/sub yes *
PRINT FILE BROWSABLE 1 logic rel/sub all rel/sub yes *
PRINT FILE DISPOSITION 10 token rel/sub all rel/sub yes *
PRINT FILE PATHNAME 256 alpha rel/sub all rel/sub no Table Key

* Controlled in System Administration or at runtime.
```

Table 4-7-1. Predefined Field Attributes (Part 3)

Table 4-7-1: Predefined Fields Attributes (Part 4)

```
| Domian Info | IPC Characteristics
Predefined Field | Size Sign Store | Pass Rec Share Modify Init Val

PRINT FORM ID 10 alpha rel/sub all rel/sub yes *
PRINT FORMAT 10 alpha rel/sub all rel/sub yes
PRINT HARD COPY 1 logic rel/sub all rel/sub yes *
PRINT MODE 10 token rel/sub all rel/sub yes *
PRINT NOTIFY USER 1 logic rel/sub all rel/sub yes *
PRINT ON SCREEN 1 logic rel/sub all rel/sub yes *
PRINT PAGE ESTIMATE 10.0 binary rel/sub all rel/sub yes *
PRINT PRINTER ID 10 alpha rel/sub all rel/sub yes *
PRINT PRIORITY 10 alpha rel/sub all rel/sub yes *
PRINT RECORD LIMIT 10.0 binary rel/sub all rel/sub yes 0
```

PRINT REPORT OPTIONS 256 alpha rel/sub all rel/sub yes null
PRINT SPOOL DATE C-th greg-bin rel/sub all rel/sub yes null
PRINT SUMMARY ONLY 1 logic rel/sub all rel/sub yes 0
PROCESS CODE 4 alpha rel/sub all rel/sub yes null
PROCESS NAME 30 alpha man prohib prohib no *
PROCESS TYPE 10 token man prohib prohib no *
RECORD NUMBER 10.0 binary man man man no 0
RETURN CODE 10.0 binary rel/sub all rel/sub yes 0
SCROLL TO END 1 logic sub all sub yes 0
SELECTED APPLICATION 3 alpha all all rel/sub no null
SELECTED DATABASE 3 alpha all all rel/sub no
SELECTED VERSION 2 alpha all all rel/sub no null
SKIP AFTER 2.0 binary sub rcv sub yes 0
SKIP BEFORE 2.0 binary sub rcv sub yes 0
SOURCE APPLICATION 3 alpha all all sub no *
SOURCE VERSION 2 alpha all all sub no *
SUBHEADING 79 alpha rel/sub all rel/sub yes null Table Key

*** Controlled in System Administration or at runtime.**

Table 4-7-1. Predefined Field Attributes (Part 4)

Table 4-7-1: Predefined Fields Attributes (Part 5)

| Domian Info | IPC Characteristics
Predefined Field | Size Sign Store | Pass Rec Share Modify Init Val

SUBMIT DATE C-th greg-bin rel/sub all rel/sub yes null
SUBMIT MODE 10 alpha rel/sub all rel/sub yes null
SUBMIT NOTIFY USER 1 logic rel/sub all rel/sub yes 0
SUBMIT OPTIONS 256 alpha rel/sub all rel/sub yes null
SUBMIT PRIORITY 10 alpha rel/sub all rel/sub yes null
SUBMIT PROCESS 1 alpha rel/sub all rel/sub yes 0
SUBMIT QUEUE 1 alpha rel/sub all rel/sub yes null
TEMP 1 (APPX 5.3.1) 1 alpha sub all sub yes null
TEMP 2 (APPX 5.3.1) 1 alpha sub all sub yes null
TEMP 4 (APPX 5.3.1) 2 alpha sub all sub yes null
TEMP 30 (APPX 5.3.1) 4 alpha sub all sub yes null
TEMP 30 CTR (APPX 5.3.1) 30 alpha sub all sub yes null
TEMP 30 LJ (APPX 5.3.1) 30 alpha sub all sub yes null
TEMP 30 RJ (APPX 5.3.1) 30 alpha sub all sub yes null
TEMP 32 (APPX 5.3.1) 32 alpha sub all sub yes null
TEMP 79 (APPX 5.3.1) 79 alpha sub all sub yes null

```
TEMP 80 (APPX 5.3.1) 80 alpha sub all sub yes null
TEMP 132 (APPX 5.3.1) 132 alpha sub all sub yes null
TEMP 256 (APPX 5.3.1) 256 alpha sub all sub yes null
TEMP 512 (APPX 5.3.1) 512 alpha sub all sub yes null
TEMP 2K (APPX 5.3.1) 2K alpha sub all sub yes null
TEMP 8K (APPX 5.3.1) 8K alpha sub all sub yes null
TEMP 32K (APPX 5.3.1) 32K alpha sub all sub yes null
TEXT AT POSITION 5.0 binary sub rcv sub no 0
USER ID 3 alpha all all all no *
VERSION 2 alpha man prohib prohib no *
WARNINGS 10.0 binary sub all sub yes 0 Table Key
```

```
* Controlled in System Administration or at runtime.
```

Table 4-7-1. Predefined Field Attributes (Part 5)

A, B, C...Z

A through Z are index work variables for use in ILF statements. They are floating-point variables that can have up to 15 places to the left of the decimal and up to 15 to the right, subject to a maximum of 15 total digits. These fields and their related fields, integer variables AI, BI, CI...ZI, are the only fields that can be used in a CALC statement.

```
SET      --- A                          =  TAP INVOICE QUANTITY
SET      --- B                          =  TAP INVOICE PRICE
CALC     C  = A * B
```

A though Z variables can also be used as index work variables in BEG LOOP/END LOOP and SET TEMP statements and in place of occurrence numbers and/or appearance numbers wherever such num

```
BEG LOOP A  = 1   TO 10   STEP 001
SET      TAP WORK COUNTER          A   =      0
END LOOP A
```

AI, BI, CI...ZI

AI through ZI are index work variables for use in ILF statements. They are integer variables that can be used in computations which require only integers. Before setting these variables, any numbers with decimal places are automatically rounded up to the next higher integer. The range of values allowed is from –2,147,483,648 to +2,147,483,647, inclusive. These fields and their related fields, floating point variables A, B, C...Z, are the only fields that can be used in a CALC statement. Note that in the example below quantity and price are both rounded to integers as part of setting the variables AI and BI.

```
SET      --- AI                          =  TAP INVOICE QUANTITY
SET      --- BI                          =  TAP INVOICE PRICE
CALC     CI = AI * BI
```

AI through ZI variables can also be used as index work variables in BEG LOOP/END LOOP and SET TEMP statements and in place of occurrence numbers and/or appearance numbers wherever such numbers occur. For example,

```
BEG LOOP AI = 001 TO 010  STEP 001
SET      TAP WORK COUNTER           AI  =      0
END LOOP AI
```

ACCESS PATH

ACCESS PATH contains the current key access path of a file. **At the present time, it cannot be modified.**

However, **when implemented**, it may be set in the Option Intercept event point in input processes. This will allow the designer to set the key access path of a file during a user scan operation. Normally, a file is scanned using the primary key of the file but setting this predefined field would override that path.

```
IF       --- ACESS PATH                EQ TAR CUSTOMER NAME
```

This instruction is not yet implemented.

ALTERNATE IMAGE NUMBER

ALTERNATE IMAGE NUMBER can be set in the Select Image event point in both input processes and output processes.

If set to a number other than zero, APPX will display the image that carries the value of this predefined field. If no such image exists, APPX will display the first image.

If set to zero, APPX will display no image and continue to the next frame.

Any normal frame that includes a SET --- ALTERNATE IMAGE NUMBER statement in its *Select Image* event point, is considered an optional frame.

```
SET      --- ALTERNATE IMAGE NUMBER     =      2
```

APPLICATION

This field identifies the application that contains the process being executed. This value does not change if a COPY or GOSUB statement is executed that references a different application.

```
      IF        --- APPLICATION                EQ     TAP
      AND       --- VERSION                    EQ     00
T     SET       --- PRINT ON SCREEN            =      Y
```

Related PDFs: PROCESS NAME, PROCESS TYPE, VERSION

AUTO READNEXT

This field is used in input processes to determine whether or not APPX automatically retrieves the next record after it finishes storing the current one. It can be changed during data entry by selecting the set attributes option. In general, it is established by the designer when the input process is defined. This field can also be used in inquiry processes to control information flow.

```
      IF        --- MODE                       EQ     CHANGE
T     SET       --- AUTO READNEXT              =      1
```

Default Value:

The default value is blank but can be changed to *Y* or *N* by the designer when the input process is defined, or by the user while the input process is being executed. Blank means *Y* in all modes except delete mode, when it means *N*. If AUTO READNEXT is blank when the process begins, the first record is not read from the file being maintained.

Related PDFs: EXACT KEY REQUIRED

BETWEEN

A value is placed in this field when a DATE BTW statement is executed in an event point. It contains the number of date/time units (centuries, years, months, days, hours, minutes, seconds, hundredths) between the two dates being compared. The unit contained in this field is defined by the DATE BTW statement.

```
      DATE BTW TAP WORK DATE                   5  TAP TODAYS DATE
      IF        --- BETWEEN                    GT     10
```

In this example, the unit in BETWEEN is 'days,' indicated by the value *5* date unit specified in the DATE BTW statement.

BILLING CODE

When the usage log is implemented, this field will initially contain the current billing code. The billing code will be saved as part of each record in the usage log. This field will affect future usage log records written for jobs executed by the current user.

```
SET DATE TAP TODAYS DATE
APPEND   --- BILLING CODE                1  TAP TODAYS DATE
```

CANCEL OK

This field controls whether or not a process or family of processes can be cancelled.

When each process is defined, the field *User Cancel OK* can be entered as *Y* or *N*. When the process is invoked, the predefined field CANCEL OK is set to the value that the designer specified for that process.

If there is a child process, and the child's CANCEL DISPOSITION is set to *prohibit*, that value takes precedence for the child process.

The value of CANCEL OK can be toggled back and forth in any fashion by the designer. The example below would prevent a family of processes from being cancelled.

```
SET      --- CANCEL OK                  =      0
```

CHILD ID

This predefined field will contain the value of the CHILD ID that the designer entered when the application was designed. A CHILD ID can be assigned to either optional or automatic child processes. That value is assigned to this field when the child process is invoked.

```
IF       --- CHILD ID                   EQ     50
SET      --- CANCEL OK                  =      1
```

Related PDFs: INCLUDE CHILDREN, NEXT CHILD ID

COLOR BACKGROUND

Combined with the ILF statement COLOR, this field is used to conditionally set the background color of a specific field (as shown in the example below) or all fields on an image. The field can be set to either a constant (as shown) or a field containing the color name.

```
IF       TAR CUSTOMER BALANCE           LT     0
SET      --- COLOR BACKGROUND           =      RED
COLOR    TAR CUSTOMER BALANCE           (AT APPEARANCE #    )
```

Default Value: Taken from system administration files.

Related PDFs: COLOR FOREGROUND, FONT

COLOR FOREGROUND

Combined with the ILF statement COLOR, this field is used to conditionally set the foreground color of a specific field or all fields (as shown in the example below) on an image. The field can be set to either a constant or a field containing the color name (as shown).

```
IF      TAR CUSTOMER PAST DUE          GT     10000
SET     --- COLOR FOREGROUND           =  SYS COLOR RED
COLOR                                  (AT APPEARANCE #    )
```

Default Value: Taken from system administration files.

Related PDFs: COLOR BACKGROUND, FONT

COMMIT MODE

This field is used to define or change the COMMIT MODE of any process. COMMIT MODE determines those points in time when APPX will commit changes made to the tables stored within an RDBMS. It is only applicable in conjunction with an RDBMS; it cannot be used with APPXIO. Also, not all File Managers support this feature.

This field can be set in the Additional Attributes of all processes but can be added or overridden by use of this field. Note that when COMMIT MODE is changed via a SET statement, the change takes effect at the next COMMIT or ROLLBACK statement.

```
SET      --- COMMIT MODE              =      COMPATIBLE
```

Valid Values:

COMPATIBLE	Changes are committed as soon as all logical locks are freed. This provides maximum compatibility between APPXIO files and RDBMS tables. Note that both APPXIO and RDBMS locks must be released.
AUTOCOMMIT*	Commit each modification as it is made. ***This value will be implemented in a future release.** If selected at Design Time a Warning message will be displayed "Warning - AUTOCOMMIT Not Fully Implemnted! Use it anyway?". Use the COMMIT ILF statement within the appropriate Event Point in your application to get the same effect as this attribute.
PCF CYCLE	Commit modifications as each PCF record is processed, normally after the *Post PCF Update* event point.
END	Only commit modifications at the end of the process family.
MANUAL	Modifications must be committed manually via use of the COMMIT statement. APPX will not automatically COMMIT any changes.

COMPATIBLE is the default value while use of AUTOCOMMIT, when implemented, is the least effective in terms of performance.

Based on the structure of your application, there may be other places where you want to COMMIT a transaction. That's what the COMMIT statement is for. One thing to keep in mind is that the frequency of COMMITs will affect performance. The more COMMITs you do, the slower your application will be. For interactive processes, you can probably ignore the performance issue, but for batch-mode operations, COMMITing too often can really slow things down.

Another issue to be aware of is that APPXIO files do not support transaction processing. If you ROLLBACK a change to an RDBMS-hosted file, any changes made to APPXIO will not be rolled back. Related to this is the issue of visibility. Changes made to an RDBMS-hosted file are invisible to other users until they are committed. Changes made to an APPXIO-hosted file are visible immediately.

APPX also supports savepoints. A savepoint is a partial transaction. You mark the beginning of a savepoint with the SAVEPNT statement - the only argument is a name of your choosing. Executing a SAVEPNT tells the RDBMS that it should write a marker into the current transaction. If you find that you want to roll back part of a transaction, you can refer to a savepoint name in the ROLLBACK statement. The transaction is still open and you can commit other changes, but changes made since the savepoint was created are discarded.

If using COMPATIBLE mode, it is helpful to understand when locks are applied and released. When you read an RDBMS record with hold, you obtain a physical lock and a logical lock. As soon as you delete that record, rewrite it, or read another record, the logical lock is forfeited, but the physical lock is held until the transaction is committed (or rolled back). The physical lock may, depending on the database, prevent other users from reading the record, or it may prevent other users from locking the record. APPXIO, on the other hand, releases the physical lock at the same time as the logical lock. In COMPATIBLE mode, APPX commits changes as soon your task releases all the logical locks, both APPXIO and RDBMS.

Related Statements

COMMIT, ROLLBACK, SAVEPNT

COMPANY ADDRESS 1

This field contains the first line of the company address that was entered for the current database in system administration. (The current database is defined when the *Select Database* option is chosen, and that value is then placed into the DATABASE predefined field.)

```
DISPLAY  --- COMPANY ADDRESS 1          (AT APPEARANCE #    )
```

Related PDFs: COMPANY ADDRESS 2, COMPANY ADDRESS 3, COMPANY NAME, DATABASE

COMPANY ADDRESS 2

This field contains the second line of the company address that was entered for the current database in system administration. (The current database is defined when the *Select Database* option is chosen, and that value is then placed into the DATABASE predefined field.)

```
DISPLAY  --- COMPANY ADDRESS 2          (AT APPEARANCE #    )
```

Related PDFs: COMPANY ADDRESS 1, COMPANY ADDRESS 3, COMPANY NAME, DATABASE

COMPANY ADDRESS 3

This field contains the third line of the company address that was entered for the current database in system administration. (The current database is defined when the *Select Database* option is chosen, and that value is then placed into the DATABASE predefined field.)

```
DISPLAY  --- COMPANY ADDRESS 3          (AT APPEARANCE #    )
```

Related PDFs: COMPANY ADDRESS 1, COMPANY ADDRESS 2, COMPANY NAME, DATABASE

COMPANY NAME

This field contains the name of the company that was entered for the current database in system administration. (The current database is defined when the *Select Database* option is chosen, and that value is then placed into the DATABASE predefined field.)

```
DISPLAY  --- COMPANY NAME               (AT APPEARANCE #    )
```

Related PDFs: COMPANY ADDRESS 1, COMPANY ADDRESS 2, COMPANY ADDRESS 3, DATABASE

CURSOR AT APPEARANCE

This field has significance only for input processes, and only if the cursor is positioned on an input item. (The item need not be modifiable.) Under these circumstances, this field will contain the appearance number of the item. In other words, if the cursor is positioned on the first appearance of the item, CURSOR AT APPEARANCE will have the value *1*; if the cursor is positioned on the second appearance, *2*; and so forth.

Remember that APPEARANCE refers to multiple appearances of a unique field on an image, and that OCCURRENCE refers to multiple occurrences of a field, as defined in the data dictionary.

```
     IF       --- CURSOR AT APPEARANCE       EQ     1
T    SET      --- CURSOR COLUMN              =      30
```

Default Value: Wherever the cursor is, if it is sitting on a field.

Related PDFs: CURSOR AT OCCURRENCE

CURSOR AT OCCURRENCE

This field has significance only for input processes, and only if the cursor is positioned on an input item. (The item need not be modifiable.) Under these circumstances, this field will contain the occurrence number of the item. In other words, if the cursor is positioned on the first occurrence of the item, CURSOR AT OCCURRENCE will have the value *1*; if the cursor is positioned on the second occurrence, *2*; and so forth.

Remember that APPEARANCE refers to multiple appearances of a unique field on an image, and that OCCURRENCE refers to multiple occurrences of a field, as defined in the data dictionary.

```
      IF        --- CURSOR AT OCCRRENCE        EQ      1
T     SET       --- CURSOR COLUMN              =       30
```

Default Value: Wherever the cursor is, if it is sitting on a field.

Related PDFs: CURSOR AT APPEARANCE

CURSOR COLUMN

This field contains the number of the column (horizontal position) where the cursor currently sits. It can be used to change the location of the cursor if used along with CURSOR ROW and the POSITION statement as shown in the following example.

```
      SET       --- CURSOR COLUMN              =       25
      SET       --- CURSOR ROW                 =       5
      POSITION                                 (AT APPEARANCE #     )
```

This example positions the cursor at row 5, column 25. The positioning is absolute; that is, if the current image begins at row 15 and column 1, the cursor will be outside the current image after this example is executed.

The POSITION statement can also be used to set the value of this field as shown below:

```
      POSITION TAP VENDOR NAME                 (AT APPEARANCE #     )
```

Default Value: Wherever the cursor is.

Related PDFs: CURSOR ROW

CURSOR ROW

This field contains the number of the row (vertical position) where the cursor currently sits. It can be used to change the location of the cursor, if used along with CURSOR COLUMN and the POSITION statement as shown in the following example.

```
SET       --- CURSOR COLUMN              =      25
SET       --- CURSOR ROW                 =      5
POSITION                                 (AT APPEARANCE #    )
```

This example positions the cursor at row 5, column 25. The positioning is absolute; that is, if the current image begins at row 15 and column 1, the cursor will be outside the current image after this example is executed.

The POSITION statement can also be used to set the value of this field as shown below:

```
POSITION TAP VENDOR NAME                 (AT APPEARANCE #    )
```

This example positions the cursor at the input item called VENDOR NAME and sets the value of CURSOR ROW (and CURSOR COLUMN) accordingly.

Default Value: Wherever the cursor is.

Related PDFs: CURSOR COLUMN

DATABASE

This is the default database used when opening database-related files and evaluating security classes. This field is initialized to the value of SELECTED DATABASE when a detached child is invoked. Once set, this value never changes during the life of a process.

```
      IF        --- DATABASE                 EQ     TST
T     SET       --- PRINT ON SCREEN          =      Y
```

Related PDFs: NEXT DATABASE, SELECTED DATABASE

DEFAULT MODE

This field is used only for input and query processes. For input processes, it initially contains the value of the *Default Mode* parameter entered by the designer when the input process was defined. For query processes, the initial value is null. The only appropriate places to change this parameter are in the *Pre-Invocation* or *Start of Process* event points.

In query processes, a value of *ADD* or blank will reset any previous setup for the query; a value of *CHANGE* or *INQUIRE* will allow the user to modify any previous setup for the query. A value of *DELETE* will delete the sort work files.

```
      SET       --- DEFAULT MODE                =       INQUIRE
```

Initial Value:

The Initial Value is initialized to blank when a child is invoked detached. For an input process, it is set to the value of MODE before invoking a child whose *Default Mode* is blank.

Valid Values: ADD, DELETE, INQUIRE, CHANGE, or blank.

Related PDFs: MODE

ENTRY LEVEL

This field is used only for input processes and has meaning only during the *DATA ADDITION* interactive phase. It contains a number that essentially indicates the number of times the operator has selected Enter (assuming no errors were encountered). ENTRY LEVEL is not incremented until after the *Verify* and *Pre-Display/Verify* event points have completed successfully.

An entry level of *1* indicates the first time fields are modifiable on the image. An entry level of *2* indicates that the previously entered data has been verified plus additional fields may have been retrieved (or computed) and/or displayed, and such fields may now be available for entry or modification.

The entry level for any given item on an image - that is, the time at which the item becomes modifiable - is defined when the designer paints the image.

The entry level for an optional child can be set as an additional attribute. If set, that optional child cannot be invoked until the proper entry level is reached.

```
      IF        --- ENTRY LEVEL                 EQ      1
      AND       --- INTERACTIVE PHASE           EQ      DATA ADDITION
T     SET       TAP WORK VENDOR NO              =   TAP VENDOR NO
```

Related PDFs: INTERACTIVE PHASE, MODE

ERRORS

This field contains a count of the number of errors generated so far within the current subprocess family, either by the use of the ERROR statement or by data lookup error conditions. It can also be set to zero at any time, and then interrogated at a later time, to determine if any errors were encountered between those two points.

```
      IF        --- ERRORS                      EQ      0
T     MESSAGE   Transmission of Payments Has Completed Successfully.
```

Related PDFs: WARNINGS

EXACT KEY REQUIRED

This field is used in input processes to determine whether or not APPX will require the end user to enter a valid key to access a record in the file being maintained. It can be changed during data entry by selecting the set attributes option. In general, it is established by the designer when the input process is defined.

This field can also be used in inquiry processes to control the process flow.

```
      IF        --- MODE                        EQ      DELETE
T     SET       --- EXACT KEY REQUIRED          =       Y
```

Default Value: *N*, but can be changed by the designer when the input process is defined.

Related PDFs: AUTO READNEXT

FONT

Combined with the ILF statement FONT, this field is used to conditionally set the font type of a specific field or all fields (as shown in the example below) on an image. The field can be set to either a constant or a field containing the font name (as shown).

```
      IF        TAR CUSTOMER TYPE               EQ      A
T     SET       --- FONT                        =   SYS FONT ARIAL BOLD
T     FONT                                      (AT APPEARANCE #     )
```

Default Value: Taken from system administration files.

Related PDFs: COLOR BACKGROUND, COLOR FOREGROUND

FORM LENGTH

This field pertains only to output processes and contains the value of the form length that was entered in the Forms file in system administration for the form selected in the printer disposition.

```
      IF        --- FORM LENGTH                 EQ      66
T     DISPLAY   TAP WORK TEXT                   (AT APPEARANCE #     )
```

Related PDFs: FORM WIDTH, LINES LEFT ON PAGE

FORM WIDTH

This field pertains only to output processes and contains the value of the form width that was entered in the Forms file in system administration for the form selected in the printer disposition. This parameter can also be entered when the output process is defined in application design. If the parameter in the output process is blank, this field will determine the form width.

```
      IF       --- FORM WIDTH                EQ     132
T     DISPLAY  TAP WORK TEXT                 (AT APPEARANCE #    )
```

Related PDFs: FORM LENGTH, LINES LEFT ON PAGE

INCLUDE CHILDREN

This field determines whether or not child processes will be invoked from a parent process. It affects both automatic and optional child processes. Which child processes will be invoked and which will be skipped depends on where this field is modified. This field is immediately reset to *Y* after one or more child processes have been skipped.

When a process (particularly a JOB or INPUT process) invokes a child process, the value of INCLUDE CHILDREN is reset at the end of that child process to its value prior to the child process invocation.

If INCLUDE CHILDREN is set to *N* in the *End of Frame* event point of a frame that calls automatic child processes, all child processes for that frame will be skipped.

If INCLUDE CHILDREN is set to *N* in a *Pre-Invocation* event point, only that child process is skipped.

If INCLUDE CHILDREN is set to *N* in an *Post Invocation* event point, any remaining automatic child processes will be skipped.

```
      SET      --- INCLUDE CHILDREN          =      N
```

Related PDFs: CHILD ID, NEXT CHILD ID

INCLUDE RECORD

This field is used only in query processes and determines whether or not any given record, on a file being sorted, will be included in the sort. Before each record is presented to query selection, this field is reset to null (blank).

If it is left blank, then the normal query selection - whether end user-entered or designer-entered - will determine whether or not the record is included in the sort.

If this field is set to *N*, the record will not be included in the sort even if it would have passed the normal query selection.

```
      IF        TAP VENDOR NO                EQ      55555
T     SET       --- INCLUDE RECORD           =       N
```

INTERACTIVE PHASE

This field is set during input processes and indicates which data entry phase is currently in force. It works with the predefined field MODE and, although they work together, each has a specific use.

MODE is determined when the user selects an input process from a menu and selects a mode option (*ADD, CHG, DEL,* or *INQ*). INTERACTIVE PHASE determines what the user may do while in that mode. For example, if you are in add mode entering data into a scrolling frame, you can move the cursor to a previously added record and select the change item option. At this time you will still be in add mode, but the interactive phase will change from data addition to data modification.

```
      IF        --- INTERACTIVE PHASE        EQ      DATA ADDITION
      AND       --- ENTRY LEVEL              EQ      1
T     SET       TAP WORK VENDOR NO           =   TAP VENDOR NO
```

Valid Values:

NONE

DATA ADDITION (add mode before a record is saved)

DATA DELETION (user is prompted to 'Confirm Delete')

DATA INQUIRE (the record is displayed, cannot be modified)

DATA MODIFICATION (the record is displayed, can be modified)

DATA SCROLL (multiple records are being prepared for display)

KEY ENTRY (user is prompted to enter a key)

MENU ENTRY (currently not used)

Related PDFs: ENTRY LEVEL, MODE

KEYMAP NAME

This field represents the current keymap file name being used to map APPX function and option keys to the user's keyboard. It can be set or reset by setting this field to either a constant or an alpha field with a keymap name for a value. Note that the keymap name must be the name of a valid keymap file residing in the default APPX data directory.

```
      IF        --- DATABASE                 EQ      ABC
T     SET       --- KEYMAP NAME              =       VT320
```

LANGUAGE ID

This is the current language that all images are being presented to the user in. This field is only used in installations using the Language Translation feature. This field is initialized to the value of NEXT LANGUAGE ID when a detached child is invoked. Once set, this value never changes during the life of a process. Refer to the *Language Translation Manual* for further information.

```
      IF        --- LANGUAGE ID                EQ     ESP
T     DISABLE       SPANISH BUTTON             (AT APPEARANCE #    )
```

Related PDFs: NEXT LANGUAGE ID

LINES LEFT ON PAGE

This field is used in output processes and indicates how many lines are left to print on the current page, based on FORM LENGTH and the number of lines that have already been printed.

```
      IF        --- LINES LEFT ON PAGE         LE     4
T     GOSUB           :SPECIAL FOOTER
```

Related PDFs: FORM LENGTH, FORM WIDTH

LOG BANNER

This field contains the value of the *Banner?* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. If supported by the operating system, LOG BANNER will print a banner page before the log. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
      SET       --- LOG BANNER                 =      Y
```

Default Value: Taken from system administration files.

LOG COPIES

This field contains the value of the *Copies* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. LOG COPIES contains the number of copies of the log that will be produced. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
      SET       --- LOG COPIES                 =      2
```

Default Value: Taken from system administration files.

LOG FILE DISPOSITION

This field contains the value of the *Disposition* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. LOG FILE DISPOSITION indicates whether the log file will be scratched, saved in the user's print library, or requeued after printing. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
SET      --- LOG FILE DISPOSITION      =      SAVE
```

Default Value: Taken from system administration files.

Valid Values:

SCRATCH (scratch after printing)

SAVE (place in user's print library after printing)

REQUEUE (place back in print queue after printing)

Related PDFs: LOG MODE

LOG FILE PATHNAME

This field contains the full directory path tree to the print file and the name of the print file.

```
SET      --- TEMP 80                   =  --- LOG FILE PATHNAME
```

LOG FORM ID

This field contains the value of the *Form* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. LOG FORM ID contains a key to the Forms file in system administration, which retrieves the record that identifies the form on which the log will be printed. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
SET      --- TEMP 80                   =  --- LOG FILE PATHNAME
```

Default Value: Taken from system administration files.

LOG FORMAT

This field contains formatting information send to the printer when printing a log. The use of the field is not currently implemented and is reserved for future use.

LOG HARD COPY

This field contains the value of the *Hard Copy?* option, which was entered in the *Report/Log Default Values* fields in system administration, for logs. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
SET       --- LOG HARD COPY              =       Y
```

Default Value: Taken from system administration files.

LOG MODE

This field contains the value of the *Mode* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. LOG MODE indicates whether the file will be held in the print queue, spooled directly to the printer, or kept in the user's print library instead of being directed to the print queue. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
SET       --- LOG MODE                   =       HOLD
```

Default Value: Taken from system administration files.

Valid Values:

HOLD (hold in the print queue until an operator releases it)

SPOOL (spool directly to the printer)

KEEP (place in user's print library, not print queue)

Related PDFs: LOG FILE DISPOSITION

LOG NOTIFY USER

This field contains the value of the *Notify?* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. If supported by the operating system, LOG NOTIFY USER can alert the user when the log has finished printing. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
SET      --- LOG NOTIFY USER          =      Y
```

Default Value: Taken from system administration files.

LOG ON SCREEN

This field contains the value of the *On Screen?* option, which was entered in the *Report/Log Default Values* fields in system administration, for logs. The system-wide defaults for these values are entered in the System Parameters file. The values can be overridden for each new application, database, and user.

```
SET      --- LOG ON SCREEN            =      Y
```

Default Value: Taken from system administration files.

LOG PRINTER ID

This field contains the value of the *Printer* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. LOG PRINTER ID contains a key to the Printers file in system administration, which will retrieve the record that identifies the printer on which the log will be printed. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
SET      --- LOG PRINTER ID           =      BAND PRINTER
```

Default Value: Taken from system administration files.

LOG PRIORITY

This field contains the value of the *Priority* option, which was entered in the *Report/Log Default Values* fields in system administration, for error and modification logs. If supported by the operating system, LOG PRIORITY can assign a specific priority to the log file in the print queue. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user.

```
      SET       --- LOG PRIORITY                =       10
```

Default Value: Taken from system administration files.

Valid Values: Operating system specific.

LOG REPORT OPTIONS

This field contains a string of printer commands that are passed to the printer for printer control purposes when printing logs. The information is written to a line in the log report file name.cfg file. Because these commands are operating system and printer specific, you should review those respective requirements before attempting to use this field. The field can be SET to a constant or alpha field (as shown in the example below) containing the print commands.

```
      SET       --- LOG REPORT OPTIONS          =  SYS COURIER PORTRAIT DUPLX
```

Valid Values: Operating system specific.

LOG SPOOL DATE

This field contains the value of the *Spool Date* option, which can optionally be entered when the input process DISPOSITION is run. If supported by the operating system, LOG SPOOL DATE can cause a spooled log to delay being printed until a specified date and time.

```
      SET       --- LOG SPOOL DATE              =  TAP WORK DATE
```

MODE

This field is used only for input processes, and contains the value that the operator selects by selecting the add item, delete item, inquire item, or change item icon when the process first loads from the menu.

```
      IF        --- MODE                        EQ     ADD
T     SET       TAP WORK VENDOR NO              =  TAP VENDOR NO
```

Valid Values: ADD, DELETE, INQUIRE, CHANGE

Related PDF's: ENTRY LEVEL, INTERACTIVE PHASE, DEFAULT MODE

NEW PAGE AFTER

This field is used in output processes, and indicates whether or not the report will skip to a new page after a subsequent PRINT statement is executed. This field is also used when you are running something outside of APPX that will affect the screen. If this field is set to Y or left blank, APPX will repaint the screen after the RUN statement is executed.

```
SET      --- NEW PAGE AFTER            =      Y
PRINT    TAP WORK TEXT                 AT 050 ROWS 010 COLUMNS 030
```

Related PDF's: NEW PAGE BEFORE, SKIP AFTER, SKIP BEFORE

NEW PAGE BEFORE

This field is used in output processes, and indicates whether or not the report will skip to a new page before a subsequent PRINT statement is executed.

```
SET      --- NEW PAGE BEFORE           =      Y
PRINT    TAP WORK TEXT                 AT 005 ROWS 002 COLUMNS 020
```

Related PDF's: NEW PAGE AFTER, SKIP AFTER, SKIP BEFORE

NEXT APPLICATION

This field can be used to identify an application ID for use in a subsequent MENU, INPUT, OUTPUT, or similar statement, if the statement itself does not specify an application.

This field is also used to control which source file is accessed when opening, creating, or scratching a source file. It is automatically cleared following an OPEN, CREATE, or SCRATCH statement.

```
SET      --- NEXT APPLICATION          =      TAP
SET      --- NEXT PROCESS NAME         =      VENDORS
INPUT                                        DETACHED     END? N  FAIL 0
```

Related PDF's: NEXT PROCESS NAME, NEXT VERSION

NEXT CHILD ID

This field can be set to choose which child process will be invoked next.

If it is set in the End of Frame event point on a frame having automatic child processes, the first child process defined with a CHILD ID that matches NEXT CHILD ID will be invoked. Once that child has been completed, processing will continue normally.

If this field is set in the Pre- Invocation event point, processing will immediately skip to the first child encountered that has a matching CHILD ID.

If this field is set in the Post Invocation event point, the next child process to be invoked will be the first child process encountered where CHILD ID matches NEXT CHILD ID.

There are two special CHILD IDs: '+' means move to the next (or first) child; '-' means move to the previous (or last) child. These IDs are automatically set by ***APPX*** but can be overridden using statements. They can also be interrogated to determine the direction of process flow.

```
SET      --- NEXT CHILD ID          =      EOM
```

Related PDF's: CHILD ID, INCLUDE CHILDREN

NEXT DATABASE

This field can be set before the execution of a CREATE, OPEN, or SCRATCH statement to operate on a file from a database other than the one currently identified by the DATABASE field. It is then cleared automatically following the execution of the CREATE, OPEN, or SCRATCH statement.

This field can also be set before invoking the SELECT DATABASE subroutine process to automatically select a specific database. Note that the database is not actually changed to the selected value until the next invocation of a detached process.

```
SET      --- NEXT DATABASE          =      TST
SUBR     --- SELECT DATABASE               SUBPROCESS   END? N  FAIL 0
INPUT    TAP VENDORS                       DETACHED     END? N  FAIL 0
```

Related PDFs: DATABASE, SELECTED DATABASE

NEXT LANGUAGE ID

This field is used to instantly change the presentation language of the current and subsequent images displayed to a user. It is only used in installations using the Language Translation feature. Refer to the *Language Translation Manual* for further information.

```
      IF       --- OPTION                 EQ     USER 1
T     SET      --- NEXT LANGUAGE ID       =      DUT
```

Related PDFs: LANGUAGE ID

NEXT PROCESS NAME

This field can be used to identify a specific process for use in a subsequent MENU, INPUT, OUTPUT, or similar statement, if the statement itself does not explicitly specify a process.

```
SET      --- NEXT APPLICATION          =      TAP
SET      --- NEXT VERSION              =      00
SET      --- NEXT PROCESS NAME         =      VENDORS
INPUT                                        DETACHED     END? N  FAIL 0
```

Related PDFs: NEXT APPLICATION, NEXT VERSION

NEXT VERSION

This field can be used to identify a specific version of an application for use in a subsequent MENU, INPUT, OUTPUT, or similar statement.

This field is also used to control which source file is accessed when opening, creating, or scratching a source file. It is automatically cleared following an OPEN, CREATE, or SCRATCH statement.

```
SET      --- NEXT APPLICATION          =      TAP
SET      --- NEXT VERSION              =      00
SET      --- NEXT PROCESS NAME         =      VENDORS
INPUT                                        DETACHED     END? N  FAIL 0
```

This example will fail if the value in NEXT VERSION is not valid for the current database.

Related PDFs: NEXT APPLICATION, NEXT PROCESS NAME

OPERATIONAL PHASE

This field is stored in system administration for each database and application combination. Its value can be changed from initial setup or recovery processing by means of the predefined process BEGIN LIVE OPERATIONS.

There are certain differences between the operating phases. In initial setup and recovery processing, for example, records can be deleted from files even if there is delete protection, and keys can be changed even if there is key protection. In live operations or recovery processing, modification logs are produced for any input process with a non-blank *Mod Log File Name*. In initial setup, mod logs are *never* produced. And for any input item defined with *Modifiable?* equal to blank, it means that the item is modifiable in initial setup and recovery processing, but *not* in live operations. (As an example, this allows the designer to use the same input process for initial setup and live operations, without

compromising data integrity.) In addition, images and even entire frames can be skipped if the application is in live operations, by setting the parameter *Skip if Live Operations?* to *Y* for that image or frame.

```
      IF        --- OPERATIONAL PHASE          EQ     INITIAL SET UP
```

Default Value: Taken from system administration files for a given database/application combination when a child is invoked as detached.

Valid Values: INITIAL SET UP, LIVE OPERATIONS, RECOVERY PROCESSING

OPTION

This predefined field can be used either to set an option in a manner transparent to the end user, or to intercept the end user's option selections. If statements are used to set OPTION to a specific value, APPX will behave as though the user had selected that option. The field can be intercepted only in the Option Intercept event points, and can be intercepted or set either at the frame level or the image level. To set this field, use the Pre-Display or Option Intercept event points.

```
      IF        --- OPTION                     EQ     USER 99
T     RUN       --- PROCESS NAME                          END? N  FAIL 0
```

Default Value: Whatever option the user has selected.

Valid Values: USER 0 through USER 255, SCAN, SELECT ACCESS PATH, PREVIOUS ACTIVITY, NEXT RECORD, REDISPLAY, INSERT TEXT, END PARAGRAPH, ADD MODE, DELETE MODE, INQUIRE MODE, CHANGE MODE, SET ENTRY ATTRIBUTES, DIRECT PROCESS 1, DIRECT PROCESS 2, END, HELP ITEM, PRINT SCREEN, CANCEL, SHOW MESSAGES, HELP, RETURN, ACKNOWLEDGE DELETE, SCROLL FIRST, SCROLL LAST, SCROLL PREV, SCROLL NEXT, SCROLL UP, SCROLL DOWN, LOGOUT, RESCROLL, KEY ENTRY.

PAGE NUMBER

This field relays the value of the *Page Number* field as maintained during the printing of a report. It can be used to restart page numbering if, for example, the designer wishes to begin numbering the pages of each customer statement at 1.

```
      IF        TAP WORK RECORD TYPE           EQ     NEXT
T     SET       --- PAGE NUMBER                =      0
```

Default Value: Whichever page the report is on.

PAN COLUMN

In input processes, this field contains the number of the column (horizontal position) where the cursor currently sits when the user pans beyond the physical limits of the terminal screen. If the user pans beyond the screen limits, CURSOR COLUMN contains the column number where the cursor is positioned within the screen, and PAN COLUMN contains the actual physical column number of the cursor.

```
SET      --- PAN COLUMN                =      100
SET      --- PAN ROW                   =      5
```

Related PDFs: CURSOR COLUMN, CURSOR ROW, PAN ROW

PAN ROW

In input processes, this field contains the number of the row (vertical position) where the cursor currently sits when the user pans beyond the physical limits of the terminal screen. If the user pans beyond the screen limits, CURSOR ROW contains the row number where the cursor is positioned within the screen, and PAN ROW contains the actual physical row number of the cursor.

```
SET      --- PAN COLUMN                =      100
SET      --- PAN ROW                   =      5
```

Related PDFs: CURSOR COLUMN, CURSOR ROW, PAN COLUMN

PRINT BANNER

This field contains the value of the *Banner?* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. If supported by the operating system, PRINT BANNER will print a banner page before the report. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user, and overridden again each time the input process DISPOSITION is invoked.

```
SET      --- PRINT BANNER              =      Y
```

Example recovered from the APPX 5.4.4 PRINT BANNER topic; the current source illustration is unavailable.

Default Value: Taken from system administration files.

PRINT COPIES

This field contains the value of the *Copies* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. PRINT COPIES contains the number of copies of the report that will be produced. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
        SET      --- PRINT COPIES              =      2
```

Example recovered from the APPX 5.4.4 PRINT COPIES topic; the current source illustration is unavailable.

Default Value: Taken from system administration files.

PRINT FILE BROWSABLE

This field indicates whether or not an on-screen report is browsable by users. Browsable reports allow the user to select a detail line of the report, then select option 33 to access the PCF file's default input process. The selected report detail record is immediately available for maintenance or inquiry purposes. There must be a Default Input Process defined for the PCF file in the Data Dictionary.

```
SET      --- PRINT FILE BROWSABLE       =      Y
```

Default Value: (Y)es.

PRINT FILE DISPOSITION

This field contains the value of the *Disposition* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. PRINT FILE DISPOSITION indicates whether the report file will be scratched, saved in the user's print library, or requeued after printing. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT FILE DISPOSITION     =      SAVE
```

Default Value: Taken from system administration files.

Valid Values:

SCRATCH (scratch after printing)

SAVE (place in user's print library after printing)

REQUEUE (place back in print queue after printing)

Related PDFs: PRINT MODE

PRINT FILE PATHNAME

This field contains the full directory path tree to the print file and the name of the print file.

```
SET      --- TEMP 80                    =  --- PRINT FILE PATHNAME
```

PRINT FORM ID

This field contains the value of the *Form* option that which was entered in the *Report/Log Default Values* fields in system administration, for reports. PRINT FORM ID contains a key to the Forms file in system administration, which retrieves the record that identifies the form on which the report will be printed. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT FORM ID              =      WIDE
```

Default Value: Taken from system administration files.

PRINT FORMAT

This field contains formatting information send to the printer when printing a report. The use of the field is not currently implemented and is reserved for future use.

PRINT HARD COPY

This field contains the value of the *Hard Copy?* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. The system-wide defaults for these values are entered in the System Parameters file. These values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT HARD COPY            =      Y
```

Default Value: Taken from system administration files.

PRINT MODE

This field contains the value of the *Mode* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. PRINT MODE indicates whether the file will be held in the print queue, spooled directly to the printer, or kept in the user's print library instead of being directed to the print queue. The system-wide defaults for these values are entered in the System Parameters file. The values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT MODE                =      HOLD
```

Valid Values:

HOLD (hold in the print queue until an operator releases it)

SPOOL (spool directly to the printer)

KEEP (place in user's print library, not print queue)

Related PDFs: PRINT FILE DISPOSITION

PRINT NOTIFY USER

This field contains the value of the *Notify?* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. If supported by the operating system, PRINT NOTIFY USER can alert the user when the report finishes printing. The system-wide defaults for these values are entered in the System Parameters file. The values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT NOTIFY USER         =      Y
```

Default Value: Taken from system administration files.

PRINT ON SCREEN

This field contains the value of the *On Screen?* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. The system-wide defaults for these values are entered in the System Parameters file. The values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT ON SCREEN           =      Y
```

Default Value: Taken from system administration files.

PRINT PAGE ESTIMATE

This field contains the value of the *Page Estimate* option, which can optionally be entered when the input process DISPOSITION is executed. **When implemented**, it will be used to estimate percent complete on systems that do not provide a means for knowing the number of records in a file.

```
SET      --- PRINT PAGE ESTIMATE        =      10
```

PRINT PRINTER ID

This field contains the value of the *Printer* option that was entered in the *Report/Log Default Values* fields in system administration, for reports. PRINT PRINTER ID contains a key to the Printers file in system administration, which retrieves the record that identifies the printer on which the report will be printed. The system-wide defaults for these values are entered in the System Parameters file. The values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT PRINTER ID           =      BAND
```

Default Value: Taken from system administration files.

PRINT PRIORITY

This field contains the value of the *Priority* option, which was entered in the *Report/Log Default Values* fields in system administration, for reports. If supported by the operating system, PRINT PRIORITY can assign a specific priority to the report file in the print queue. The system-wide defaults for these values are entered in the System Parameters file. The values can be overridden for each new application, database, and user, and overridden again every time the input process DISPOSITION is invoked.

```
SET      --- PRINT PRIORITY             =      10
```

Default Value: Taken from system administration files.

PRINT RECORD LIMIT

This field contains the value of the *Record Limit* option, which can optionally be entered when the input process DISPOSITION is executed. **When implemented**, it will determine the number of records from the process control file that will actually be printed.

```
SET      --- PRINT RECORD LIMIT         =      10
```

PRINT REPORT OPTIONS

This field contains a string of printer commands that are passed to the printer for printer control purposes when printing reports. The information is written to a line in the <report file name>.cfg file. Because these commands are operating system and printer specific, you should review those respective requirements before attempting to use this field. The field can be SET to a constant or alpha field (as shown in the example below) containing the print commands.

```
SET      --- PRINT REPORT OPTIONS        =  SYS COURIER PORTRAIT DUPLX
```

Valid Values: Operating system specific.

PRINT SPOOL DATE

This field contains the value of the *Spool Date* option, which can optionally be entered when the input process DISPOSITION is run. If supported by the operating system, PRINT SPOOL DATE can cause a spooled report to delay being printed until a specified date and time.

```
SET      --- PRINT SPOOL DATE            =  TAP WORK DATE
```

PRINT SUMMARY ONLY

This field contains the value of the *Print Summary Only?* option, which can optionally be entered when the input process DISPOSITION is run. If PRINT SUMMARY ONLY is *Y*, all detail frames in the output process or processes that follow will be executed but not printed; only subheadings, subtotals, and grand totals will be printed.

```
SET      --- PRINT SUMMARY ONLY          =      Y
```

PROCESS CODE

This field is used to pass information from one process to another among related and subprocess families.

```
SET      --- PROCESS CODE                =      SUMM
```

Query processes have special rules with respect to "sharing" of work fields and temporary work files among APPX processes. (See Interprocess Communications for more information on data sharing.) PROCESS CODE represents an exception to these special rules, as follows:

The "Setup" (Operator Interactive) phase of Query processing inherits inbound work fields and temporary files according to normal Interprocess Communication rules. But it passes outbound work fields/temp files *only* to the "Execution" phase of Query processing. Query (Execution) inherits inbound files/fields *only* from its associated Query (Setup). It can pass *nothing* to any subsequent job step, with the following exception:

The predefined field PROCESS CODE can be used to pass limited information into and out of Query processes. Up through Release 3.0, the application designer could not count on a Query running to completion (and making PROCESS CODE modifications available) before a subsequent Output or Update starts executing.

An exception to this is that the Query (Runtime) does not make PROCESS CODE available until *after* the subsequent Output/Update's *Start of Process* ILF series has executed, but before the first frame starts executing for the Output/Update

To access a PROCESS CODE (modified in a Query) in an Output's or Update's *Start of Process*, you can put a "dummy" update in after the Query, and before the subsequent Output/Update. This dummy update should be based in Query's PCF, and contain a single END PROC statement in its *Start of Frame* ILF series. This will make PROCESS CODE available in a subsequent Output/Update's *Start of Process* ILF series.

PROCESS NAME

This field identifies the name of the current process that is executing. The value does not change if a COPY or GOSUB statement is executed that references a different process.

```
      IF       --- PROCESS NAME              EQ     VENDOR LIST
      AND      --- PROCESS TYPE              EQ     OUTPUT
T     SET      --- PRINT ON SCREEN           =      N
```

Illustration recovered from the earlier PROCESS NAME topic; the current source image is unavailable.

Related PDFs: PROCESS TYPE, APPLICATION, VERSION

PROCESS TYPE

This field identifies the type of process that is currently executing. The value does not change if a COPY or GOSUB statement is executed that references a different process type.

```
      IF       --- PROCESS NAME              EQ     VENDOR LIST
      AND      --- PROCESS TYPE              EQ     OUTPUT
T     SET      --- PRINT ON SCREEN           =      N
```

Valid Values: MENU, JOB, INPUT, OUTPUT, UPDATE, QUERY, INQUIRY, STATUS, SUBROUTINE, ACTION

Related PDFs: PROCESS NAME, APPLICATION, VERSION

RECEIVE ARG LEN

After executing a RECEIVE statement you can obtain information about the sending field(s). RECEIVE ARG LEN will contain the length of the received field.

RECEIVE AP

After executing a RECEIVE statement you can obtain information about the sending field(s). RECEIVE AP will contain the Application ID of the received field(s).

RECEIVE NAME

After executing a RECEIVE statement you can obtain information about the sending field(s). RECEIVE NAME will contain the name of the received field(s).

RECORD NUMBER

When implemented, this field will contain a count of the records that have been read from the process control file.

```
      IF        --- RECORD NUMBER              GT      400
T     END
```

RETURN CODE

This field is returned whenever a CALL or RUN statement is completed. Its value is determined by the process that was called or run.

```
      RUN           /appx/deal                                END? N  FAIL 0
      IF        --- RETURN CODE                EQ      52
T     GOSUB         :ACE OF SPADES
```

Assuming that the directory /appx contains the following sample C program, this program will be executed and a return code of *1* to *52* will be passed back to the APPX process that executed the RUN statement.

```
/* deal.c */
#include <stdlib.h>
#include <time.h>
int main( int argc, char ** argv )
{
/*
** Initialize the random number generator
*/
   srand(( unsigned ) time(0) );
/*
** Return a random number between 1 and 52
*/
   return( rand() % 52 + 1 );
}
```

SCROLL TO END

If this field is set to *Y* at the frame level of an input process, and if the frame is a scrolling frame, APPX will read through the process control file and present each record as defined on the related image, scrolling completely through the file until end of file is reached.

```
SET       --- SCROLL TO END              =       Y
```

SELECTED APPLICATION

This field is set to the current contents of NEXT APPLICATION by the SELECT APPLICATION predefined input process. The current value of the predefined field SOURCE APPLICATION remains unaffected when that input process is executed. Instead, the current value of SELECTED APPLICATION is modified, which in turn is used to determine the initial value of SOURCE APPLICATION the next time a child process is invoked as detached. This predefined field can only be used by the APPX applications (application design, system administration, database management, and the runtime application).

```
IF        --- SELECTED APPLICATION       EQ      TAP
```

Related PDFs: NEXT APPLICATION, NEXT VERSION, SELECTED VERSION, SOURCE APPLICATION, SOURCE VERSION

SELECTED DATABASE

This field is set to the current contents of NEXT DATABASE by the SELECT DATABASE predefined subroutine process. The current value of the predefined field DATABASE remains unaffected when that input process is executed. Instead, the current value of SELECTED DATABASE is modified, which in turn is used to determine the initial value of DATABASE the next time a child process is invoked as detached.

```
IF        --- SELECTED DATABASE          EQ      TST
```

Related PDFs: DATABASE, NEXT DATABASE

SELECTED VERSION

This field is set to the current contents of NEXT VERSION by the SELECT APPLICATION predefined input process. The current value of the predefined field SOURCE VERSION remains unaffected when that input process is executed. Instead, the current value of SELECTED VERSION is modified, which in turn is used to determine the initial value of SOURCE VERSION the next time a child process is invoked as detached. This predefined field can only be used by the APPX applications (application design, system administration, database management, and the runtime application).

```
IF        --- SELECTED VERSION           EQ      00
```

Related PDFs: NEXT APPLICATION, NEXT VERSION, SELECTED APPLICATION, SOURCE APPLICATION, SOURCE VERSION

SKIP AFTER

This field is used in output processes and determines the number of lines that are skipped after a subsequent PRINT statement is executed.

```
SET       --- SKIP AFTER                 =       2
PRINT     TAP WORK TEXT                  AT 010 ROWS 002 COLUMNS 020
```

Related PDFs: NEW PAGE AFTER, NEW PAGE BEFORE, SKIP BEFORE

SKIP BEFORE

This field is used in output processes and determines the number of lines that are skipped before a subsequent PRINT statement is executed.

```
SET       --- SKIP BEFORE                =       2
PRINT     TAP WORK TEXT                  AT 010 ROWS 002 COLUMNS 020
```

Related PDFs: NEW PAGE AFTER, NEW PAGE BEFORE, SKIP AFTER

SOURCE APPLICATION

This field identifies the current application being acted upon by application design.

This predefined field can only be used by the APPX applications (application design, system administration, database management, and the runtime application).

```
IF        --- SOURCE APPLICATION          EQ      0AD
```

Related PDFs: NEXT APPLICATION, NEXT VERSION, SELECTED APPLICATION, SELECTED VERSION, SOURCE VERSION

SOURCE VERSION

This field identifies the current version of the application being acted upon by application design.

This predefined field can only be used by the APPX applications (application design, system administration, database management, and the runtime application).

```
IF        --- SOURCE VERSION              EQ      00
```

Related PDFs: NEXT APPLICATION, NEXT VERSION, SELECTED APPLICATION, SELECTED VERSION, SOURCE APPLICATION

STATUS CODE

This field is returned by certain file-related statements (for example, CREATE, OPEN, READ, etc.) that result in a false condition, thereby setting the next true/false status indicator to *F*. STATUS CODE is a token field and contains a value indicating the reason for the I/O command failure, such as:

FI_AOF - Record Already on File (following a WRITE or REWRITE)

FI_EOF - End of File (following a READNEXT)

FI_NOF - Record Not in File (following a READ)

STATUS CODE can be used to set the primary key to the system message file (--- MESSAGE) to obtain a descriptive I/O error message, as shown in the example below.

```
      OPEN     TGL ACCTMS    SHARE? Y  FAIL 0 CACHE? N
F     ERROR    Unexpected Error OPEN TGL ACCTMS (see error message below)
F     SET      --- MESSAGE ID                 =  --- STATUS CODE
F     READ     --- MESSAGE                HOLD 0 FT 0 BY MESSAGE ID
FT    SET      --- TEMP 80                   =  --- MESSAGE TXT
FT    ERROR    TEMP 80
```

The descriptive message is the same message that would be generated by setting the FAIL (or FT) parameter on the I/O statement appropriately (where 0=nothing, 1=warning, 2=error, 3=cancel).

SUBHEADING

This field allows the end user to enter up to 79 characters to be printed as a subheading with the standard page header. It is available each time the predefined input process DISPOSITION is run.

```
SET      --- SUBHEADING                =      As of
APPEND   --- SUBHEADING                1  TAP WORK ALPHA AS OF DATE
```

SUBMIT DATE

This field contains the value of the *Submit Date* option, which can optionally be entered when the input process DISPOSITION is run, when a process is submitted to background. If supported by the operating system, SUBMIT DATE can cause a background process to delay execution until a specified date and time.

```
SET      --- SUBMIT DATE               =  TAP WORK DATE
```

Related PDFs: SUBMIT MODE, SUBMIT NOTIFY USER, SUBMIT OPTIONS, SUBMIT PRIORITY, SUBMIT PROCESS, SUBMIT QUEUE

SUBMIT MODE

This field contains the value of the *Mode* option, which can optionally be entered when the input process DISPOSITION is run, when a process is submitted to background. If supported by the operating system, a background process can either be run immediately or held in the background queue until a system operator releases it.

```
SET      --- SUBMIT MODE               =      HOLD
```

Valid Values:

HOLD (hold in background queue until released by operator)

RUN (begin execution immediately)

Related PDFs: SUBMIT DATE, SUBMIT NOTIFY USER, SUBMIT OPTIONS, SUBMIT PRIORITY, SUBMIT PROCESS, SUBMIT QUEUE

SUBMIT NOTIFY USER

This field contains the value of the *Notify?* option, which can optionally be entered when the input process DISPOSITION is run, when a process is submitted to background. If supported by the operating system, SUBMIT NOTIFY USER can alert the user when the background process has completed.

```
SET      --- SUBMIT NOTIFY USER          =      Y
```

Related PDFs: SUBMIT DATE, SUBMIT MODE, SUBMIT OPTIONS, SUBMIT PRIORITY, SUBMIT PROCESS, SUBMIT QUEUE

SUBMIT OPTIONS

This field contains a string of commands that are passed to the operating system as command line arguments when running background processes. Because these commands are operating system specific, you should review those requirements before attempting to use this field. The field can be SET to a constant or alpha field (as shown in the example below) containing the submission commands.

```
SET      --- SUBMIT OPTIONS              =  SYS ACCOUNTING MONTH END
```

Valid Values: Operating system specific.

Related PDFs: SUBMIT DATE, SUBMIT MODE, SUBMIT NOTIFY USER, SUBMIT PRIORITY, SUBMIT PROCESS, SUBMIT QUEUE

SUBMIT PRIORITY

This field contains the value of the *Priority* option, which can optionally be entered when the input process DISPOSITION is run, when a process is submitted to background. If supported by the operating system, SUBMIT PRIORITY can assign a specific priority to the background process.

```
SET      --- SUBMIT PRIORITY             =      10
```

Valid Values: Operating system specific.

Related PDFs: SUBMIT DATE, SUBMIT MODE, SUBMIT NOTIFY USER, SUBMIT OPTIONS, SUBMIT PROCESS, SUBMIT QUEUE

SUBMIT PROCESS

This field controls whether or not a process is submitted to background. If the end user selects the *Background* option from the DISPOSITION input screen, this field is automatically set to *Y*.

If background processing is selected for a job stream, any subsequent child process that is invoked as a separate task will be submitted to background independently.

Not all hardware platforms support background processing.

```
SET      --- SUBMIT PROCESS              =      Y
```

Valid Values: Operating system specific.

Related PDFs: SUBMIT DATE, SUBMIT MODE, SUBMIT NOTIFY USER, SUBMIT OPTIONS, SUBMIT PRIORITY, SUBMIT QUEUE

SUBMIT QUEUE

This field contains the value of the *Queue* option, which can optionally be entered when the input process DISPOSITION is run, when a process is submitted to background. If supported by the operating system, SUBMIT QUEUE can assign a specific job queue to the background process.

```
SET      --- SUBMIT QUEUE              =      TAPU
```

Valid Values: Operating system specific.

Related PDFs: SUBMIT DATE, SUBMIT MODE, SUBMIT NOTIFY USER, SUBMIT OPTIONS, SUBMIT PRIORITY, SUBMIT PROCESS

TEMP n

TEMP x

This field is a temporary alphanumeric work area that can be used by any statement series. Substring manipulation of this field is provided through the use of the SET TEMP statement. This field can also be used in CANCEL, ERROR, MESSAGE, and WARNING statements to provide variable messages.

TEMP x

Temp fields variy from 1 to 32k in size (x). Temp fields temporarily store alpha numeric characters.

Valid TEMP x sizes are;
1,2,3,4,5,6,7,8,9,10,11,12,16,20,22,24,30,32,40,50,60,64,79,80,128,132,256,512,1k,2k,8k, and 32k. TEMP 132 for example.

Left/Right/Center justification with and without zero fill variations can be specified on all --- TEMP fields. The suffix designates the type of justification:

L - Left Justified
R- Right Justified
L0 - Left Justified, zero fill
R0 - Right Justified, zero fill
C - Centered.

For example:

--- TEMP 128 - no justification, no fill (same as always)
--- TEMP 128L - left justification, no fill
--- TEMP 128L0 - left justification, zero fill
--- TEMP 128R - right justification, no fill
--- TEMP 128R0 - right justification, zero fill
--- TEMP 128C - center justification, no fill

> Note that when using SET TEMP with the justified/filled versions that APPX does not apply any justification or fill. The character(s) will be inserted into the location you specified, regardless of the justification/fill of the target field. For example, using SET TEMP to put an 'X' in the 7th position in TEMP 30C (center justification) will not centre the "X", it will remain in the 7th position. Only a SET statement applies fill/justification.

TEXT AT POSITION

This field is set after an IF, AND, or OR statement using the *IN* relation is executed, which returns a true/false value of *T* (indicating that the first field includes the second field). The field indicates the starting position of the character string within the first field.

```
      IF        TAP WORK DATA                  IN      JUNK
T     SET       --- AI                         =   --- TEXT AT POSITION
T     SET       --- TEMP 79                    =       MESS
T     SET TEMP 79    AT 1    FOR 4    INTO 4   OF   TAP WORK DATA
```

In this example, the first occurrence of the text JUNK in the field TAP WORK DATA is replaced by the text MESS.

USER ID

This field contains the three-character logon ID for the current user.

```
      IF        --- USER ID                    NE TAP WORK USER ID
      AND       TAP OP EXCLUSIVE               EQ      1
T     ERROR     Cannot Edit Another User's Data
```

VERSION

This identifies the version of the application that contains the process currently being executed. This value does not change if a COPY or GOSUB statement is executed that references a different application.

```
      IF       --- APPLICATION              EQ     TAP
      AND      --- VERSION                  EQ     00
T     SET      --- PRINT ON SCREEN          =      Y
```

Related PDFs: APPLICATION, PROCESS NAME, PROCESS TYPE

WARNINGS

This field contains a count of the number of warnings generated so far within the current subprocess family, either by the use of the WARNING statement or by data lookup warning conditions. It can also be set to zero at any time, and then interrogated at a later time, to determine if any warnings were encountered between those two points.

```
      SET      TAP WORK NO WARNINGS         =  --- WARNINGS
```

Related PDF: ERRORS

CHAPTER 4-8

Runtime Subroutine's and Predefined Processes

APPX MENU

This menu is the default startup process for all users.In addition to allowing a user to select a new database, the APPX MENU process provides access to system administration, and application design. This menu, shown in below, can be invoked at any time and is typically used as one of the steps in a startup job.For example, consider the following job:

100 SYS UPDATE SYS LOG IN USER
200 --- MENU --- APPX MENU
300 SYS UPDATE SYS LOG OUT USER

The first and last steps of the above job may write records to a customized system log file that tracks each user as they enter and exit APPX.

Menu Invoked by APPX MENU Predefined Process

BEGIN LIVE OPERATIONS

This subroutine process allows an end user to move automatically from either the initial setup operational phase or the recovery processing operational phase, to the live operations phase. The optional child job process that invokes this subroutine should have a Parent Disposition of End After; a MENU statement with the proper application ID and a blank process name should be defined in the Post Invocation event point of the job process. This will cause the main Live Operations menu for that application to display to the end user after the operational phase is changed.

CHECK GUI CLIENT

This routine has been updated. Use .CLIENT CHECK FOR GUI for new applications.

This subroutine checks to see if the current engine is connected to a GUI-enabled client. No arguments are passed to the subroutine. It simply sets the predefined field RETURN CODE to 1 if running under a GUI-enabled client.

The subroutine can be invoked via SUBR or GOSUB. However, if invoked via SUBR, it must not be invoked DETACHED.

The following example generates a message or warning depending on whether or not the user is running under a GUI-enabled client.

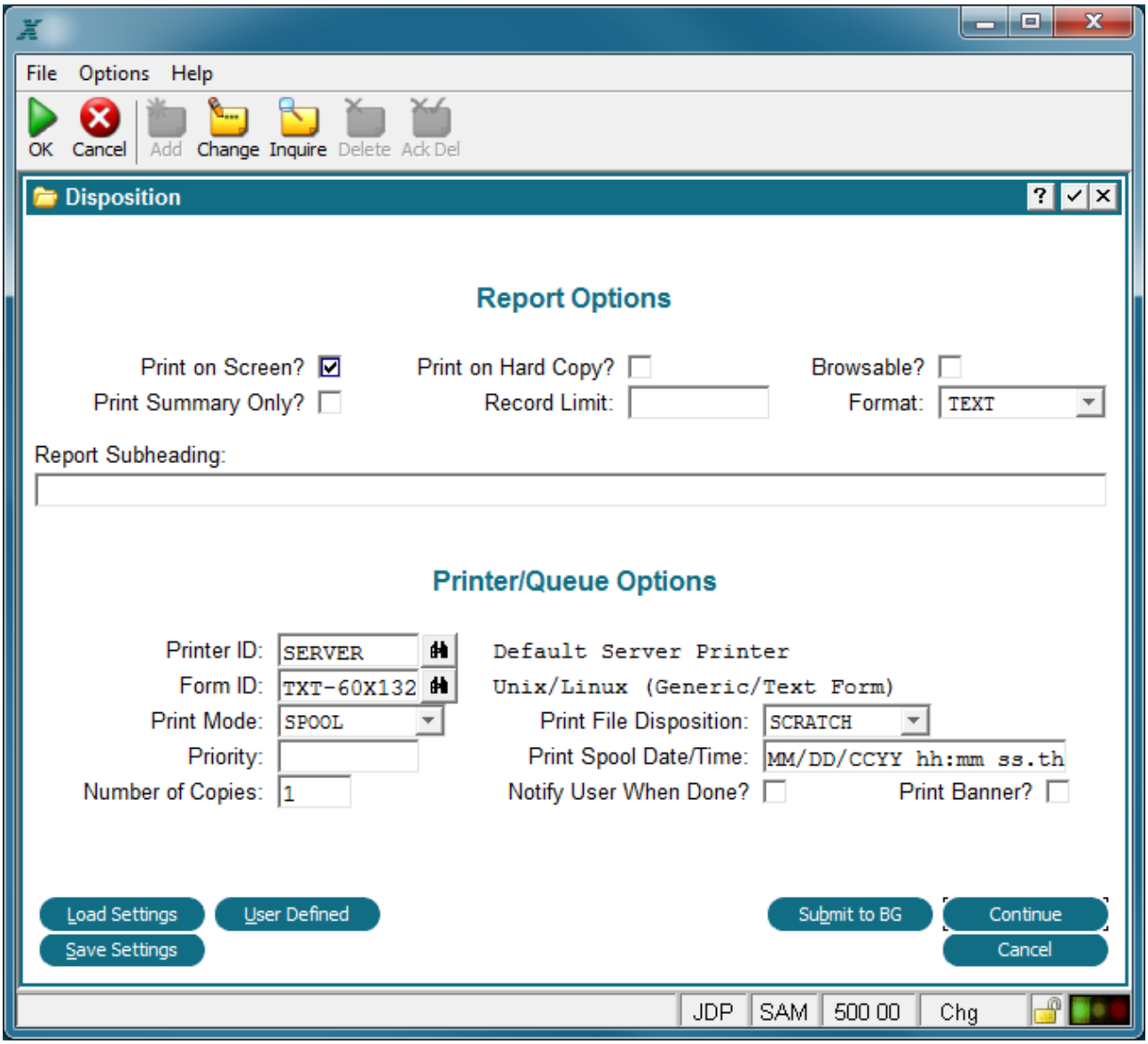
```
      SUBR     --- CHECK GUI CLIENT                SUBPROCESS   END? N  FAIL 0
      *
      IF       --- RETURN CODE               EQ     1
T     MESSAGE  User is running under GUI enabled client.
F     WARNING  User is not running under GUI enabled client.
```

DISPOSITION

This is the input process that a designer uses to allow the end user to choose a printer, or choose whether to print a report or log to the screen, or whether to submit a process to background.If DISPOSITION is not invoked, any subsequent output will be directed to the screen or printer according to the defaults set in system administration.

This process, shown below, can be invoked at any time, but must not be invoked as DETACHED, and must not be specified as a 'Separate Task' (in other words, a designer should never allow this process to be submitted to background).If either of these parameters are wrong, the invocation will have no effect.

Before invoking this process, the designer can override the default values by modifying the corresponding PRINT? or SUBMIT? predefined fields.If the PDFs are modified using SET statements in the Pre-Invocation event point, the user will still be able to manually modify the value.However, if the PDFs are modified by using child constraints, the values will display but cannot be changed by the user.



Disposition Predefined Process

Load Settings. Retrieve a previously saved Disposition.

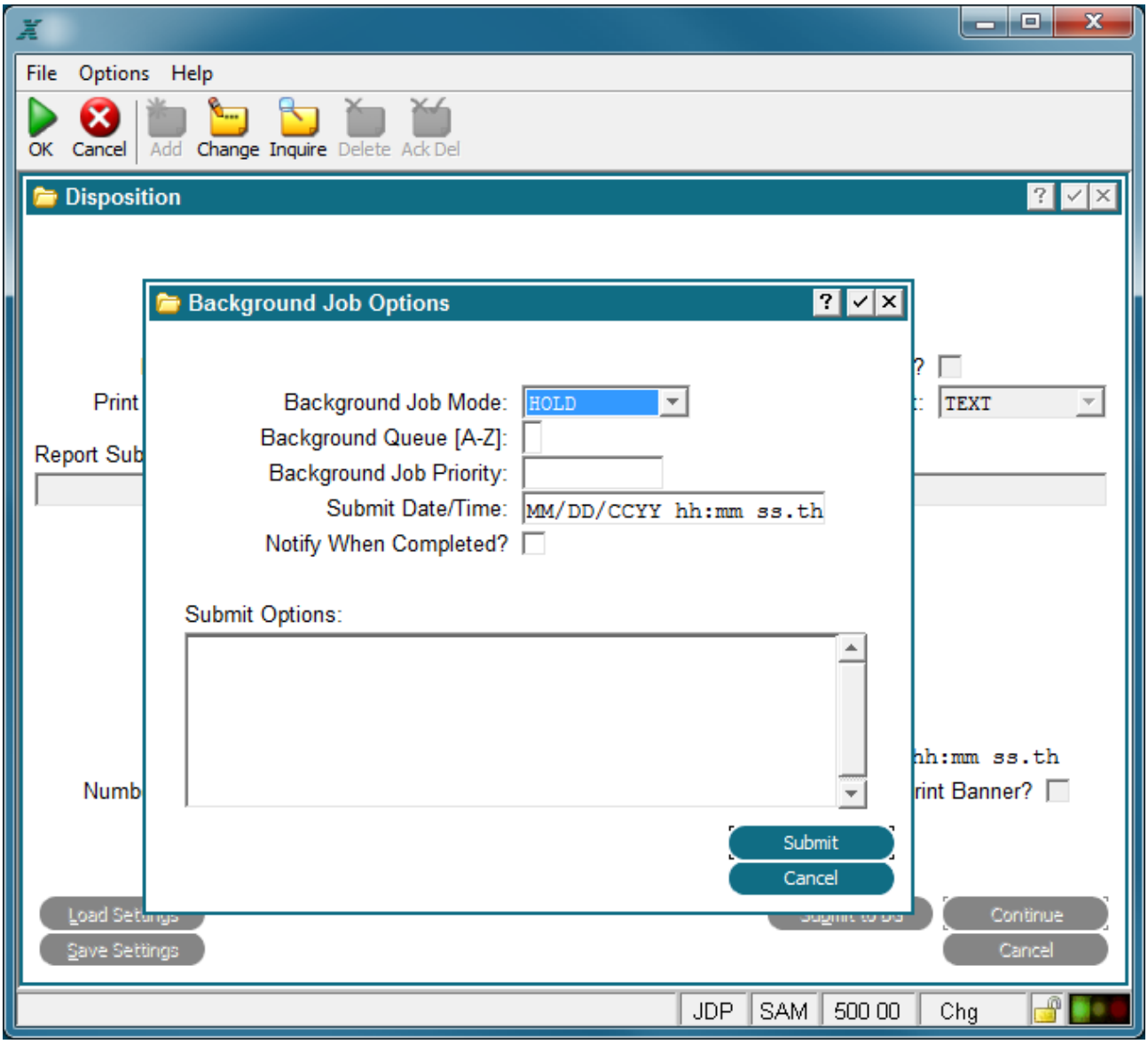
Save Settings. Allow the operator the ability to save the Disposition settings on this screen for later retrieval.

User Defined. Allow for you to pass parameters directly to the print spooler as part of the print file configuration file (.cfg).

Submit to Background. If the end user selects the submit to background option, DISPOSITION invokes the DISPOSITION (BACKGROUND) predefined input process as a subprocess.

DISPOSITION (BACKGROUND)

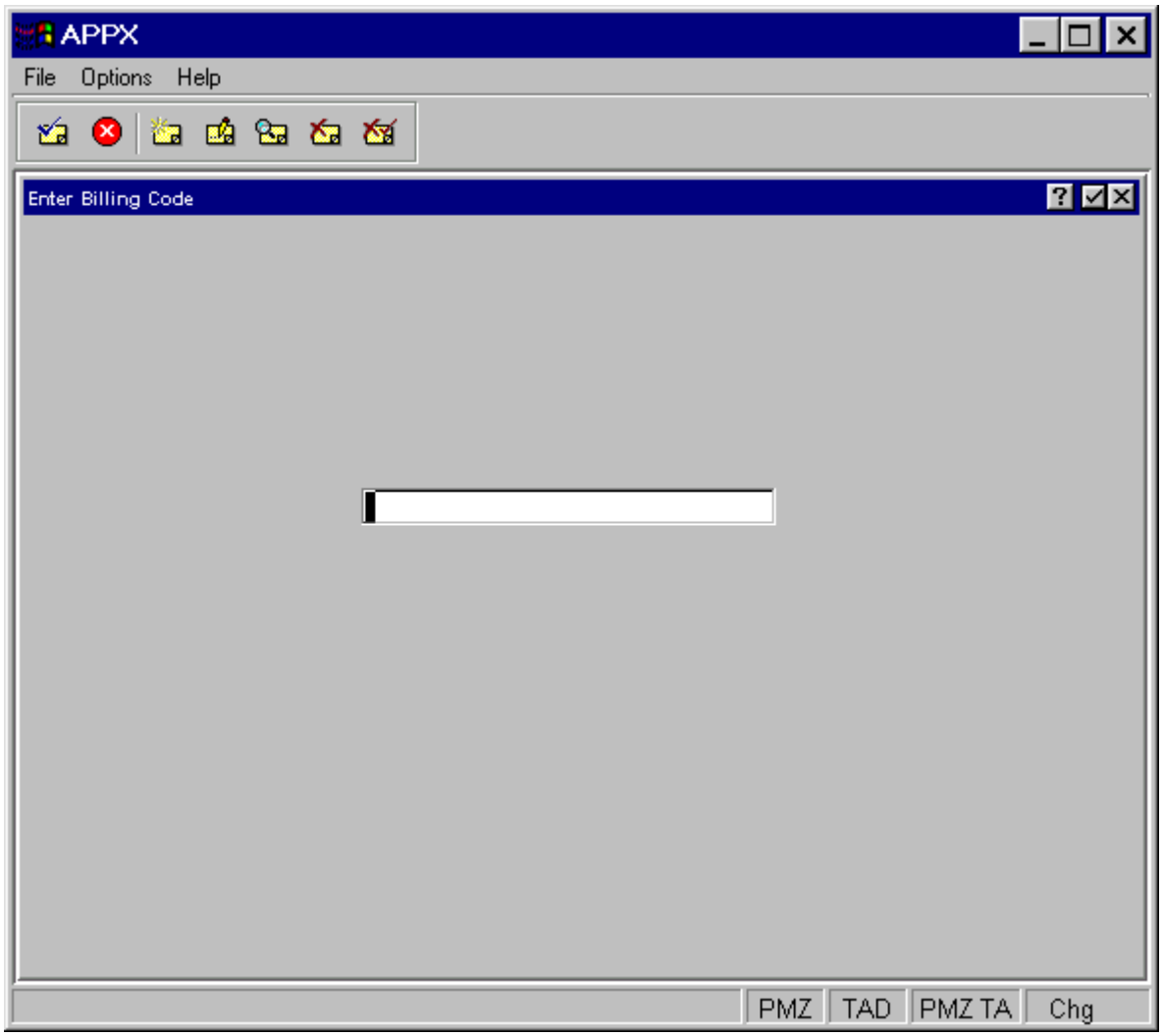
This is the input process that allows an end user to choose a priority, spool date, mode, and other options for background processing.It is not explicitly invoked by the designer, but rather invoked as a subprocess by DISPOSITION, when the end user selects the submit to background option. The background disposition screen is shown in below:



Background Disposition Predefined Process

ENTER BILLING CODE

This process, example below, allows the user to enter a value into the predefine dfield BILLING CODE. When the usage log is implemented, this field will be saved as a part of each record in the usage log.



Enter Billing Code Predefined Process

GET CMD LINE PARM

This routine has been updated. Use .ENV GET CMD LINE PARM for new applications.

This subroutine checks for the existence of a parameter on the command line used to invoke the current engine. Two arguments are expected to be passed to the subroutine:

Parameter to be checked (alpha field, maximum length 132)

Buffer for returned value (alpha field, maximum length 2048 or 2K)

Must be PASS'ed shared.

Returns specified parameter only if it existed on the command line.

The subroutine can be invoked via SUBR or GOSUB.

The following example generates a message or warning depending on whether or not the parameter *-m* existed on the command line when the APPX engine was invoked.

```
      SET      --- TEMP 132                  =      -m
      SET      --- TEMP 256                  =
      *
      PASS     --- TEMP 132                  FIELD            SHARE? N
      PASS     --- TEMP 256                  FIELD            SHARE? Y
      SUBR     --- GET CMD LINE PARM               DETACHED     END? N  FAIL 0
      *
      IF       --- TEMP 256                  EQ --- TEMP 132
T     APPEND   --- TEMP 132                  1      found
F     APPEND   --- TEMP 132                  1      not found
-     APPEND   --- TEMP 132                  1      on on command line
T     MESSAGE  TEMP 132
F     WARNING  TEMP 132
```

GET ENV VAR

This routine has been updated. Use .ENV GET ENV VARIABLE for new applications.

This subroutine retrieves the contents of an environment variable. Two arguments are expected to be passed to the subroutine:

Desired environment variable (alpha field, maximum length 132)

Buffer for returned value (alpha field, maximum length 2048 or 2K)

Must be PASS'ed shared.

Returns contents of specified environment variable.

The subroutine can be invoked via SUBR or GOSUB.

The following example retrieves the contents of the PATH environment variable and stores it in a work field.

```
      SET      --- TEMP 132                  =      PATH
      SET      --- TEMP 2K                   =
      *
      PASS     --- TEMP 132                  FIELD            SHARE? N
      PASS     --- TEMP 2K                   FIELD            SHARE? Y
      SUBR     --- GET ENV VAR                     DETACHED     END? N  FAIL 0
      *
      SET      CSY WORK PATH ENV VAR         =  --- TEMP 2K
```

PROCESS QUERY RECORD

This subroutine potentially adds a PCF record to the result set of a query (provided the record meets the query constraints). No arguments are passed to the subroutine, and no values are returned.

The subroutine can only be invoked via GOSUB. Also, it can only be used within the Establish PCF Range event point in a query process (or in a subroutine called from that event point).

The following example processes two ranges of vendor records for query selection. Only vendors 10-19 and 1000-1999 will be selected for printing if on file and then only if they also satisfy any runtime constraints.

```
*         Process first range of records
SET       TAP VENDOR VENDOR NO            =      10
BEG AT    TAP VENDOR   IN TAP VENDOR VENDOR NO
SET       TAP VENDOR VENDOR NO            =      19
END AT    TAP VENDOR   IN TAP VENDOR VENDOR NO
BEG READ TAP VENDOR                  HOLD 0 KEY IS  VENDOR VENDOR NO
GOSUB     --- PROCESS QUERY RECORD
END READ TAP VENDOR
*         Process second range of records
SET       TAP VENDOR VENDOR NO            =      1000
BEG AT    TAP VENDOR   IN TAP VENDOR VENDOR NO
SET       TAP VENDOR VENDOR NO            =      1900
END AT    TAP VENDOR   IN TAP VENDOR VENDOR NO
BEG READ TAP VENDOR                  HOLD 0 KEY IS  VENDOR VENDOR NO
GOSUB     --- PROCESS QUERY RECORD
END READ TAP VENDOR
```

SELECT DATABASE

Used in conjunction with the NEXT DATABASE predefined field, this subroutine process accesses a different database. This database becomes the current database and is used by any subsequent detached child processes.

To use this subroutine, set the NEXT DATABASE field to the new database ID, then call the SELECT DATABASE predefined subroutine as a subprocess.

```
SET       --- NEXT DATABASE              =      TST
SUBR      --- SELECT DATABASE                  SUBPROCESS   END? N  FAIL 0
```

Another method of changing databases based on user selection is the use of designer-defined subroutines. These subroutines can be executed from menus when a user makes a selection to change from one database to another. For example, if a menu contains an option for a user to change from the

current database to database ABC, the corresponding optional child would be a subroutine called, perhaps, SELECT DATABASE ABC. You can create a subroutine for every database defined for your installation and allow users to select them via menu options. These subroutines can also be executed from jobs or other processes when navigation between multiple databases is required.

The aforementioned subroutine would consist of these ILF statements:

```
SET      --- NEXT DATABASE              =      ABC
SUBR     TSY SELECT DATABASE ABC              SUBPROCESS   END? N  FAIL 0
```

SEND FILE TO CLIENT

This routine has been updated. Use .CLIENT DOWNLOAD FILE for new applications.

This subroutine retrieves a file from the server and stores it on the client system. Three arguments are expected to be passed to the subroutine:

Source pathname (alpha field, maximum length 256)

Destination pathname (alpha field, maximum length 256)

If blank, the client will open a dialog browser so the user can select the file.

Should be PASS'ed shared to allow for return of user-selected file.

If the destination pathname is relative, it will be relative to the location of the APPX client jar file.

Field for status indicator (numeric field)

Must be PASS'ed shared.

Returns status code (0=Failure, 1=Success).

The subroutine can be invoked via SUBR or GOSUB. While the file is in transit, the client will show a progress slider and the APPX session will wait until it completes before returning.

The following example retrieves a file from the APPX server and stores it in the user-selected file on the APPX client. A message (or warning) is used to report the name of the file the user selected and whether or not it was sent successfully.

```
      SET      --- TEMP 132                  =      /tmp/testfile.txt
      SET      --- TEMP 256                  =
      SET      --- XI                        =      0
      *
      PASS     --- TEMP 132                  FIELD            SHARE? N
      PASS     --- TEMP 256                  FIELD            SHARE? Y
      PASS     --- XI                        FIELD            SHARE? Y
      SUBR     --- SEND FILE TO CLIENT             DETACHED     END? N  FAIL 0
      *
      IF       --- XI                        EQ     1
T     APPEND   --- TEMP 256                  1      sent OK
T     MESSAGE  TEMP 256
F     APPEND   --- TEMP 256                  1      not sent to client
F     WARNING  TEMP 256
```

Subroutine API Overview

Release 5.1.0 of the APPX Utility includes a new standardized designer API which can be used to gain access to extended functionality from within an APPX application. This API provides APPX Designers with a robust set of subroutines which can be called to do a variety of tasks. This API replaces the older subroutines that have been informally used, and all designers are encouraged to begin using the new subroutines.

General Information

All of these new subroutines are defined in the (---) application and begin with a period (.). They all use a standard call interface and use the same framework for returning results and reporting errors. They are grouped by name prefix so that related subroutines are grouped together by function. Data is passed into and returned from these subroutines by use of the PASS statement. Failure information is returned by use of a work field with the same name as the subroutine. This failure code field is tokenized so you can scan to see the failure reasons that can be returned. Note that the work field has a scope of 'Detached', and so will retain it's value from invocation to invocation, as well as across all invocation types.

If the subroutine accepts parameters (i.e., READ, WRITE, APPEND to --- .STREAM OPEN), the parameters are case insensitive.

If the subroutine has required parameters and you do not PASS the correct number of parameters, the subroutine will issue a CANCEL identifying which parameter was missing.

General Routines

Application Routines Contains routines to change the current application phase (Live Operations, Recovery Processing, Initial Setup) or to select a new database.

API Name	Description
.BEGIN INITIAL SETUP	Changes the current application to the 'Initial Setup' phase.
.BEGIN LIVE OPERATIONS	Changes the current application to the 'Live Operations' phase.
.BEGIN RECOVERY PROCESSING	Changes the current application to the 'Recovery Processing' phase.
.SELECT DATABASE	Switches to the specified database.

Utility Routines Contains routines to add/change/delete a user, change a user's auxiliary password, test a user's security code, add/change/delete Hook records, activate temporary Hook records, compile processes, process the Data Dictionary, switch user context, update application documentation, pause execution for a specified number of seconds (with or without a countdown timer), implement timeouts, indirect field referencing (to set or retrieve a field value by name), and more.

API Name	Description
.UTIL ADD USER	Adds a user to the Appx User file.
.UTIL ADD HOOK	Adds a record to the Hook file.
.UTIL CHECK SECURITY	Checks the security code for the specified user.
.UTIL CHG AUX PASS	Changes the Auxiliary password for the specified user.
.UTIL CHG HOOK	Changes fields on the Hook File.
.UTIL CHG USER	Changes fields on the Appx User File.
.UTIL CLEAR PASS LIST	Clears any unfilled PASS requests.
.UTIL COMPILE PROC	Compiles the specified Process Type/Name or Application.
.UTIL DEL USER	Deletes a user from the Appx User File.
.UTIL DEL HOOK	Deletes a record from the Hook File.
.UTIL FIELD GET	Retrieves the value of the specified field name.
.UTIL FIELD SET	Sets a value into the specified field name.
.UTIL GET EM NAME	For a given Process Type/Name, returns the Em name.
.UTIL GET HOOK RECORDS	Copies the engine Hook records into a temporary file for modification.
.UTIL LOAD STACK FILE	Loads --- STACK with the current process stack.
.UTIL MOD SCROLL BEHAV	This subroutine allows the user to select a record on a scrolling display by just clicking it.
.UTIL PROCESS DD	Processes the Data Dictionary for the selected Application or File.
.UTIL PROCESS QRY REC	Writes the current record to the Query pointer file.
.UTIL PUT HOOK RECORDS	Activates the hooks in the temporary file.
.UTIL SLEEP	Pauses for the specified number of seconds.
.UTIL SLEEP WITH TIMER	Pauses for the specified number of seconds with a countdown timer.

API Name	Description
.UTIL SWITCH USER	Changes to a different user.
.UTIL TIMEOUT EXIT	Exits or logout a user after a set timeout period.
.UTIL TIMEOUT SET	Sets the keyboard timeout value.
.UTIL UPDATE DOCUMENT	Update process documentation via ILF.

Web Processing Contains the routine to populate Appx variables from a CGI Script.

API Name	Description
.IMPORT CGI DATA	Populates Appx Variables from STDIN.

Widget Routines Contains routines to apply a theme to your GUI screens, convert colors (including the new transparency option), turn the standard menus and buttons on or off, debug the current --- WIDGET file, copy to/from the --- WIDGET file, and more.

API Name	Description
.WIDGET APPLY THEME	Applies a GUI Theme to the current image.
.WIDGET CNV CLR TO RGB	Converts an alpha/hex color code to decimal.
.WIDGET CNV RGB TO CLR	Converts a decimal color code to alpha/hex.
.WIDGET DEL BY NAME	Deletes selected widgets.
.WIDGET DEL MODE BTN	Deletes the mode buttons from the toolbar.
.WIDGET DEL SCROLL BTN	Deletes the scroll buttons from the toolbar.
.WIDGET DEL STD MENUS	Deletes the standard pull down menus.
.WIDGET HIDE BY NAME	Hides selected widgets.
.WIDGET HIDE MODE BTN	Hides the mode buttons on the toolbar.
.WIDGET HIDE SCROL BTN	Hides the scroll buttons on the toolbar.
.WIDGET HIDE STD MENUS	Hides the standard pull down menus.
.WIDGET MISSING THEME	Finds all Inputs/Menus that do not use .WIDGET APPLY THEME.
.WIDGET SET FROM MWDGT	Copies the memory file to --- WIDGET.
.WIDGET SET INTO MWDGT	Copies the current --- WIDGET file to a memory file.
.WIDGET SET THEME	Sets the current Theme Name.
.WIDGET SHOW BY NAME	Shows previously hidden widgets.
.WIDGET SHOW MODE BTN	Shows previously hidden mode buttons on the toolbar.
.WIDGET SHOW SCROL BTN	Shows previously hidden scroll buttons on the toolbar.
.WIDGET SHOW STD MENUS	Shows the previously hidden standard pull down menus.
WIDGET VIEW RUNTIME	Shows properties of the current --- WIDGET file.

Data Manipulation

Conversion Contains routines to convert data to/from Hex, splits a number into its whole and fractional parts, convert a text field to HTML encoding, and more.

API Name	Description
.CONVERT BYTES TO HEX	Converts a field to hexadecimal characters.
.CONVERT HEX PR TO NUM	Converts a hex pair of alpha characters to a decimal number.
.CONVERT NUM TO HEX PR	Converts a decimal number to a hex pair of alpha characters.
.CONVERT SPLIT NUMBER	Splits a number into its whole and fractional parts.
.CONVERT TEXT TO HTML	Converts a text field to HTML encoding.
.CONVERT TRANSLATE	Converts a string from one language to another.

Text Contains routines to fill a field with a character, search & replace text, convert to/from upper/lower case, parse a line into fields, and more.

API Name	Description
.TEXT CREATE PAD	Fills a field with a single character.
.TEXT CUT AT POS	Removes characters from a text/alpha field.
.TEXT FIND	Find the position of text in a text/alpha field.
.TEXT FIND AND REPLACE	Find and replace text in a text/alpha field.
.TEXT GET LENGTH	Determine the length of a text/alpha field.
.TEXT INSERT AT POS	Inserts characters into a text/alpha field.
.TEXT LOWER TO UPPER	Convert lower case to upper case in a text/alpha field.
.TEXT PARSE LINE	Parse a string into separate fields.
.TEXT UPPER TO LOWER	Convert upper case to lower case in a text/alpha field.

System Information

Environment Contains routines to get the command line parameters, environment variables, configuration information, parent process name, data file paths, application license info, and more.

API Name	Description
.ENV GET APPXPATH	Returns the path to the location of Appx data files.
.ENV GET CMD LINE PARM	Returns the value of a command line parameter.
.ENV GET CONFIG INFO	Populates PDF fields with configuration information.
.ENV GET ENV VARIABLE	Returns the value of an environment variable.
.ENV GET OS TYPE	Return the type of operating system Appx is running on.
.ENV GET PARENT PROC	Returns the name and type of the parent process.

API Name	Description
.ENV GET PATH NAME	Returns the pathname of the requested APPX data file.
.ENV GET PATH SEP	Returns the directory separator character of the host operating system.
.ENV GET SCREEN SIZE	Returns the size of the Appx screen in rows and columns.
.ENV VIEW LICENSE INFO	Displays the APPX license info for the current application.

Client Contains routines to check the client version, upload/download files (with and without conversion), read/write the clipboard, and load a URL. In particular, the .CLIENT LOAD URL routine has been significantly enhanced to print or display files, start new sessions, and change client settings.

API Name	Description
.CLIENT CHECK FOR GUI	Returns a flag to indicate if the user is running the Desktop Client.
.CLIENT CHECK VERSION	Returns the version of the Desktop Client.
CLIENT DOWNLOAD FILE	Downloads a file to the user's PC.
.CLIENT GET CLIPBOARD	Gets the current content of the system clipboard.
.CLIENT GET CONSTANT	Returns the value of a client constant.
.CLIENT LOAD URL	Loads a URL, document, runs a command on the user's PC or changes a client setting.
.CLIENT PLAY SOUND	Plays a .wav file on the user's PC.
.CLIENT SET CLIPBOARD	Puts data on the system clipboard.
.CLIENT UPLOAD FILE	Uploads a file from the Client to the server.

File System

File Manipulation Contains routines to perform a variety of file operations, creating, copying, archiving, deleting, moving, restructuring and more.

API Name	Description
.FILE COPY	Copies a file from one location to another, creating any required directories.
.FILE CREATE	Creates the specified file.
.FILE CREATE ARCHIVE	Creates an archive of the specified files, in either TAR or TGZ format.
.FILE DELETE	Deletes the given file from the filesystem.
.FILE EXISTS	Tests for the existence of the given file in the filesystem.
.FILE EXTRACT ARCHIVE	Extracts all the files from a previously created archive.
.FILE MAKE DIR	Creates the given directory and parent directories in the filesystem.
.FILE MOVE	Moves a file or directory from one location to another, creating any required directories
.FILE RESTRUCT	Restructures the specified file.
.FILE SPLIT FILENAME	Splits the filename from the file extension and returns both.
.FILE SPLIT PATHNAME	Splits the filename from the path and returns both.

Stream Routines The stream processing routines have been significantly enhanced. You can now open multiple stream files at once, open STDIN:, STDOUT: and STDERR:, and open a URL to read a website directly.

API Name	Description
.STREAM CLOSE	Closes a file stream and frees up the stream resources for that file.
.STREAM CLOSE ALL	Closes all file streams and frees up the stream resources for those files.
.STREAM OPEN	Opens a stream to the given file creating the file and path as needed.
.STREAM READ	Read data from the given stream.
.STREAM WRITE	Write data to the given stream.

.BEGIN INITIAL SET UP

This subroutine changes the current application to the 'Initial Setup' phase.

Usage:

```
GOSUB     --- .BEGIN INITIAL SET UP
*         Check for errors
IF        --- .BEGIN INITIAL SET UP      NE
```

Description:

This subroutine changes the current application to the 'Initial Setup' phase. No parameters are required.

This should be invoked as an Optional Child and the Parent Disposition should be End After. A MENU statement with the proper application ID and a blank process name should be defined in the Post Invocation event point of the Optional Child invocation. This will cause the main Initial Setup menu for that application to display to the end user after the operational phase is changed.

You must have identified one of your menus with an Operational Phase Startup of 'INTIAL SETUP', otherwise this routine does nothing.

.BEGIN LIVE OPERATIONS

This subroutine changes the current application to the 'Live Operations' phase.

Usage:

```
GOSUB     --- .BEGIN LIVE OPERATIONS
*         Check for errors
IF        --- .BEGIN LIVE OPERATIONS     NE
```

Description:

This subroutine changes the current application to the 'Live Operations' phase. No parameters are required.

This should be invoked as an Optional Child and the Parent Disposition should be End After. A MENU statement with the proper application ID and a blank process name should be defined in the Post Invocation event point of the Optional Child invocation. This will cause the main Live Operations menu for that application to display to the end user after the operational phase is changed.

You must have identified one of your menus with an Operational Phase Startup of 'LIVE OPNS', otherwise this routine does nothing.

.BEGIN RECOVERY

This subroutine changes the current application to the 'Recovery Processing' phase.

Usage:

```
GOSUB     --- .BEGIN RECOVERY
*         Check for errors
IF        --- .BEGIN RECOVERY            NE
```

Description:

This subroutine changes the current application to the 'Recovery Processing' phase. No parameters are required.

This should be invoked as an Optional Child and the Parent Disposition should be End After. A MENU statement with the proper application ID and a blank process name should be defined in the Post Invocation event point of the Optional Child invocation. This will cause the Recovery menu for that application to display to the end user after the operational phase is changed.

You must have identified one of your menus with an Operational Phase Startup of 'RECOVERY PROC', otherwise this routine does nothing.
Comments:

Read what other users have said about this page or add your own comments.

.SELECT DATABASE

This subroutine switches to the specified database.

Usage:

```
PASS        <database>                FIELD          SHARE? N
GOSUB     --- .SELECT DATABASE
*         Check for errors
IF        --- .SELECT DATABASE        NE
```

Description:

This subroutine switches to the specified database. A single parameter is required, if it is missing the subroutine will CANCEL.

<database> contains the Database ID you want to switch to (Required).

This new database then becomes the current database for any subsequent child processing.

For example, you could use this to change databases in the Pre-invocation event point of an Optional Child on a menu, and that Optional Child will execute using the new database. Note that all further processing will be in the new database, even after you return to the menu. If you want to return to the original database after executing the child, call this subroutine again in the Post-Invocation event point of the Optional Child, PASSing it the original Database ID.

.UTIL ADD USER

This subroutine adds a user to the Appx User file.

Usage:

```
PASS        <error_msg>               FIELD          SHARE? Y
PASS      0SA USER RECORD             FIELD          SHARE? N
GOSUB     --- .UTIL ADD USER
*         Check for errors
IF        --- .UTIL ADD USER          NE
```

Description:

This subroutine adds a user to the Appx User file. All parameters are required, if any required parameters are missing, the subroutine will CANCEL.

<error_msg> will contain a detailed error message if the user was not able to be added (Required). This must be PASSed Share "Y" to return the value.

0SA USER RECORD is the record structure containing the user information (Required).

The rules for required fields are different depending on whether the current user is an Appx System Administrator or not. If they are not a System Admin, then some fields must either be blank or they must contain the same information as the current user. In other words, they can only set up new users that will have the same settings. For example, they cannot set up a System Administrator unless they are also a System Administrator.

USER ID: The 3 character Appx User Id

USER SA: Y if the new user is a System Admin, N if not. Can only be Y if the current user is an Appx System Administrator.

USER SYS ID: The O/S user id.

USER NAM: The user's name.

USER ALPHA SORT: A character string for sorting the User file (optional).

USER PROF: The security profile. If the new user is not a System Admin leave this blank and it will be set to the same profile as the current user.

USER INIT DB: The startup database*.

USER INIT AP: The startup application*.

USER INIT TYPE: The startup process type*.

USER INIT NAM: The startup process name*.

* If the current user is not a System Admin, then the above 4 fields should either be blank, or the same as the current user. If the current user is a System Administrator, then these can be filled in as required. Valid combinations are USER INIT DB only, or USER INIT DB and USER INIT AP only, or all 4 fields.

USER INIT SRC AP: For designers, the application id to start App Design with (optional). If specified, you must also supply the next field.

USER INIT SRC VER: For designers, the version to start App Design with (optional). If specified, you must also supply the previous field.

USER EM CACHE LEVEL: The Em Cache Level (optional).

USER EM MAX CACHE: The maximum number of cached Ems (optional).

USER LOGPROF: If you want to track the activity of this user, supply a valid Log Profile name (optional).

USER DEF LANG ID: The default Language Id (optional).

USER RPT SCR: Default value for view reports on screen (Y/N) (optional).

USER RPT HCPY: Default value for printing reports on the printer (Y/N) (optional).

USER RPT NOTIFY: Default value for notifying the user when the report is printed (Y/N) (not implemented) (optional).

USER RPT MODE: Default value for Report Print Mode (HOLD, KEEP, SPOOL) (optional).

USER RPT DISP: Default value for Report Disposition (REQUEUE, SAVE, SCRATCH) (optional).

USER RPT CPYS: Default value for number of copies (optional).

USER RPT PRIOR: Default value for print priority (optional).

USER RPT PRTR: The user's default printer for reports (optional).

USER RPT FORM: The user's default form for reports (optional).

USER LOG SCR: Default value for view logs on screen (Y/N) (optional).

USER LOG HCPY: Default value for printing reports on the printer (Y/N) (optional).

USER LOG NOTIFY: Default value for notifying the user when the log is printed (Y/N) (not implemented) (optional).

USER LOG MODE: Default value for Log Print Mode (HOLD, KEEP, SPOOL) (optional).

USER LOG DISP: Default value for Log Disposition (REQUEUE, SAVE, SCRATCH) (optional).

USER LOG CPYS: Default value for number of copies (optional).

USER LOG PRIOR: Default value for print priority (optional).

USER LOG PRTR: The user's default printer for reports (optional).

USER LOG FORM: The user's default form for reports (optional).

Also see .UTIL CHG USER and .UTIL CHG AUX PASS.

.UTIL ADD HOOK

This subroutine adds a record to the Hook file.

Usage:

```
PASS        <error_msg>                FIELD          SHARE? Y
PASS     --- HOOK RECORD               FIELD          SHARE? N
GOSUB    --- .UTIL ADD HOOK
*        Check for errors
IF       --- .UTIL ADD HOOK            NE
```

Description:

This subroutine adds a record to the Hook file. All parameters are required, if any required parameters are missing, the subroutine will CANCEL.

<error_msg> will contain a detailed error message if the Hook record was not able to be added (Required). This must be PASSed Share "Y" to return the value.

--- HOOK RECORD is the record structure containing the Hook information (Required).

The fields are:

HOOK AP
HOOK VER
HOOK PROC TYPE
HOOK PROC NAM

The above fields identify the process to be hooked (Application, Version, Process Type, Process Name). This must be a valid process in the specified application/version.

HOOK OV DB: If you want the hook to switch the user to another database, enter that database here. Leave blank if you want the user to remain in their original database.

HOOK ACTIVE: Enter a Y to make this hook active the next time a user logs on. Blank or N means the hook is not active.

HOOK OV AP
HOOK OV VER
HOOK OV PROC TYPE
HOOK OV PROC NAM

The above fields identify the hook process (Application, Version, Process Type, Process Name). This must be a valid process in the specified application/version.

HOOK OV DB: If you want the hook to switch the user to another database, enter that database here. Leave blank if you want the user to remain in their original database.

HOOK ACTIVE: Enter a Y to make this hook active the next time a user logs on. Blank or N means the hook is not active.

This subroutine is different from .UTIL GET HOOK RECORDS / .UTIL PUT HOOK RECORDS in that the the changes are permanent, and they do not take effect immediately. If you want the changes to take effect immediately, use .UTIL GET HOOK RECORDS to get the current hook records from the engine, make the same changes as you did with this subroutine, then update the engine with .UTIL PUT HOOK RECORDS. Or you can do nothing, and the changes will take effect the next time users log on.

Also see .UTIL CHG HOOK and .UTIL DEL HOOK.

> Note that although --- HOOK is an indexed file that can contain more than one record, only the current record buffer will be processed.

.UTIL CHECK RBS

This subroutine is called to check the security access for the specified user when Role Based Security is used.

Usage:

```
PASS      --- SECCHK RECORD              FIELD            SHARE? Y
GOSUB     --- .UTIL CHECK RBS
*         Check for errors
IF        --- .UTIL CHECK RBS            NE
```

Description:

This subroutine is called to check the security access for the specified user when Role Based Security (RBS) is used. If you are not using Role Based Security, use .UTIL CHECK SECURITY instead.

The --- SECCHK RECORD is a required parameter, if it is missing the subroutine will CANCEL.

Using this subroutine, you can check to see if a specific user is allowed to run a specific process from a specific parent, or if the specific user has access to a record or field in a file.

Different fields are required and returned in --- SECCHK, depending on whether you are checking Process or File/Field security. The common fields are:

SECCHK SECUSER RID

This is the Record Id (RID) of the specific user/role to be checked. In RBS, a user may have more than one Role and you need to indicate which Role you want checked. To determine which RID to use, read 0SA SECUSER by user id (possibly in a BEG READ/END READ loop), and GOSUB 0SA R/S – LOAD HIERARCHY for each record. You can then check SECDB DATABASE ID and / or SECDEPT DESC and/or SECWG DESC and /or SECROLE DESC to see if this is the DB/Dept/Workgroup/Role you are interested in. If so, use SECUSER RID, otherwise read next SECUSER

SECCHK DB ID - The 3 character database id to be checked
SECCHK ACL CONTEXT - The context to be checked, PROCESS, FILE or FIELD
SECCHK SOURCE (Required if SECCHK ACL CONTEXT = PROCESS)
One of:
APP START to check processes started from the Database record, ie, the Live Operations menu of the startup application.
USER START to check processes started from 0SA USER startup or the command line.
SYSPARM to check Direct Process 1
DEF INP to check processes invoked as Default Inputs from SCAN
OPT CHILD to check optional children

For Processes:

SECCHK PRNT AP ID - The Application Id of the Parent Process
SECCHK PRNT TYPE - The Process Type of the Parent Process
SECCHK PRNT NAM - The name of the Parent Process. Not Required if SECCHK SOURCE is not OPT CHILD
SECCHK PROC AP ID - The Application Id of the Child Process
SECCHK PROC TYPE - The Process Type of the Child Process
SECCHK PROC NAM - The Process Name of the Child Process

Returns a Y, N or Blank in the following fields:

SECCHK PROC RUN OK - Indicates if the user can run the process.
SECCHK PROC ADD OK - Indicates if the user can add records to the PCF file.
SECCHK PROC DEL OK - Indicates if the user can delete records in the PCF file.
SECCHK PROC CHG OK - Indicates if the user can change records in the PCF file.

If a blank is returned, it means the flag will be inherited from some parent process at runtime.

For Files:

SECCHK FLD AP ID - The Application Id of the file to be checked.
SECCHK FLD FI NAM - The File name to be checked.

Returns:

SECCHK FI ACC OK - Y or N indicating if the user has access to the file or not

For Fields:

SECCHK FLD AP ID - The Application Id of the file to be checked
SECCHK FLD NAM - The field name to be checked. Note that GROUP HEADER/TRAILERS and SYNONYMS do not have security, and will return the system defaults.

Returns

SECCHK FLD VIEW OK - Y or N indicating if the user is allowed to view the contents of the field or not
SECCHK FLD EDIT OK - Y or N indicating if the user is allowed to change the contents of the field or not

---

.UTIL CHECK SECURITY

This subroutine is called to check the security code for the specified user.

Usage:

```
PASS        <result>                FIELD          SHARE? Y
PASS        <sec_class>             FIELD          SHARE? N
PASS        <user_id>               FIELD          SHARE? N
PASS        <database_id>           FIELD          SHARE? N
PASS        <oper_phase>            FIELD          SHARE? N
GOSUB     --- .UTIL CHECK SECURITY
*         Check for errors
IF        --- .UTIL CHECK SECURITY     NE
```

Description:

This subroutine is called to check the security code for the specified user. All parameters are required, except for <oper_phase>. If any required parameters are missing, the subroutine will CANCEL.

<result> will contain Y or N, depending on the setting of the specified security code (Required). This must be PASSed Share "Y" to return the value.

<sec_class> is the security class to be tested, from 1-9999 (Required).

<user_id> is the user to be tested (Required).

<database_id> is the database to be tested (Required).

<oper_phase> is the operational phase to be tested (Optional). If not passed, it will default to the operational phase of the current application. If passed, it must be one of Live Operations, Initial Set Up or Recovery Processing.

If you are using Role Based Security, use .UTIL CHECK RBS instead.

.UTIL CHG AUX PASS

This subroutine changes the auxiliary password for the specified user.

Usage:

```
PASS        <user_id>                FIELD          SHARE? N
PASS        <aux_password>           FIELD          SHARE? N
PASS        <new_aux_password>       FIELD          SHARE? N
GOSUB     --- .UTIL CHG AUX PASS
*         Check for errors
IF        --- .UTIL CHG AUX PASS     NE
```

Description:

This subroutine changes the auxiliary password for the specified user. All parameters are required, if any are missing the subroutine will CANCEL.

<user_id> is the 3 character Appx User Id for which you want to change the password (Required).

<aux_password> is the current auxiliary password for this user (Required). You can pass a blank field if the user does not currently have a auxiliary password.

<new_aux_password> is the desired new password for the user. You can pass a blank field to remove the auxiliary password.

Also see .UTIL ADD USER and .UTIL CHG USER.

.UTIL CHG HOOK

This subroutine changes fields on the Hook file.

Usage:

```
PASS        <error_msg>              FIELD          SHARE? Y
PASS     --- HOOK RECORD             FIELD          SHARE? N
GOSUB    --- .UTIL CHG HOOK
*        Check for errors
IF       --- .UTIL CHG HOOK          NE
```

Description:

This subroutine changes fields on the Hook file. All parameters are required, if any required parameters are missing, the subroutine will CANCEL.

<error_msg> will contain a detailed error message if the Hook record was not able to be changed (Required). This must be PASSed Share "Y" to return the value.

--- HOOK RECORD is the record structure containing the Hook information (Required).

The mandatory fields are:

HOOK AP:
HOOK VER:
HOOK PROC TYPE:
HOOK PROC NAM:
HOOK DB:
HOOK USER ID:

The above fields identify the hook record to be updated. (Application, Version, Process Type, Process Name, Database and User Id).

Enter values for the following fields, but only for the fields you want to change, all others can be blank.

HOOK OV AP
HOOK OV VER
HOOK OV PROC TYPE
HOOK OV PROC NAM

The above fields identify the hook process (Application, Version, Process Type, Process Name). This must be a valid process in the specified application/version.

HOOK OV DB: If you want the hook to switch the user to another database, enter that database here. Leave blank if you want the user to remain in their original database.

HOOK ACTIVE: Enter a Y to make this hook active the next time a user logs on. N means the hook is not active.

This subroutine is different from .UTIL GET HOOK RECORDS /.UTIL PUT HOOK RECORDS in that the the changes are permanent, and they do not take effect immediately. If you want the changes to take effect immediately, use.UTIL GET HOOK RECORDS to get the current hook records from the engine, make the same changes as you did with this subroutine, then update the engine with.UTIL PUT HOOK RECORDS. Or you can do nothing, and the changes will take effect the next time users log on.

Also see .UTIL ADD HOOK and .UTIL DEL HOOK.

> Note that although --- HOOK is an indexed file that can contain more than one record, only the current record buffer will be processed.

.UTIL CHG USER

This subroutine changes fields on the Appx User file.

Usage:

```
PASS        <error_msg>                FIELD          SHARE? Y
PASS     0SA USER RECORD               FIELD          SHARE? N
GOSUB    --- .UTIL CHG USER
*        Check for errors
IF       --- .UTIL CHG USER            NE
```

Description:

This subroutine changes fields on the Appx User file. All parameters are required, if any required parameters are missing, the subroutine will CANCEL.

<error_msg> will contain a detailed error message if the user was not able to be changed (Required). This must be PASSed Share "Y" to return the value.

0SA USER RECORD is the record structure containing the user information (Required). You only need to fill in the USER ID and the field(s) you want to change, all others can be blank.

The rules for editing are different depending on whether the current user is an Appx System Administrator or not. If they are not a System Admin, then you cannot turn on the USER SA flag, and some fields must either be blank or they must contain the same information as the current user. In other words, a non System Admin cannot change security settings except to make them match their existing settings.

The fields are:

USER ID: The 3 character Appx User Id. This is required, and identifies which Appx user you want to change.

All remaining fields are optional, and only need to be filled in if you want to change it.

USER SA: Y if the new user is a System Admin, N if not. Can only be Y if the current user is an Appx System Administrator.

USER SYS ID: The O/S user id.

USER NAM: The user's name.

USER ALPHA SORT: A character string for sorting the User file.

USER PROF: The security profile.

USER INIT DB: The startup database.

USER INIT AP: The startup application.

USER INIT TYPE: The startup process type.

USER INIT NAM: The startup process name.

If the current user is not a System Admin, then the above 4 fields should either be blank, or the same as the current user. If the current user is a System Administrator, then these can be filled in as required. Valid combinations are USER INIT DB only, or USER INIT DB and USER INIT AP only, or all 4 fields.

USER INIT SRC AP: For designers, the application id to start App Design with. If specified, you must also supply the next field.

USER INIT SRC VER: For designers, the version to start App Design with. If specified, you must also supply the previous field.

USER EM CACHE LEVEL: The Em Cache Level.

USER EM MAX CACHE: The maximum number of cached Ems.

USER LOGPROF: If you want to track the activity of this user, supply a valid Log Profile name.

USER DEF LANG ID: The default Language Id.

USER RPT SCR: Default value for view reports on screen (Y/N).

USER RPT HCPY: Default value for printing reports on the printer (Y/N).

USER RPT NOTIFY: Default value for notifying the user when the report is printed (Y/N) (not implemented).

USER RPT MODE: Default value for Report Print Mode (HOLD, KEEP, SPOOL).

USER RPT DISP: Default value for Report Disposition (REQUEUE, SAVE, SCRATCH).

USER RPT CPYS: Default value for number of copies.

USER RPT PRIOR: Default value for print priority.

USER RPT PRTR: The user's default printer for reports.

USER RPT FORM: The user's default form for reports.

USER LOG SCR: Default value for view logs on screen (Y/N).

USER LOG HCPY: Default value for printing reports on the printer (Y/N).

USER LOG NOTIFY: Default value for notifying the user when the log is printed (Y/N) (not implemented).

USER LOG MODE: Default value for Log Print Mode (HOLD, KEEP, SPOOL).

USER LOG DISP: Default value for Log Disposition (REQUEUE, SAVE, SCRATCH).

USER LOG CPYS: Default value for number of copies.

USER LOG PRIOR: Default value for print priority.

USER LOG PRTR: The user's default printer for reports.

USER LOG FORM: The user's default form for reports.

Also see .UTIL ADD USER and .UTIL CHG AUX PASS.

.UTIL CLEAR PASS LIST

This subroutine clears any unfilled PASS requests.

Usage:

```
GOSUB    --- .UTIL CLEAR PASS LIST
*        Check for errors
IF       --- .UTIL CLEAR PASS LIST      NE
```

Description:

This subroutine clears any unfilled PASS requests. No parameters are required.

This can be useful if you have issued a number of PASS statements, but decide not to run the subroutine. This will remove the unused values, otherwise they will remain until the next subroutine is invoked.

A common situation is where you have PASS statements in the Pre-Invocation of an Optional or Automatic child. This event point may execute more than once before the child is actually executed, so you may want to use this subroutine before the PASS statements to clear any that were executed previously. Note that it's possible for the Pre-Invocation point to execute without the child process ever executing, therefore if you are going to put PASS statements in the Pre-invocation event point, it's a good idea to condition them on --- OPTION being equal to the Optional Child in question. This cannot be done in Automatic Children, so PASS statements should be avoided in that event point, if possible. If you must use them, use this subroutine to clear any unused PASSed values.

.UTIL COMPILE PROC

This subroutine compiles the specified Process Type/Name or Application.

Usage:

```
PASS        <application>            FIELD          SHARE? N
PASS        <version>                FIELD          SHARE? N
PASS        <proc_type>              FIELD          SHARE? N
PASS        <proc_name>              FIELD          SHARE? N
GOSUB     --- .UTIL COMPILE PROC
*         Check for errors
IF        --- .UTIL COMPILE PROC     NE
```

Description:

This subroutine compiles the specified Process Type/Name or Application. The first 2 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<application> is the application that contains the processes to be compiled (Required).

<version> is the version of the above application (Required).

<proc_type> is the process type to be compiled (Optional). If PASSed, this must be a valid Process Type, INPUT, OUTPUT, JOB, SUBROUTINE, etc. If not PASSed, then all processes in <application> will be compiled.

<proc_name> is the process name to be compiled (Optional). You can only PASS this if you also PASS the <proc_type>. If not PASSed, then all processes of type <proc_type> will be compiled.

This subroutine performs the same function as 'Create Executable Modules' in application design. Only Em's that need to be rebuilt will be compiled. A message will appear in the status area when Appx is actually compiling an Em.

If .UTIL COMPILE PROC is blank, it means the compiler was successfully invoked, it does not mean that every process compiled successfully. You must check the --- PCERR file to see which processes had errors, if any. The --- PCERR ERR NO field can be used to read --- MESSAGE to get a readable error message:

```
SET       --- MESSAGE ID              =  --- PCERR ERR NO
READ      --- MESSAGE              HOLD 0 FT 0 BY MESSAGE ID
```

The --- PCERR STMT field will contain the problem statement, in printable form.

.UTIL.COMPUTE.HASH

This subroutine computes the SHA-2 hash value for the given string. APPX 5.4.5 & higher only.

Usage:

```
PASS        <hash value returned>      FIELD          SHARE? Y
PASS        <hash type>                FIELD          SHARE? N
PASS        <Data to hash>             FIELD          SHARE? N
GOSUB     --- .UTIL COMPUTE HASH
*         Check for errors
IF        --- .UTIL COMPUTE HASH       NE
```

Description:

This subroutine computes the SHA-2 hash value for the given string. The first 2 parameters are required and if any required parameters are missing, the subroutine will CANCEL.

<hash value returned> is the computed value returned. This must be passed with Share="Y" to return a value. It should be an alpha field at least 64 or 128 bytes in length, depending on the <hash type> requested (Required).

<hash type> is the type of hash value you want returned (Required):

- B for a 64 byte binary value
- UC for a 128 byte readable value, upper case
- LC for a 128 byte readable value, lower case

<Data to hash> is the string to be hashed (32k max size).

.UTIL DEL USER

This subroutine deletes a record from the Appx User file.

Usage:

```
PASS        <error_msg>                FIELD          SHARE? Y
PASS        <user_id>                  FIELD          SHARE? N
PASS        <keymap_flag>              FIELD          SHARE? N
GOSUB     --- .UTIL DEL USER
*         Check for errors
IF        --- .UTIL DEL USER           NE
```

Description:

This subroutine deletes a record from the Appx User file. The first 2 parameters are required, if any required parameters are missing, the subroutine will CANCEL.

<error_msg> will contain a detailed error message if the user was not able to be deleted (Required). This must be PASSed Share "Y" to return the value.

<user_id> is the 3 character Appx user id to be deleted (Required).

<keymap_flag> is a Y/N flag indicating whether or not the user's keymap should be deleted (Optional). The default value is "N".

.UTIL DEL HOOK

This subroutine deletes a record from the Hook file.

Usage:

```
PASS        <error_msg>                FIELD          SHARE? Y
PASS     --- HOOK RECORD               FIELD          SHARE? N
GOSUB    --- .UTIL DEL HOOK
*        Check for errors
IF       --- .UTIL DEL HOOK            NE
```

Description:

This subroutine deletes a record from the Hook file. All parameters are required, if any required parameters are missing, the subroutine will CANCEL.

<error_msg> will contain a detailed error message if the Hook record was not able to be deleted (Required). This must be PASSed Share "Y" to return the value.

HOOK RECORD is the record structure containing the Hook information (Required).

The mandatory fields are:

HOOK AP:
HOOK VER:
HOOK PROC TYPE:
HOOK PROC NAM:
HOOK DB:
HOOK USER ID:

The above fields identify the hook record to be deleted. (Application, Version, Process Type, Process Name, Database and User Id). The remaining fields will be ignored.

This subroutine is different from .UTIL GET HOOK RECORDS/.UTIL PUT HOOK RECORDS in that the the changes are permanent, and they do not take effect immediately. If you want the changes to take effect immediately, use.UTIL GET HOOK RECORDS to get the current hook records from the engine, make the same changes as you did with this subroutine, then update the engine with.UTIL PUT HOOK RECORDS. Or you can do nothing, and the changes will take effect the next time users log on.

Also see .UTIL ADD HOOK and .UTIL CHG HOOK.

> Note that although --- HOOK is an indexed file that can contain more than one record, only the current record buffer will be processed.

.UTIL FIELD GET

This subroutine is called to set a value into a specified field name.

Usage:

```
PASS        <App_Id>                FIELD          SHARE? N
PASS        <Field_Name>            FIELD          SHARE? N
PASS        <Occ_no>                FIELD          SHARE? N
PASS        <value>                 FIELD          SHARE? N
GOSUB     --- .UTIL FIELD SET
*         Check for errors
IF        --- .UTIL FIELD SET       NE
```

Description:

This subroutine is called to set a value into a specified field name. All parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<App_Id> is the Application Id of the field you want to set (Required). The version will be taken from the currently running version.

<Field_Name> is the field you want to set (Required). This must be a valid field in the specified application.

<Occ_no> is the occurrence number (Required). If blank or zero, it will default to 1.

<value> is the string of data you want to set into the specified field (Required).

<value> must be appropriate for the type of field. For example, if the target field is an unsigned integer, then you cannot set real or negative numbers into it. If the value is too large, too small or has too many decimal places for the target field, it will not be set. If the target field is a token, you must pass a valid token value (case sensitive). Date/time fields must be a string in the format CCYYMMDDhhmmsstt. If any leading parts are not supplied, they must be replaced with a dash character, ie, '--120228' or '--------2241'. Trailing dashes are optional. If the data cannot be moved into the target field, the previous contents of the target field will remain unchanged.

> Note: During debugging you will not be able to inspect the contents (via F11) of a field referenced using this API unless your process also has a reference in ILF to either the specific field (ie, a DISPLAY statement) or to the file containing the field (ie, READ/WRITE, etc) or to some other field in the same file (if the field is part of a file and not a work field).

See also .UTIL FIELD GET.

.UTIL FIELD SET

This subroutine is called to set a value into a specified field name.

Usage:

```
PASS        <App_Id>                FIELD          SHARE? N
PASS        <Field_Name>            FIELD          SHARE? N
PASS        <Occ_no>                FIELD          SHARE? N
PASS        <value>                 FIELD          SHARE? N
GOSUB     --- .UTIL FIELD SET
*         Check for errors
IF        --- .UTIL FIELD SET       NE
```

Description:

This subroutine is called to set a value into a specified field name. All parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<App_Id> is the Application Id of the field you want to set (Required). The version will be taken from the currently running version.

<Field_Name> is the field you want to set (Required). This must be a valid field in the specified application.

<Occ_no> is the occurrence number (Required). If blank or zero, it will default to 1.

<value> is the string of data you want to set into the specified field (Required).

<value> must be appropriate for the type of field. For example, if the target field is an unsigned integer, then you cannot set real or negative numbers into it. If the value is too large, too small or has too many decimal places for the target field, it will not be set. If the target field is a token, you must pass a valid token value (case sensitive). Date/time fields must be a string in the format CCYYMMDDhhmmsstt. If any leading parts are not supplied, they must be replaced with a dash character, ie, '--120228' or '--------2241'. Trailing dashes are optional. If the data cannot be moved into the target field, the previous contents of the target field will remain unchanged.

> Note: During debugging you will not be able to inspect the contents (via F11) of a field referenced using this API unless your process also has a reference in ILF to either the specific field (ie, a DISPLAY statement) or to the file containing the field (ie, READ/WRITE, etc) or to some other field in the same file (if the field is part of a file and not a work field).

See also .UTIL FIELD GET.

.UTIL GET EM NAME

This subroutine is called to get the Em name of the specified Process Type/Name.

Usage:

```
PASS        <em_name>                FIELD          SHARE? Y
PASS        <process_type>           FIELD          SHARE? N
PASS        <process_name>           FIELD          SHARE? N
PASS        <application_id>         FIELD          SHARE? N
PASS        <version>                FIELD          SHARE? N
GOSUB     --- .UTIL GET EM NAME
*         Check for errors
IF        --- .UTIL GET EM NAME      NE
```

Description:

This subroutine is called to get the Em name of the specified Process Type/Name. The first 3 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<em_name> returns the Em name (Required). This must be PASSed with Share "Y" to return the value. Note that this is not the full path to the Em on disk, it's just the 8 character file name with no extension.

<process_Type> is the process type. This must be a valid Process Type, INPUT, OUTPUT, JOB, SUBROUTINE, etc (Required).

<process_Name> is the process name (Required).

<application_Id> is the application that contains the above process. If not passed, the current application is assumed.

<version> is the version that contains the above process. If not passed, the current version is assumed

.UTIL GET HOOK RECORDS

This subroutine copies the engine Hook records into a temporary file for modification.

Usage:

```
GOSUB     --- .UTIL GET HOOK RECORDS
*         Check for errors
IF        --- .UTIL GET HOOK RECORDS     NE
```

Description:

This subroutine copies the engine Hook records into the temporary file --- HOOK. No parameters are required.

Once the records are copied, you can modify the contents of --- HOOK as required. To activate the new hook settings, use .UTIL PUT HOOK RECORDS.

The new settings will stay in effect until the user logs out.

.UTIL GET MESSAGES

This subroutine populates the --- MESSAGES file with any messages that were issued.

Usage:

```
GOSUB     --- .UTIL GET MESSAGES
*         Check for errors
IF        --- .UTIL GET MESSAGES         NE
```

Description:

This subroutine populates the --- MESSAGES file with any messages (Error, Warning, Message) that were issued to the user.

After calling this routine, you can read --- MESSAGES to see what Errors, Warning and Messages were issued. You would typically do this at the end of your code, after you have issued all the Error/Warning/Message commands. Note that you can get this information even before the messages have been displayed to the user.

You could use this information to provide your own message display in addition to the one provided by Appx, or to check to see what messages were issued by your code.

.UTIL.KILL.SESSION

This subroutine Cancels the specified process.

Usage:

```
PASS          <PID>                     FIELD            SHARE? N
PASS          <Error Message>           FIELD            SHARE? Y
GOSUB     --- .UTIL KILL SESSION
*         Check for errors
IF        --- .UTIL KILL SESSION         NE
```

Description:

This subroutine will attempt to cancel (kill) the specified process. The <PID> parameter is required, if it is missing, the subroutine will CANCEL.

<PID> is the process id you want to cancel, in decimal format.

<Error Message> is an optional parameter that will contain more information if the process could not be cancelled. This must be PASSed with the Share flag to return a result.

If the current user is an APPX System Administrator, then any valid <PID> is allowed (including non APPX processes). If the current user is not an APPX administrator they can only cancel one of their own APPX processes.

The restrictions applied by the host operating system still apply, i.e., if the current user is not an Administrator at the O/S level they will probably not be allowed to cancel other user's processes even if they are an APPX System Administrator.

.UTIL LOAD STACK FILE

This subroutine loads --- STACK with the current process stack.

Usage:

```
GOSUB     --- .UTIL LOAD STACK FILE
*         Check for errors
IF        --- .UTIL LOAD STACK FILE      NE
```

Description:

This subroutine loads --- STACK with the current process stack. No parameters are required. The --- STACK file contains one record for every process in the process family. You may read this file for debugging or other informational purposes. This is the same file that displays if you press GO-1 while in the ILF debugger.

.UTIL MOD SCROLL BEHAV

.UTIL MOD SCROLL BEHAVE

This subroutine allows the user to select a record on a scrolling display by just clicking it.

Usage:

```
GOSUB     --- .UTIL MOD SCROLL BEHAV
```

Description:

This subroutine allows the user to select a record on a scrolling display by just clicking it, or by moving the cursor & pressing enter. There are no parameters or return codes.

It must be called from the Option Intercept event point of the scrolling input image.

This subroutine replaces --- MOD SCROLL BEHAV.

.UTIL PROCESS DD

This subroutine processes the Data Dictionary for the selected Application or File.

Usage:

```
PASS        <application>            FIELD          SHARE? N
PASS        <version>                FIELD          SHARE? N
PASS        <work_fields>            FIELD          SHARE? N
PASS        <file_name>              FIELD          SHARE? N
GOSUB     --- .UTIL PROCESS DD
*         Check for errors
IF        --- .UTIL PROCESS DD       NE
```

Description:

This subroutine processes the Data Dictionary for the selected Application or File. The first 2 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<application> is the application that contains the files to be processed (Required).

<version> is the version of the above application (Required).

<work_fields> is a Y/N flag that indicates whether or not work fields should also be processed (Optional). If not passed, defaults to Y.

<file_name> is the specific file in <application> you want processed (Optional). If not PASSed, then all files in <application> will be processed.

This subroutine performs the same function as 'Process Data Dictionary' in application design.

If .UTIL PROCESS DD is blank, it means the Data Dictionary compiler was successfully invoked, it does not mean that every file processed successfully. You must check the --- PDERR file to see which processes had errors, if any. The --- PDERR TEXT field will contain the error message in printable form. You can also use the --- PDERR ERR NO field to read --- MESSAGE to get the readable error message:

```
SET       --- MESSAGE ID              =  --- PDERR ERR NO
READ      --- MESSAGE              HOLD 0 FT 0 BY MESSAGE ID
```

.UTIL PROCESS QRY REC

This subroutine adds the current PCF record to the query pointer file.

Usage:

```
GOSUB     --- .UTIL PROCESS QRY REC
```

Description:

This subroutine adds the current PCF record to the query pointer file. There are no parameters or return codes.

It must be called from the Establish PCF Range event point of a Query process.

Normally Appx adds records to the pointer file for you, based on the Designer and End User selections, however, you can do this yourself if you prefer. If you add any ILF statements to the Establish PCF Range event point, then you are completely responsible for adding records via this subroutine.

This subroutine replaces --- PROCESS QUERY RECORD.

.UTIL PUT HOOK RECORDS

This subroutine copies hook records from the temporary file back to the Appx engine.

Usage:

```
GOSUB     --- .UTIL PUT HOOK RECORDS
*         Check for errors
IF        --- .UTIL PUT HOOK RECORDS     NE
```

Description:

This subroutine copies hook records from the temporary file back to the Appx engine. No parameters are required.

This is intended for use after you have copied the contents of the engine hook file into --- HOOK via .UTIL GET HOOK RECORDS and modified it. This will activate your new settings, and they will remain in effect until the user logs off.

.UTIL SLEEP

This subroutine pauses for the specified number of seconds.

Usage:

```
PASS          <seconds>                FIELD          SHARE? N
GOSUB     --- .UTIL SLEEP
*         Check for errors
IF        --- .UTIL SLEEP              NE
```

Description:

This subroutine pauses for the specified number of seconds. The number of seconds must be PASSed or the subroutine will CANCEL.

<seconds> is the number of seconds to 'sleep' (Required). This must be an integer greater than zero. Passing zero or a negative number will immediately exit.

Control will not return to the calling program until the specified number of seconds has elapsed. This subroutine can be interrupted via Control-C in character mode.

No information is displayed to the user during this time. If you want a 'countdown timer' to inform the user how much longer they have to wait, use .UTIL SLEEP WITH TIMER.

.UTIL SLEEP WITH TIMER

This subroutine pauses for the specified number of seconds and displays a countdown timer.

Usage:

```
PASS        <seconds>                FIELD          SHARE? N
PASS        <refresh>                FIELD          SHARE? N
GOSUB     --- .UTIL SLEEP WITH TIMER
*         Check for errors
IF        --- .UTIL SLEEP WITH TIMER     NE
```

Description:

This subroutine pauses for the specified number of seconds and displays a countdown timer. The number of seconds must be PASSed or the subroutine will CANCEL.

<seconds> is the number of seconds to 'sleep' (Required). This must be an integer greater than zero. Passing zero or a negative number will immediately exit.

<refresh> is the frequency in seconds of how often the countdown should be updated. This parameter is optional, and if not PASSed, or is zero or negative, no countdown will be displayed. In this case, this subroutine is the same as .UTIL SLEEP.

Control will not return to the calling program until the specified number of seconds has elapsed. This subroutine can be interrupted via Control-C in character mode.

.UTIL SUBR CLOSE

This utility closes the subroutine you created.

Usage:

```
GOSUB     --- .UTIL SUBR CLOSE
*         Check for errors
IF        --- .UTIL SUBR CLOSE           NE
```

Description:

This utility closes and compiles the subroutine you created. No parameters are required.

The subroutine will be compiled using .UTIL COMPILE PROC. Be sure to check for errors as described in the Usage area above, which includes a compile error. If there are compile errors within your subroutine, read the --- PCERR file and examine the records to see the specific errors or just look at your subroutine in Application Design.

Also see .UTIL SUBR CREATE and .UTIL SUBR DELETE.

> Note that the .UTIL SUBR * group of routines share certain internal fields therefore you can only use them in a process family with share class SUBPROCESS. In other words, don't call .UTIL SUBR CREATE in one process, then .UTIL SUBR WRITE ILF in another process that you have invoked Related or Detached.

.UTIL SUBR CREATE

This utility adds a subroutine to the Application.

Usage:

```
PASS        <process_name>          FIELD          SHARE? N
PASS        <process_desc>          FIELD          SHARE? N
PASS        <Application>           FIELD          SHARE? N
PASS        <Version>               FIELD          SHARE? N
GOSUB     --- .UTIL SUBR CREATE
*         Check for errors
IF        --- .UTIL SUBR CREATE     NE
```

Description:

This utility adds a subroutine to the specified Application/Version.

<process_name> is the name of the subroutine want to add (Required). This parameter is required, if it is missing, the subroutine will CANCEL.

<process_desc> is a description of the process (Optional). If not PASSed or PASSed blank, it will default to the Process Name.

<Application> is the Application where the process should be added (Optional). If not PASSed or PASSed blank, it will default to the current application.

<Version> is the Version where the process should be added (Optional). If not PASSed or PASSed blank, it will default to the current version.

The subroutine will be added to the specified application. You can then begin adding statements to the subroutine via .UTIL SUBR WRITE ILF.

Also see .UTIL SUBR CLOSE and .UTIL SUBR DELETE.

> Note that the .UTIL SUBR * group of routines share certain internal fields therefore you can only use them in a process family with share class SUBPROCESS. In other words, don't call .UTIL SUBR CREATE in one process, then .UTIL SUBR WRITE ILF in another process that you have invoked Related or Detached.

.UTIL SUBR DELETE

This utility deletes a subroutine from the Application.

Usage:

```
PASS        <process_name>          FIELD          SHARE? N
PASS        <Application>           FIELD          SHARE? N
PASS        <Version>               FIELD          SHARE? N
GOSUB     --- .UTIL SUBR DELETE
*         Check for errors
IF        --- .UTIL SUBR DELETE     NE
```

Description:

This utility deletes a subroutine from the specified Application/Version.

<process_name> is the name of the subroutine want to delete (Required). This parameter is required, if it is missing, the subroutine will CANCEL.

<Application> is the Application from which the process should be deleted (Optional). If not PASSed or PASSed blank, it will default to the current application.

<Version> is the Version from which the process should be deleted (Optional). If not PASSed or PASSed blank, it will default to the current version.

The subroutine will be deleted from the specified application.

Although this is intended to allow you to remove subroutines you create with .UTIL SUBR CREATE, you can delete any subroutine.

.UTIL SUBR WRITE ILF

This subroutine writes ILF code to a subroutine in the Application.

Usage:

```
PASS        <ilf_verb>                FIELD        SHARE? N
PASS        <TF_flags>                FIELD        SHARE? N
PASS        <opt_fields_as_needed>    FIELD        SHARE? N
GOSUB    --- .UTIL SUBR WRITE ILF
*        Check for errors
IF       --- .UTIL SUBR WRITE ILF     NE
```

Description:

This subroutine adds an ILF line to a subroutine. The <ilf_verb> parameter is required, if it is missing or an unknown verb, the subroutine will CANCEL.

<ilf_verb> is the name of the ILF statement you want to add (Required).

<tf_flags> are the TF flags for the ILF statement you want to add. If the statement normally has TF flags then <tf_flags> are required and you can just PASS blanks (i.e. --- SPACE) where no TF flags apply. For statements that don't have TF flags, like a * (comment) or LABEL statement, <tf_flags> are not required. For example, you would add a LABEL statement as follows:

```
PASS        LABEL                     FIELD        SHARE? N
PASS        :NEWLABEL                 FIELD        SHARE? N
GOSUB    --- .UTIL SUBR WRITE ILF
```

<opt_fields_as_needed> are the fields that define the parameters for the statement to be created. Just pass all the field you would normally see as editable when adding the statement in left to right order. You can omit passing all blank fields past the last field you want a value in. For example, to SET --- TEMP 30 to --- TEMP 80 on a TRUE you would pass.

```
PASS        SET                       FIELD        SHARE? N
PASS        T                         FIELD        SHARE? N
PASS        ---                       FIELD        SHARE? N
PASS        TEMP 30                   FIELD        SHARE? N
PASS     --- SPACE                    FIELD        SHARE? N
PASS        ---                       FIELD        SHARE? N
PASS        TEMP 80                   FIELD        SHARE? N
PASS     --- SPACE                    FIELD        SHARE? N
GOSUB    --- .UTIL SUBR WRITE ILF
```

Also see .UTIL SUBR CLOSE and .UTIL SUBR DELETE.

> Note that the .UTIL SUBR * group of routines share certain internal fields therefore you can only use them in a process family with share class SUBPROCESS. In other words, don't call .UTIL SUBR CREATE in one process, then .UTIL SUBR WRITE ILF in another process that you have invoked Related or Detached.

.UTIL SWITCH USER

This subroutine changes to a different user.

Usage:

```
PASS        <user_id>                FIELD          SHARE? N
PASS        <aux_password>           FIELD          SHARE? N
GOSUB     --- .UTIL SWITCH USER
*         Check for errors
IF        --- .UTIL SWITCH USER      NE
```

Description:

This subroutine changes to a different user. The change, if successful, is immediate and all subsequent processes will execute under the new user id. All parameters are required, if any are missing the subroutine will CANCEL.

<user_id> is the User Id you want to switch to (Required). Note that this is not the 3 character Appx user id, but the User Id entered in the O/S Login ID column for users.

<aux_password> is the auxiliary password for this user (Required). You can set this password in Appx System Administration / Security / Users, then use the 'Change Aux Password' option. This password cannot be blank.

The <aux_password> does not have to be the same as the user's O/S password (if they have one), however if it is different, the user will not be able to use the 'New Session' or Alt-F1 key combination to open a new session to the same server. It will fail because the passwords don't match, and they will have to manually log in.

.UTIL TIMEOUT EXIT

This subroutine exits the current process or logs a user off after a set timeout period.

Usage:

```
PASS        <action>                 FIELD          SHARE? N
PASS        <action_delay>           FIELD          SHARE? N
GOSUB     --- .UTIL TIMEOUT EXIT
*         Check for errors
IF        --- .UTIL TIMEOUT EXIT     NE
```

Description:

This subroutine exits the current process or logs a user off after a set timeout period. The <action> parameter is required, and the subroutine will CANCEL if it is not PASSed. The <action_delay> parameter is optional.

This subroutine should only be called in the Option Intercept or Global Option Intercept event points. You must have set a keyboard timeout via .UTIL TIMEOUT SET first, otherwise this routine does nothing.

<action> is the action that should be performed if a TIMEOUT has occurred (Required). It must be one of End or Logout. If it is End and the timeout has occurred, the current process will END. If it is Logout and the timeout has occurred, then the user will be logged out.

You may want to use Logout on Menus, and End on input processes. Thus, an unattended session at an Input process will first return to the menu, then log the user off.

<action_delay> is an optional parameter that represents the number of minutes before the action is taken. If this parameter is PASSed, then a message will be displayed to the user advising them how much time is left before the program exits. If there is no further activity, then the <action> will be taken when <action_delay> minutes has expired.

> Note: If you use <action_delay> then:

After the warning, the <action_delay> becomes the new timeout.
The warning only appears once. If the user does something to reset the timer after the warning has appeared, the next time the timer expires the specified <action> will be taken immediately.

.UTIL TIMEOUT SET

This subroutine sets the keyboard timeout value.

Usage:

```
PASS        <seconds>                FIELD          SHARE? N
GOSUB     --- .UTIL TIMEOUT SET
*         Check for errors
IF        --- .UTIL TIMEOUT SET      NE
```

Description:

This subroutine sets the keyboard timeout value. The number of seconds must be PASSed or the subroutine will CANCEL.

<seconds> is the number of seconds before a timeout occurs (Required). This must be an integer greater than zero. Passing zero or a negative number will not start a timer.

The timer will count down unless the user presses a key or mouse clicks. When the user presses a key or clicks the mouse, the timer starts again. If the timer reaches zero, --- OPTION is set to TIMEOUT and the process resumes executing as if the user had pressed an option key. You can check for --- OPTION = TIMEOUT in the option intercept or global option intercept event points or use .UTIL TIMEOUT EXIT.

This routine is normally called in the Start of Process event point, but you can use it anywhere to reset the timeout value. You can have multiple timers running at different process levels but only one timer is allowed at each processing level. For example, you could set a 30 minute timer at the menu, and a 5 minute timer in the inputs.

When the lower level timeout is activated, control is returned to the higher level timer, which is then reset just as if a key had been pressed.

> Note: This timer could be used for many different things other than the one presented here. When the timer reaches zero, a TIMEOUT event is generated, but the timer is reset and continues on. It will continue to generate TIMEOUT events until the the timer is explicitly set to zero or the level is exited.

Also see .UTIL TIMEOUT EXIT.

.UTIL UPDATE DOCUMENT

This subroutine is called to update documentation via ILF.

Usage:

```
PASS        <app_id>                FIELD          SHARE? N
PASS        <version>               FIELD          SHARE? N
PASS        <item_type>             FIELD          SHARE? N
PASS        <process_type>          FIELD          SHARE? N
PASS        <name>                  FIELD          SHARE? N
PASS        <doc_type>              FIELD          SHARE? N
PASS        <documentation>         FIELD          SHARE? N
GOSUB     --- .UTIL UPDATE DOCUMENT
*         Check for errors
IF        --- .UTIL UPDATE DOCUMENT      NE
```

Description:

This subroutine is called to update documentation via ILF. All parameters except for <documentation> are required. If any required parameters are missing, the subroutine will CANCEL.

<app_id> is the application whose documentation you want to update (Required).

<version> is the version of application whose documentation you want to update (Required).

<item_type> is the type of documentation you want to update (Required). Must be one of Application, Domain, Record, Field and Process.

<process_type> is the process type whose documentation you want to update (Required). Must be a valid Appx process type (Input, Output, etc) if <item_type> is Process. This is ignored for the other <item_types>, but must still be passed.

<name> is the name of the item whose documentation you want to update (Required). For <item_type> Domain, it must be a Domain name. For <item_type> Record, it must be a File name. For <item_type> Field, it must be a field name. For <item_type> Process, it must be a process name. This is ignored for <item_type> Application, but must still be passed.

<doc_type> is the type of documentation you want to update, User or Tech (Required).

<documentation> is the documentation you want updated (Optional). If blank or not passed, existing documentation will be removed. Maximum length of 1264 characters.

.IMPORT CGI DATA

This subroutine populates Appx variables from STDIN.

Usage:

```
GOSUB     --- .IMPORT CGI DATA
*         Test for Error
IF        --- .IMPORT CGI DATA          NE
```

Description:

This subroutine populates Appx variables from STDIN. No parameters are required.

This can only be used in Appx sesssions that have been invoked by a web server. Running this in a normal Appx session will cause the session to hang or crash.

APPX understands how to parse CGI data into APPX variables. It picks apart the CGI data string and looks for variable NAMEs that match an APPX variable name and sets the variable accordingly. This acts as a SET statement where the sender is always alpha. So, if you use the ALPHA representation of a DATE field, then when APPX fills the date field from the CGI data, it will do the correct conversion from the ALPHA value.

The format of your CGI NAMEs for variables must match the pattern that APPX understands: AAA:BBBB BBB(CCC)=DDDDDD, where AAA is the Application ID (optional), BBBB BBB(CCC) is the APPX variable (with optional occurrence), and DDDDDD is the value. Optional occurrences should use leading zeroes for a total of 3 characters. If the Application Id is missing, Appx will default to the current application.

The environment variable CONTENT_LENGTH must be set to the size of the text being imported before invoking APPX, else APPX will fail or hang during startup. This is usually set by the web server itself.

> Note that you can use this routine as many times a you like in the session, it is not a destructive parse of the incoming STDIN data. For example, you may have one standard application that receives web requests. It can call this routine to determine what to do next, and invoke another Appx process. That Appx process can also call this routine to populate the variables it is interested in, and so on.

To see the details of the processing this subroutine, set the environment variable APPX_CGIDATA_LOG=<filename>.

See document "Using CGI to Interface with the Web" for more detailed information. You may also want to refer to the document "Introduction to Web Server" for the basics of this concept.

.WIDGET APPLY THEME

This subroutine applies a GUI Theme to the the current image.

Usage:

```
GOSUB     --- .WIDGET APPLY THEME
*         Check for errors
IF        --- .WIDGET APPLY THEME        NE
```

Description:

This subroutine applies a GUI Theme to the the current image. No parameters are required, however, some setup is needed.

Before you can use this subroutine, you must create at least one MENU process to act as a 'theme'. On the image of the menu process, add various Widgets for the elements you want to standardize. For example, if you want all your buttons to have certain foreground/background/rollover colors, then define a button with the desired attributes. The same applies to Titlebar attributes, background images, items (fields), and so on. If you have standard attributes you want applied to some buttons, but not others, then define another button and give it a name. For example, you might want to have your 'Cancel' buttons look different from other buttons. You could give it the name CANCEL BUTTON. On the images in your application where you want a button to use those attributes, give it the same name. This technique applies to all Widget types. If the subroutine cannot find a match in your theme for a particular name, it will default to the unnamed widget in your theme. In other words, if your theme did not contain a button called CANCEL BUTTON it would use the unnamed button, if there was one.

You can also use 'prefixes' in Widget names. If the Widget name in your theme ends with a period, then this routine will apply the theme to every other widget that begins with that name. For example, if you create a button with a widget name of "NAV.", then the theme will be applied to every button whose name begins with "NAV.", such as "NAV.OK", "NAV.CANCEL", "NAV.NEXT REC" or just "NAV.".

You might want to consider giving this Menu a distinctive name to make it obvious this is not a normal menu, ie, prefix it with a ":" or other special character. The name of this process will be your 'Theme Name'.

Next, you want to set that name somewhere in your application by calling .WIDGET SET THEME. This sets a Detached work field, so you only need to assign it once. You can change this whenever you want. For example, different applications can use different themes just by changing this name. If your Theme Menu is not in the current application, then you should also set the APPLICATION parameter of .WIDGET SET THEME to the application id that contains the Theme Menu. If this is blank, the subroutine will look in the current application. You can also use a theme that is in a different version by setting the VERSION parameter of .WIDGET SET THEME.

Finally, you should add a GOSUB to this subroutine in the Global Pre-Display event point of Inputs and Pre-Display event point of Menus. You can use the .WIDGET MISSING THEME subroutine to help you find these processes.

You can create more than one theme for use in different processes. This is done by first creating another Menu Theme process with the same base name as your main Theme Menu, and then appending a period and some additional characters. For example, you may want all your File Maintenance processes to have a different look from Data Entry processes. You could define 2 additional theme menu processes, one with ".FM" appended to the name, and one with ".DE" appended to the name. In the Input processes where you want to use the ".FM" theme, go to the Image Editor, Window Properties, and put ".FM" as the widget name. Do the same for the Data Entry processes. At runtime, the --- .WIDGET APPLY THEME subroutine will notice the widget name, append it to the base name set with .WIDGET SET THEME, and use that process as the theme. You could also simply change the theme to point to another theme, but since it is Detached, it will retain that new theme until you change it back.

This subroutine copies micro adjustments, resources, all color settings, fonts, font styles, font sizes, text positions, margins, tiling mode, location type, tooltips, and the settings for the Close, Ok and Help buttons to the GUI attributes of the widgets on the current image. It only replaces default settings, so if you have manually set a font, color or other attribute, that will remain unchanged.

Your theme will also apply to the Appx runtime processes (ie, Scan, Disposition, Help, etc).

.WIDGET CNV CLR TO RGB

This subroutine converts an alpha/hex color code to decimal.

Usage:

```
PASS        <clr_binary>              FIELD          SHARE? Y
PASS        <clr_alpha>               FIELD          SHARE? N
GOSUB     --- .WIDGET CNV CLR TO RGB
*         Check for errors
IF        --- .WIDGET CNV CLR TO RGB     NE
```

Description:

This subroutine converts an alpha/hex color code to decimal. This is useful for converting web or hex color codes (ie, #FFFF0000) to the format required for the --- WIDGET file (255, 255, 0, 0). Both parameters are required, and the subroutine will cancel if they are not received.

<clr_binary> is the color value returned (Required). This must be PASSed with Share "Y" to return the value. This should be a Group Header field, where the group consists of 4 numeric fields, 9(3), binary format. This corresponds to the layout of the various color fields in the --- WIDGET file, so you may use them directly. The fields are:

WIDGET COLOR EN FG
WIDGET COLOR EN BG
WIDGET COLOR DB FG
WIDGET COLOR DB BG
WIDGET COLOR RO FG
WIDGET COLOR RO BG
WIDGET COLOR WP BG

<clr_alpha> is the hex color code you want converted (Required). This must be in the format '#RRGGBBTT' or '#RRGGBB' where RR is the hex value for Red, GG is the hex value for Green, BB is the hex value for Blue and TT is the transparency. The transparency is optional, and if omitted will default to 1 (not transparent). Other values for TT are 0-255 where 0 is fully transparent and 255 is fully opaque.

To convert from decimal format to alpha color codes, see .WIDGET CNV RGB TO CLR.

.WIDGET CNV RGB TO CLR

This subroutine converts a decimal color code to alpha/hex.

Usage:

```
PASS        <clr_alpha>               FIELD          SHARE? Y
PASS        <clr_binary>              FIELD          SHARE? N
GOSUB     --- .WIDGET CNV RGB TO CLR
*         Check for errors
IF        --- .WIDGET CNV RGB TO CLR     NE
```

Description:

This subroutine converts a decimal color code to alpha/hex. This is useful for converting colors in the --- WIDGET file (255, 255, 0, 0) format to web or hex color codes (ie, #FFFF0000). Both parameters are required, and the subroutine will cancel if they are not received.

<clr_alpha> is the hex color code returned (Required). This must be PASSed with Share "Y" to return the value. This will be in the format '#RRGGBBTT' or '#RRGGBB' where RR is the hex value for Red, GG is the hex value for Green, BB is the hex value for Blue and TT is the transparency. Other values for TT are 2-255 where 2 is nearaly fully transparent and 255 is fully opaque.

The transparency is optional, and will be blank if zero or one in <clr_binary>.

<clr_binary> is the color value to be converted (Required). This should be a Group Header field, where the group consists of 4 numeric fields, 9(3), binary format. This corresponds to the layout of the various color fields in the --- WIDGET file, so you may use them directly. The fields are:

WIDGET COLOR EN FG
WIDGET COLOR EN BG
WIDGET COLOR DB FG
WIDGET COLOR DB BG
WIDGET COLOR RO FG
WIDGET COLOR RO BG
WIDGET COLOR WP BG

To convert from alpha/hex format to decimal, see .WIDGET CNV CLR TO RGB.

.WIDGET DEL BY NAME

This subroutine deletes selected widgets.

Usage:

```
PASS        <beg_at_name>           FIELD          SHARE? N
PASS        <end_at_name>           FIELD          SHARE? N
GOSUB     --- .WIDGET DEL BY NAME
*         Check for errors
IF        --- .WIDGET DEL BY NAME   NE
```

Description:

This subroutine deletes selected widgets. <beg_at_name> is required, the subroutine will cancel if it is not received.

<beg_at_name> is the name of the first WIDGET to be deleted (Required).

<end_at_name> is the name of the last WIDGET to be deleted (Optional). If not PASSed, it will default to <beg_at_name>.

<beg_at_name> and <end_at_name> will be used in BEG AT/END AT commands to read the --- WIDGET file and delete all the widgets within the range.

> Note that this will delete the underlying --- WIDGET record. You can also hide or unhide --- WIDGET records via .WIDGET HIDE BY NAME or .WIDGET SHOW BY NAME

.WIDGET DEL MODE BTN

This subroutine deletes the mode buttons from the toolbar.

Usage:

```
GOSUB     --- .WIDGET DEL MODE BTN
*         Check for errors
IF        --- .WIDGET DEL MODE BTN       NE
```

Description:

This subroutine deletes the mode buttons from the toolbar. There are no parameters.

This will delete the Add, Change, Delete, Inquire and Acknowledge Delete buttons from the toolbar. It should be called in the Pre-Display or Global Pre-Display event points. Appx adds these buttons automatically on every iteration of the image, so if you want to remove them, you must call this routine every time as well.

> Note that this will delete the underlying --- WIDGET record. You can also hide or unhide the mode buttons via .WIDGET HIDE MODE BTN or .WIDGET SHOW MODE BTN

.WIDGET DEL SCROLL BTN

This subroutine deletes the scroll buttons from the toolbar.

Usage:

```
GOSUB     --- .WIDGET DEL SCROLL BTN
*         Check for errors
IF        --- .WIDGET DEL SCROLL BTN     NE
```

Description:

This subroutine deletes the scroll buttons from the toolbar. There are no parameters.

This should be called in the Pre-Display or Global Pre-Display event points. Appx adds these buttons automatically on every iteration of the image, so if you want to remove them, you must call this routine every time as well.

> Note that this will delete the underlying --- WIDGET record. You can also hide or unhide the scroll buttons via .WIDGET HIDE SCROLL BTN or .WIDGET SHOW SCROLL BTN

Also note that normally scroll buttons are not shown on the toolbar. Before you can manipulate them with this routine, you would have to:

- Design transfer the STANDARD TOOLBARS process in 0LC into your application.
- Modify the STANDARD TOOLBARS process in your application and change the 'Show on Toolbar' GUI attribute of the appropriate Optional Children on the appropriate images.
- Hook the --- STANDARD TOOLBARS process with your new process. You can then manipulate the scroll buttons with this subroutine.

.WIDGET DEL STD MENUS

This subroutine deletes the standard pull down menus.

Usage:

```
GOSUB     --- .WIDGET DEL STD MENUS
*         Check for errors
IF        --- .WIDGET DEL STD MENUS      NE
```

Description:

This subroutine deletes the standard pull down menus (File, Options, Help). There are no parameters.

This should be called in the Pre-Display or Global Pre-Display event points. Appx adds these menus automatically on every iteration of the image, so if you want to remove them, you must call this routine every time as well.

> Note that this will delete the underlying --- WIDGET record. You can also hide or unhide the menus via .WIDGET HIDE STD MENUS or .WIDGET SHOW STD MENUS

.WIDGET HIDE BY NAME

This subroutine hides selected widgets.

Usage:

```
PASS          <beg_at_name>              FIELD            SHARE? N
PASS          <end_at_name>              FIELD            SHARE? N
GOSUB     --- .WIDGET HIDE BY NAME
*         Check for errors
IF        --- .WIDGET HIDE BY NAME       NE
```

Description:

This subroutine hides selected widgets. <beg_at_name> is required, the subroutine will cancel if it is not received.

<beg_at_name> is the name of the first WIDGET to be hidden (Required).

<end_at_name> is the name of the last WIDGET to be hidden (Optional). If not PASSed, it will default to <beg_at_name>.

<beg_at_name> and <end_at_name> will be used in BEG AT/END AT commands to read the --- WIDGET file and set the WIDGET INVIS flag on all the widgets within the range.

> Note that this does not delete the underlying --- WIDGET record. You can unhide --- WIDGET records via .WIDGET SHOW BY NAME, and you can delete them completely via .WIDGET DEL BY NAME

.WIDGET HIDE MODE BTN

This subroutine hides the mode buttons on the toolbar.

Usage:

```
GOSUB     --- .WIDGET HIDE MODE BTN
*         Check for errors
IF        --- .WIDGET HIDE MODE BTN      NE
```

Description:

This subroutine hides the mode buttons on the toolbar. There are no parameters.

This will hide the Add, Change, Delete, Inquire and Acknowledge Delete buttons from the toolbar. It should be called in the Pre-Display or Global Pre-Display event points. Appx adds these buttons automatically on every iteration of the image, so if you want to hide them, you must call this routine every time as well.

> Note that this does not delete the underlying --- WIDGET record, it just sets the --- WIDGET INVIS flag. You can unhide the mode buttons via .WIDGET SHOW MODE BTN. You can also delete them completely with .WIDGET DEL MODE BTN

.WIDGET HIDE SCROL BTN

This subroutine hides the scroll buttons on the toolbar.

Usage:

```
GOSUB     --- .WIDGET HIDE SCROL BTN
*         Check for errors
IF        --- .WIDGET HIDE SCROL BTN     NE
```

Description:

This subroutine hides the scroll buttons on the toolbar. There are no parameters.

This should be called in the Pre-Display or Global Pre-Display event points. Appx adds these buttons automatically on every iteration of the image, so if you want to hide them, you must call this routine every time as well.

> Note that this does not delete the underlying --- WIDGET record. You can also unhide the scroll buttons via .WIDGET SHOW SCROLL BTN and you can delete them via .WIDGET DEL SCROLL BTN.

Also note that normally scroll buttons are not shown on the toolbar. Before you can manipulate them with this routine, you would have to:

- Modify the STANDARD TOOLBARS process in 0LC, changing the 'Show on Toolbar' GUI attribute of the appropriate Optional Children on the appropriate images. Save the new process in your application.
- Hook the --- STANDARD TOOLBARS process with your new process. You can then manipulate the scroll buttons with this subroutine.

.WIDGET HIDE STD MENUS

This subroutine hides the standard pull down menus.

Usage:

```
GOSUB     --- .WIDGET HIDE STD MENUS
*         Check for errors
IF        --- .WIDGET HIDE STD MENUS     NE
```

Description:

This subroutine hides the standard pull down menus. There are no parameters.

This should be called in the Pre-Display or Global Pre-Display event points. Appx adds these menus automatically on every iteration of the image, so if you want to hide them, you must call this routine every time as well.

> Note that this does not delete the underlying --- WIDGET record. You can also unhide the menus via .WIDGET SHOW STD MENUS and you can delete them via .WIDGET DEL STD MENUS.

.WIDGET MISSING THEME

This subroutine finds all Inputs/Menus that do not use .WIDGET APPLY THEME.

Usage:

```
PASS        <app_id>                FIELD          SHARE? N
PASS        <version>               FIELD          SHARE? N
GOSUB     --- .WIDGET MISSING THEME
*         Check for errors
IF        --- .WIDGET MISSING THEME     NE
```

Description:

This subroutine finds all Inputs/Menus that do not use .WIDGET APPLY THEME. The <app_id> parameter is required, if it is missing, the subroutine will CANCEL.

This subroutine is intended to help you implement .WIDGET APPLY THEME in your applications by finding all Input or Menu process that do not have a call to that subroutine in the Global Pre-Display (Inputs) or Pre-Display (Menus) Event Point. After running this subroutine, you will be presented with a list of all the processes that do not have it. From that list you can quickly navigate to the Event Point and add the necessary GOSUB.

If you are running in character mode or can run the Presentation Manager client, you can use the macro recording capability to record the keystrokes to navigate to the Event Point, add the GOSUB and return to the list. On the remaining items on the list, you can just play back the macro. There is no macro recording capability in the Desktop Client, however, you can copy the GOSUB statement to the clipboard, and use Option 8 to paste it in the Event Point, which will save time and typing.

<app_id> is the application you want to check (Required).

<version> is the version you want to check (Optional). Defaults to the current version.

.WIDGET RELOAD DATASRC

This subroutine reloads the data in a Table Widget.

Usage:

```
PASS        <beg_at_name>           FIELD          SHARE? N
PASS        <end_at_name>           FIELD          SHARE? N
GOSUB     --- .WIDGET RELOAD DATASRC
*         Check for errors
IF        --- .WIDGET RELOAD DATASRC     NE
```

Description:

This subroutine causes the data in a Table Widget to reload upon next execution of the Table Widget. <beg_at_name> is required, the subroutine will cancel if it is not received.

<beg_at_name> is the name of the first table WIDGET to be reloaded (Required).

<end_at_name> is the name of the last table WIDGET to be reloaded (Optional). If not PASSed, it will default to <beg_at_name>.

<beg_at_name> and <end_at_name> will be used in BEG AT/END AT commands to read the --- WIDGET file and set the WIDGET RELOAD DATASRC flag on all the widgets within the range.

See New Table Widget for more information.

.WIDGET SET FROM MWDGT

This subroutine copies the memory file to --- WIDGET.

Usage:

```
GOSUB     --- .WIDGET SET FROM MWDGT
*         Check for errors
IF        --- .WIDGET SET FROM MWDGT     NE
```

Description:

This subroutine copies the memory file to --- WIDGET. There are no parameters.

This is only useful if you have previously copied widgets to the memory file via .WIDGET SET INTO MWDGT.

This should be called in the Pre-Display event point.

> Note that every time you call this, the entire contents of --- WIDGET will be replaced. If you did not run .WIDGET SET FROM MWDGT previously, then this will simply delete all the widgets in the current --- WIDGET file. This does not change the contents of the memory file.

.WIDGET SET INTO MWDGT

This subroutine copies the current --- WIDGET file to a memory file.

Usage:

```
GOSUB     --- .WIDGET SET INTO MWDGT
*         Check for errors
IF        --- .WIDGET SET INTO MWDGT     NE
```

Description:

This subroutine copies the current --- WIDGET file to a memory file. There are no parameters.

This can be useful if you want to copy widgets from one image to another. You can use this to copy the widgets into a memory file (Related), then use .WIDGET SET FROM MWDGT to copy them into the other image.

This can be used in any event point that has widgets.

> Note that every time you call this, the previous contents of the memory file will be replaced.

.WIDGET SET THEME

This subroutine sets the current theme.

Usage:

```
PASS        <theme_name>            FIELD          SHARE? N
PASS        <application>           FIELD          SHARE? N
PASS        <version>               FIELD          SHARE? N
GOSUB     --- .WIDGET SET THEME
*         Check for errors
IF        --- .WIDGET SET THEME     NE
```

Description:

This subroutine sets the current theme.

<theme_name> is required but can be blank to clear the theme, the subroutine will cancel if it is not received.

<application> is the application id the theme is to be loaded from. (Optional).

<version> is the version id the theme is to be loaded from. (Optional).

See .WIDGET APPLY THEME for more information on using Themes.

.WIDGET SHOW BY NAME

This subroutine shows previously hidden widgets.

Usage:

```
PASS        <beg_at_name>           FIELD          SHARE? N
PASS        <end_at_name>           FIELD          SHARE? N
GOSUB     --- .WIDGET SHOW BY NAME
*         Check for errors
IF        --- .WIDGET SHOW BY NAME      NE
```

Description:

This subroutine shows previously hidden widgets..

<beg_at_name> is required, the subroutine will cancel if it is not received.

<beg_at_name> is the name of the first WIDGET to be shown (Required).

<end_at_name> is the name of the last WIDGET to be shown (Optional). If not PASSed, it will default to <beg_at_name>.

<beg_at_name> and <end_at_name> will be used in BEG AT/END AT commands to read the --- WIDGET file and clear the WIDGET INVIS flag on all the widgets within the range.

> Note that this does not add the underlying --- WIDGET record. You can hide --- WIDGET records via .WIDGET HIDE BY NAME, and you can delete them completely via .WIDGET DEL BY NAME. If you have deleted them, this routine cannot show them.

.WIDGET SHOW MODE BTN

This subroutine shows the previously hidden mode buttons on the toolbar.

Usage:

```
GOSUB     --- .WIDGET SHOW MODE BTN
*         Check for errors
IF        --- .WIDGET SHOW MODE BTN      NE
```

Description:

This subroutine shows the previously hidden mode buttons on the toolbar. There are no parameters.

This is only useful if you have hidden the mode buttons via .WIDGET HIDE MODE BTN.

> Note that this does not add the underlying --- WIDGET record, it just sets the --- WIDGET INVIS flag. You can delete them completely with .WIDGET DEL MODE BTN. If you have deleted them, this routine cannot show them.

.WIDGET SHOW SCROL BTN

This subroutine shows the previously hidden scroll buttons on the toolbar.

Usage:

```
GOSUB     --- .WIDGET SHOW SCROL BTN
*         Check for errors
IF        --- .WIDGET SHOW SCROL BTN     NE
```

Description:

This subroutine shows the previously hidden scroll buttons on the toolbar. There are no parameters.

This is only useful if you have hidden the scroll buttons via .WIDGET HIDE SCROL BTN.

> Note that this does not add the underlying --- WIDGET record, it just sets the --- WIDGET INVIS flag. You can delete them completely with .WIDGET DEL SCROLL BTN. If you have deleted them, this routine cannot show them.

Also note that normally scroll buttons are not shown on the toolbar. Before you can manipulate them with this routine, you would have to:

- Modify the STANDARD TOOLBARS process in 0LC, changing the 'Show on Toolbar' GUI attribute of the appropriate Optional Children on the appropriate images. Save the new process in your application.
- Hook the --- STANDARD TOOLBARS process with your new process. You can then manipulate the scroll buttons with this subroutine.

.WIDGET SHOW STD MENUS

This subroutine shows the previously hidden standard pull down menus.

Usage:

```
GOSUB     --- .WIDGET SHOW STD MENUS
*         Check for errors
IF        --- .WIDGET SHOW STD MENUS     NE
```

Description:

This subroutine shows the previously hidden standard pull down menus. There are no parameters.

This is only useful if you have hidden the pull down menus via .WIDGET HIDE STD MENUS.

> Note that this does not add the underlying --- WIDGET record, it just sets the --- WIDGET INVIS flag. You can delete them completely with .WIDGET DEL STD MENUS. If you have deleted them, this routine cannot show them.

.WIDGET VIEW RUNTIME

This subroutine shows properties of the current --- WIDGET file.

Usage:

```
GOSUB     --- .WIDGET VIEW RUNTIME
*         Check for errors
IF        --- .WIDGET VIEW RUNTIME       NE
```

Description:

This subroutine shows properties of the current --- WIDGET file. There are no parameters.

This is useful for debugging your --- WIDGET file. You cannot simply run an input process with --- WIDGET as the PCF, since that input process will get it's own --- WIDGET file, and those will be the widgets you see, not the ones from your input process.

This routine will copy your existing --- WIDGET file to a memory file, and then show you the contents. You can invoke this subroutine in any event point that has widgets (ie, Pre-Display, Pre-Display/Verify, etc).

If you call this in the Pre-Display event point, you can make changes to the memory file and those changes will be copied back to your process. This can be a useful way of experimenting with different --- WIDGET fields. Note that if you use SCAN while doing this, some of the buttons from the SCAN display will get copied back to your image. This is annoying but harmless.

.CONVERT BYTES TO HEX

This subroutine converts a field to hexidecimal characters.

Usage:

```
PASS          <hex_result>              FIELD            SHARE? Y
PASS          <data>                    FIELD            SHARE? N
PASS          <no_chars>                FIELD            SHARE? N
GOSUB     --- .CONVERT BYTES TO HEX
*         Check for errors
IF        --- .CONVERT BYTES TO HEX      NE
```

Description:

This subroutine converts a field to hexidecimal characters. The first 2 parameters are required, the <no_chars> is optional. If any required parameters are missing, the subroutine will CANCEL.

<hex_result> returns the hexidecimal characters corresponding to the data in <data> (Required). This must be PASSed Share "Y" to return the value.

<data> is the data you want converted to hexidecimal (Required).

<no_chars> is the number of characters of <data> to convert (Optional). If not PASSed, it will default to the length of <data>.

If <data> is not a simple alpha field, it will converted to a simple alpha field first (according to the rules of the SET statement), then that will be converted to hexidecimal.

If <hex_result> is not large enough to contain the result, --- .CONVERT BYTES TO HEX will contain 'Data was truncated'.

.CONVERT HEX PR TO NUM

This subroutine converts a hex pair of alpha characters to a decimal number.

Usage:

```
PASS        <decimal_number>          FIELD          SHARE? Y
PASS        <hex_pair>                FIELD          SHARE? N
GOSUB     --- .CONVERT HEX PR TO NUM
*         Check for errors
IF        --- .CONVERT HEX PR TO NUM  NE
```

Description:

This subroutine converts a hex pair of alpha characters to a decimal number. Both parameters are required, the subroutine will CANCEL if they are not PASSed.

<decimal_number> returns decimal value of <hex_pair> (Required). This must be PASSed with Share "Y" to return the value.

<hex_pair> is the hex pair you want converted to decimal (Required). This must contain exactly 2 characters that are in the range of 00-FF.

To convert a decimal number to a hex pair, see .CONVERT NUM TO HEX PR. To convert a string to hexidecimal, see .CONVERT BYTES TO HEX.

.CONVERT NUM TO HEX PR

This subroutine converts a decimal number to a hex pair of alpha characters.

Usage:

```
PASS        <hex_pair>                FIELD          SHARE? Y
PASS        <decimal_number>          FIELD          SHARE? N
GOSUB     --- .CONVERT NUM TO HEX PR
*         Check for errors
IF        --- .CONVERT NUM TO HEX PR    NE
```

Description:

This subroutine converts a number to a hex pair of alpha characters. Both parameters are required, the subroutine will CANCEL if they are not PASSed.

<hex_pair> returns the hexidecimal equivalent of <decimal_number> (Required). This must be PASSed with Share "Y" to return the result.

<decimal_number> is the value you want converted (Required). This be an integer in the range 0-255.

If you want to convert a string of characters to hexidecimal, see .CONVERT BYTES TO HEX. To convert a hexidecimal number to decimal, see .CONVERT HEX PR TO NUM.

.CONVERT SPLIT NUMBER

This subroutine splits a number into it's whole number and fractional parts.

Usage:

```
PASS        <whole_number>            FIELD          SHARE? Y
PASS        <fractional_part>         FIELD          SHARE? Y
PASS        <number_to_split>         FIELD          SHARE? N
GOSUB     --- .CONVERT SPLIT NUMBER
*         Check for errors
IF        --- .CONVERT SPLIT NUMBER     NE
```

Description:

This subroutine splits a number into it's whole number and fractional parts. All parameters are required, if any are missing the subroutine will CANCEL.

<whole_number> returns the whole number part <number_to_split> (Required). This must be PASSed with Share "Y" to return a result. For example, if <number to split> is 123.00456, this will return 123.0.

<fractional_part> returns the fractional part <number_to_split> (Required). This must be PASSed with Share "Y" to return a result. This should be a numeric field with sufficient decimal places to hold the fractional part of <whole number>, otherwise rounding will occur. For example, if <number to split> is 123.00456, this will return 0.00456.

<number_to_split> is the number to be split. This must contain valid numeric characters (Required).

.CONVERT TEXT TO HTML

This subroutine converts a text field to HTML encoding.

Usage:

```
PASS        <html>                  FIELD          SHARE? Y
PASS        <text>                  FIELD          SHARE? N
PASS        <html_header>           FIELD          SHARE? N
PASS        <html_footer>           FIELD          SHARE? N
GOSUB     --- .CONVERT TEXT TO HTML
*         check for errors
IF        --- .CONVERT TEXT TO HTML      NE
```

Description:

This subroutine converts a text field to HTML encoding. The first two parameters are required, if any are missing the subroutine will CANCEL. The <html_header> and <html_footer> parameters are optional.

<html> returns the converted <text> (Required). This must be PASSed with Share "Y" to return the value.

<text> is the text data you want converted to html (Required).

<html_header> is the html code you want inserted at the beginning of <html> (Optional). If not PASSed or blank, it will default to <HTML><BODY><FONT FACE=HELVETICA>

<html_footer> is any html code you want added to the end of <html> (Optional).

This routine will replace any end of line characters (Go-Return) with <br> and a pair of end of line characters with <p>. The symbols <, >, &, and hard spaces (underscores) will be converted to their HTML equivalents.

If <html> is too small to contain the converted text, --- .CONVERT TEXT TO HTML will contain 'Data was truncated'.

.CONVERT TRANSLATE

This subroutine converts a string from one language to another.

Usage:

```
PASS        <trans_text>              FIELD            SHARE? Y
PASS        <trans_error>             FIELD            SHARE? Y
PASS        <source_text>             FIELD            SHARE? N
PASS        <from_lang>               FIELD            SHARE? N
PASS        <to_lang>                 FIELD            SHARE? N
PASS        <trans_type>              FIELD            SHARE? N
PASS        <trans_app_id>            FIELD            SHARE? N
PASS        <trans_ver_id>            FIELD            SHARE? N
SUBR     --- .CONVERT TRANSLATE              DETACHED     END? N  FAIL 0
*        Check for errors
IF       --- .CONVERT TRANSLATE         NE
```

Description:

This subroutine converts a string from one language to another. The first five parameters are required, if any are missing the subroutine will CANCEL. The <trans_type>, <trans_app_id> and <trans_ver_id> parameters are optional. The translation uses the Dictionaries and Translations you have entered in the applications. Note that this routine should be invoked via SUBR with a RELATED or DETACHED invocation to ensure none of your fields are changed.

<trans_text> returns the translated version of <source_text> (Required). This must be PASSed with Share "Y" to return the value.

<trans_error> returns any addiitonal error messages from the translation (Required). This must be PASSed with Share "Y" to return the value.

<source_text> is the text you want translated (Required).

<from_lang> is the language ID that identifies <source_text> (Required). This must be a valid language code as defined in Appx System Administration.

<to_lang> is the languge Id you want <source_text> translated to (Required). This must be a valid language code as defined in Appx System Administration.

<trans_type> is the type of translation desired (Optional). Must be one of Field, Token, Clause, Message or Text. Defaults to Field if not PASSed, or is blank.

Text:One or more paragraphs
Clause:One or more words or phrases within a sentence
Token:A TOKEN field or an ALPHA field with table values consisting of a word or a phrase which requires an exact match with a Token entry in the dictionary.
Message:Text from the system MESSAGE file requires an exact match with a Message entry in the dictionary.
Field:One or more phrases and words.

<trans_app_id> is the Application Id whose dictionaries should be used for the translation (Optional). Defaults to the current application if not PASSed, or is blank.

<trans_ver_id> is the Version Id whose dictionaries should be used for the translation (Optional). Defaults to the current version if not PASSed, or is blank.

If <trans_text> is too small to contain the translated text, --- .CONVERT TRANSLATE will contain 'Data was truncated'.

> Note that this routine will return the <source_text> in the <trans_text> field if it is unable to translate <source_text>. In other word, you will always get something back from this routine, either the translated text, or as best a translation as possible. This is especially true if you are translating text which contain paragraphs or sentences. The translation routine always starts with the largest block of text and works it's way down until it has attempted everything. If it can find a match for the enter block of text, it will return that. If not, it will then look for matches of the paragraphs in the text. If it can find a match for the paragraph, it will return that. If not, it will look for matches at the sentence level. If it still cannot find a match, it will attempt to translate individual words, depending on the "Translate Words" setting on the <from_lang> file. Thus the result returned could be a mix of the original text and the portions that were able to be translated.

.TEXT CREATE PAD

This subroutine fills a field with a single character.

Usage:

```
PASS        <text_field>            FIELD        SHARE? Y
PASS        <pad_char>              FIELD        SHARE? N
PASS        <pad_length>            FIELD        SHARE? N
GOSUB     --- .TEXT CREATE PAD
*         Check for errors
IF        --- .TEXT CREATE PAD      NE
```

Description:

This subroutine fills a field with a single character. The first 2 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<text_field> is the field you want filled with <pad_char> (Required). This must be PASSed with Share "Y" to return the value.

<pad_char> is the character to fill with (Required).

<pad_length> is the number of characters to place into <text_field> (Optional). The default is to fill the entire field.

> Note that this does not append the <pad_char> to <text_field>, it completely replaces any existing data in <text_field>.

.TEXT CUT AT POS

This subroutine removes characters from a text/alpha field.

Usage:

```
PASS        <text_field>            FIELD        SHARE? Y
PASS        <start_cut>             FIELD        SHARE? N
PASS        <len_cut>               FIELD        SHARE? N
PASS        <cut_field>             FIELD        SHARE? Y
GOSUB     --- .TEXT CUT AT POS
*         Check for errors
IF        --- .TEXT CUT AT POS      NE
```

Description:

This subroutine removes characters from a text/alpha field. The first 3 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<text_field> is the field from which you want the characters removed (Required). This must be PASSed with Share "Y" to return the value.

<start_cut> is the starting position of the characters to be removed (Required).

<len_cut> is the number of characters to be removed (Required).

<cut_field> returns the characters that were removed (Optional). This must be PASSed with Share "Y" to return the value.

.TEXT FIND

This subroutine finds the position of text in a text/alpha field.

Usage:

```
PASS        <text_position>         FIELD        SHARE? Y
PASS        <text_field>            FIELD        SHARE? N
PASS        <search_text>           FIELD        SHARE? N
PASS        <start_of_text>         FIELD        SHARE? N
PASS        <len_of _text>          FIELD        SHARE? Y
PASS        <start_of_search>       FIELD        SHARE? N
PASS        <len_of _search>        FIELD        SHARE? Y
GOSUB     --- .TEXT FIND
*         Check for errors
IF        --- .TEXT FIND            NE
```

Description:

This subroutine finds the position of text in a text/alpha field. The first 3 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<text_position> returns the position of <search_text> within <text_field> (Required). This must be PASSed with Share "Y" to return the value.

<text_field> is the text to be searched (Required).

<search_text> is the text to be searched for (Required).

<start_of_text> is the starting position in <text_field> to begin the search (Optional). If not provided, <text_field> will be searched starting at position 1.

<len_of_text> is the number of characters from <start_of_text> to be searched (Optional). If not provided, <text_field> will be searched to the end of the field.

<start_of_search> is the starting position in <search_text> to use (Optional). If not provided, <search_text> starting at position 1 will be used.

<len_of_search> is the number of characters from <start_of_search> to be used (Optional). If not provided, <search_text> will be used to the end of the field.

> **Notes:**

- The <text_position> returned is always from the start of <text_field>, even if you only searched a substring of <text_field>.
- This is a case sensitive search, regular expressions are not allowed.

.TEXT FIND AND REPLACE

This subroutine finds and replaces text in a text/alpha field.

Usage:

```
PASS        <text_field>              FIELD          SHARE? Y
PASS        <search_text>             FIELD          SHARE? N
PASS        <replace_with>            FIELD          SHARE? N
PASS        <no_of_replacements>      FIELD          SHARE? Y
PASS        <skip>                    FIELD          SHARE? N
PASS        <max_no_replace>          FIELD          SHARE? N
PASS        <start_of_text>           FIELD          SHARE? N
PASS        <len_of_text>             FIELD          SHARE? N
PASS        <start_of_search>         FIELD          SHARE? N
PASS        <len_of_search>           FIELD          SHARE? N
PASS        <start_of_replace>        FIELD          SHARE? N
PASS        <len_of_replace>          FIELD          SHARE? N
GOSUB     --- .TEXT FIND AND REPLACE
*         Check for errors
IF        --- .TEXT FIND AND REPLACE     NE
```

Description:

This subroutine finds and replaces text in a text/alpha field. The first 2 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<text_field> is the text to be modified (Required). This must be PASSed with Share "Y" to return the value.

<search_text> is the text to be searched for (Required).

<replace_with> is the replacement text (Optional). If not PASSed this routine will 'cut' the the <search_text> from <text_field>. This is different from PASSing a blank field, if you pass a blank field, then blanks will be inserted into <text_field>. The number of blanks will depend on the <len_of_replace> field below.

<no_of_replacements> returns the number of times the text was replaced (Optional). This must be PASSed with Share "Y" to return the value.

<skip> is the number of occurrences of <search_text> to skip before beginning replacement (Optional). If not PASSed, all occurrences will be replaced.

<max_no_replace> is the maximum number of replacements you want performed (Optional). If not PASSed or a blank/zero value is PASSed, all occurrences will be replaced. For example, if you only want the first 2 occurrences replaced, PASS 0 for <skip> and 2 for <max_no_replace>, or if you only want the 3rd & 4th occurrences replaced, PASS 2 for <skip> and 2 for <max_no_replace>. You can also PASS -1 to indicate all occurrences.

<start_of_text> is the starting position in <text_field> to begin the search (Optional). If not PASSed or a blank/zero value is PASSed, <text_field> will be searched starting at position 1.

<len_of_text> is the number of characters from <start_of_text> to be searched (Optional). If not provided, <text_field> will be searched to the end of the field.

<start_of_search> is the starting position in <search_text> to use (Optional). If not PASSed or a blank/zero value is PASSed, <search_text> starting at position 1 will be used.

<len_of_search> is the number of characters from <start_of_search> to be used (Optional). If not provided, <search_text> will be used to the end of the field.

<start_of_replace> is the starting position in <replace_with> to use (Optional). If not PASSed or a blank/zero value is PASSed, <replace_with> starting at position 1 will be used.

<len_of_replace> is the number of characters from <start_of_replace> to be used (Optional). If you PASS a zero or blank, <search_text> will be 'cut' from <text_field>. If not PASSed at all, <replace_with> will be used to the end of the field.

> Note this is a case sensitive search, regular expressions are not allowed.

.TEXT GET LENGTH

This subroutine determines the length of a text/alpha field.

Usage:

```
PASS        <text_len>              FIELD          SHARE? Y
PASS        <text_field>            FIELD          SHARE? N
GOSUB     --- .TEXT GET LENGTH
*         Check for errors
IF        --- .TEXT GET LENGTH      NE
```

Description:

This subroutine determines the length of a text/alpha field. The both parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<text_len> returns the length of <text_field> (Required). This must be PASSed with Share "Y" to return the value.

<text_field> is the field whose length you want to determine (Required).

> Note that if you pass a non text field in <text_field>, it will be converted to an alpha field according to the rules of the SET command, and the length of that field returned.

.TEXT INSERT AT POS

This subroutine inserts characters into a text/alpha field.

Usage:

```
PASS        <text_field>            FIELD        SHARE? Y
PASS        <insert _pos>           FIELD        SHARE? N
PASS        <from_field>            FIELD        SHARE? N
PASS        <start_from>            FIELD        SHARE? N
PASS        <len_from>              FIELD        SHARE? N
GOSUB     --- .TEXT INSERT AT POS
*         Check for errors
IF        --- .TEXT INSERT AT POS   NE
```

Description:

This subroutine inserts characters into a text/alpha field. The first 3 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<text_field> is the field to receive <from_field> (Required). This must be PASSed with Share "Y" to return the value.

<insert_pos> is the starting position to receive the characters (Required).

<from_field> are the characters to be inserted (Required).

<start_from> is the starting position in <from_field> from which characters will be inserted (Optional). If not PASSed, will default to 1.

<len_from> are the number of characters to insert (Optional). If not PASSed, then all character in <from_field> starting at <start_from> will be inserted. If <start_from> + <len_from> is longer than <from_field> it will be padded with blanks as required.

.TEXT LOWER TO UPPER

This subroutine converts lower case to upper case in a text/alpha field.

Usage:

```
PASS        <converted_text>        FIELD        SHARE? Y
PASS        <original_text>         FIELD        SHARE? N
PASS        <convert_flag>          FIELD        SHARE? N
GOSUB     --- .TEXT LOWER TO UPPER
*         Check for errors
IF        --- .TEXT LOWER TO UPPER  NE
```

Description:

This subroutine converts lower case to upper case in a text/alpha field. The first 2 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<converted_field> returns the converted <original_text> (Required). This must be PASSed with Share "Y" to return the value.

<original_text> is are the characters you want converted (Required).

<convert_flag> controls how the characters will be converted (Optional). If PASSed, it must be one of:

- All - convert every character to upper case.
- Firstword - convert the character of the first word only.
- Allwords - convert the first character of every word

If not PASSed, the default value is All.

If you don't care about conserving the original data, you can pass the same field for both <converted_field> and <original_text>.

.TEXT PARSE LINE

This subroutine parses a string into separate fields.

Usage:

```
PASS        <text_to_parse>          FIELD          SHARE? N
PASS        <delimiter>              FIELD          SHARE? N
PASS        <no_of_fields>           FIELD          SHARE? Y
GOSUB     --- .TEXT PARSE LINE
*         Check for errors
IF        --- .TEXT PARSE LINE       NE
```

Description:

This subroutine parses a string into separate fields. The first parameter is required, if it is not received the subroutine will CANCEL.

<text_to_parse> contains the text you want parsed (Required).

<delimiter> is the single character to use as a field delimiter (Optional). If not PASSed, it will default to a Tab character.

<no_of_fields> returns the number of fields that were found in <text_to_parse> (Optional). This must be PASSed with Share "Y" to return a value.

The parsed data will be available in the --- .TEXT PARSE RESULT work field. You do not have to PASS this field. This is a multi occurence work field, each occurence is 512 bytes and there are a maximum of 100 occurrences. If one of the parsed fields is larger than 512 bytes, then --- .TEXT PARSE RESULT will contain 'Data Truncation'. If there are more than 100 fields parsed, then --- .TEXT PARSE RESULT will contain 'Max Occur Exceeded' and only the first 100 fields will be returned.

.TEXT UPPER TO LOWER

This subroutine converts upper case to lower case in a text/alpha field.

Usage:

```
PASS        <converted_text>          FIELD          SHARE? Y
PASS        <original_text>           FIELD          SHARE? N
PASS        <convert_flag>            FIELD          SHARE? N
GOSUB     --- .TEXT UPPER TO LOWER
*         Check for errors
IF        --- .TEXT UPPER TO LOWER    NE
```

Description:

This subroutine converts upper case to lower case in a text/alpha field. The first 2 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<converted_field> returns the converted <original_text> (Required). This must be PASSed with Share "Y" to return the value.

<original_text> is are the characters you want converted (Required).

<convert_flag> controls how the characters will be converted (Optional). If PASSed, it must be one of:

All - convert every character to lower case.
Firstword - leave the first character of the first word upper case, convert the rest.
Allwords - leave the first character of the every word upper case, convert the rest.

If not PASSed, the default value is All.

If you don't care about conserving the original data, you can pass the same field for both <converted_field> and <original_text>.

.ENV GET APPXPATH

This subroutine returns the path to the location of Appx data files.

Usage:

```
PASS        <appxpath>                FIELD          SHARE? Y
GOSUB     --- .ENV GET APPXPATH
*         Check for errors
IF        --- .ENV GET APPXPATH       NE
```

Description:

This subroutine returns the path to the location of Appx data files. A single parameter is required, if it is missing the subroutine will CANCEL.

<appxpath> returns the directory where the Appx files are located (Required). This must be PASSed with Share "Y" to return the value.

If the field you passed is too short to contain the full path, --- .ENV GET APPXPATH will be set to "Data was truncated".

.ENV GET CMD LINE PARM

This subroutine returns the value of a command line parameter.

Usage:

```
PASS        <param_value>           FIELD          SHARE? Y
PASS        <param_name>            FIELD          SHARE? N
GOSUB     --- .ENV GET CMD LINE PARM
*         Check for errors
IF        --- .ENV GET CMD LINE PARM     NE
```

Description:

This subroutine returns the value of a command line parameter. All parameters are required, if any are missing the subroutine will CANCEL.

<param_value> returns the value of the command line parameter, if it was specified on the command line that started this Appx session (Required). This must be PASSed with Share "Y" to return the value.

<param_name> is the name of the command line parameter for which you want the value (Required). Note that this must include the leading dash, if one was specified. For example, if "-data=012512" was entered on the command line that started this Appx session, then you would pass "-data" to this subroutine.

If the field you passed is too short to contain the data, --- .ENV GET CMD LINE PARM will be set to "Data was truncated".

.ENV GET CONFIG INFO

This subroutine populates PDF fields with configuration information.

Usage:

```
GOSUB     --- .ENV GET CONFIG INFO
*         Check for errors
IF        --- .ENV GET CONFIG INFO       NE
```

Description:

This subroutine populates PDF fields with configuration information. It does not require any parameters. It populates the following PDF fields:

ENGINE C-ISAM VERSION
ENGINE COMPILE DATE
ENGINE COMPILE TIME
ENGINE PATH
ENGINE PID
ENGINE RELEASE DATE
ENGINE VERSION
HOST APPXPATH
HOST NAME
HOST OS TYPE
HOST SERIAL NUMBER
HOST TYPE
HOST USER NAME
HOST USER WORKSTATION

The above fields are all DETACHED work fields, so once their value has been set, they will remain until the end of the user's session. Generally, you only need to call this routine once per session.

.ENV GET ENV VARIABLE

This subroutine returns the value of a environment variable.

Usage:

```
PASS        <env_value>              FIELD          SHARE? Y
PASS        <env_name>               FIELD          SHARE? N
GOSUB     --- .ENV GET ENV VARIABLE
*         Check for errors
IF        --- .ENV GET ENV VARIABLE      NE
```

Description:

This subroutine returns the value of an environment variable. All parameters are required, if any are missing the subroutine will CANCEL.

<env_value> returns the value of the environment variable, if it found (Required). This must be PASSed with Share "Y" to return the value.

<env_name> is the name of the environment variable for which you want the value (Required).

If the field you passed is too short to contain the data, --- .ENV GET ENV VARIABLE will be set to "Data was truncated".

To get the value of a client constant, see .CLIENT GET CONSTANT.

.ENV GET OS TYPE

This subroutine returns the type of operating system Appx is running on.

Usage:

```
PASS        <os_type>                FIELD          SHARE? Y
GOSUB     --- .ENV GET OS TYPE
*         Check for errors
IF        --- .ENV GET OS TYPE       NE
```

Description:

This subroutine returns the type of operating system Appx is running on. The parameter is required, if it is missing the subroutine will CANCEL.

<os_type> returns the value of the Host O/S Type (Required). This must be PASSed with Share "Y" to return the value.

If the field you passed is too short to contain the data, --- .ENV GET OS TYPE will be set to "Data was truncated".

.ENV GET PARENT PROC

This subroutine returns the name and type of the parent process.

Usage:

```
PASS        <parent_type>            FIELD          SHARE? Y
PASS        <parent_name>            FIELD          SHARE? Y
PASS        <parent_app>             FIELD          SHARE? Y
GOSUB     --- .ENV GET PARENT PROC
*         Check for errors
IF        --- .ENV GET PARENT PROC   NE
```

Description:

This subroutine returns the name and type of the parent process. All parameters are required, if any are missing the subroutine will CANCEL.

<parent_type> returns the process type of the parent process (Required). This must be PASSed with Share "Y" to return the value.

<parent_name> returns the process name of the parent process (Required). This must be PASSed with Share "Y" to return the value.

<parent_app> returns the application id of the parent process (Required). This must be PASSed with Share "Y" to return the value.

If any field you passed is too short to contain the data, --- .ENV GET PARENT PROC will be set to "Data was truncated".

> **Notes:**

- If you invoke this process via GOSUB, then the parent information will refer to the parent of the current process, since ILF code is compiled into the current process. If you invoke this process via SUBR, then the parent information will refer to the process that invoked the SUBR, since a SUBR invocation creates a new child process.
- You cannot use this in a File Level Event Point, it will return blanks for all parameters.

.ENV GET PATH NAME

This subroutine returns the path name of the requested Appx file.

Usage:

```
PASS        <file_path>                FIELD          SHARE? Y
PASS        <app_id>                   FIELD          SHARE? N
PASS        <file_name>                FIELD          SHARE? N
PASS        <error_msg>                FIELD          SHARE? Y
PASS        <database>                 FIELD          SHARE? N
PASS        <version>                  FIELD          SHARE? N
GOSUB     --- .ENV GET PATH NAME
*         Check for errors
IF        --- .ENV GET PATH NAME       NE
```

Description:

This subroutine returns the path name of the requested Appx file. The first three parameters are required, if any are missing the subroutine will CANCEL. The remaining parameters are optional, depending on the type of file (see below).

<file_path> returns the path and file name of the requested file (Required). This must be PASSed with Share "Y" to return the value. Note that this will not include the '.dat' extension

<app_id> is the application id of the file you are interested in (Required).

<file_name> is the Data Dictionary name of the file you are interested in (Required).

<error_msg> will contain any additional error information (optional).

<database> is the name of the database that contains the file you are interested in. If not PASSed, it will default to the current database.

<version> is the version that contains the file you are interested in. If not PASSed, it will default to the version used by <database>, unless you are checking a Design File (see below).

This will only work for permanent disk based files. You cannot use this on Appx/Net files, or files stored in a RDBMS.

There are 3 types of files you can inquire on. Each type has it's own requirements for the parameters that must be passed:

Normal Data Files

- <app_id> must be supplied
- <database> is optional and will default to the current database
- <version> is optional and will default to the start up version of the specified database

System Administration Files

- <app_id> can be blank, the contents will be ignored.
- <database> must be 0SA
- <version> can be blank, the contents will be ignored.

Application Design Files

- <app_id> must be filled in.
- <database> must be 0AD
- <version> must be filled in.

If the field you passed in <file_path> is too short to contain the data, --- .ENV GET PATH NAME will be set to "Data was truncated".

.ENV GET PATH SEP

This subroutine returns the directory separator character of the host operating system.

Usage:

```
PASS        <path_separator>          FIELD          SHARE? Y
GOSUB     --- .ENV GET PATH SEP
*         Check for errors
IF        --- .ENV GET PATH SEP       NE
```

Description:

This subroutine returns the directory separator character of the host operating system. A single parameter is required, if it is missing the subroutine will CANCEL.

<path_separator> returns the operating system path separator (Required). This must be PASSed with Share "Y" to return the value.

.ENV GET SCREEN SIZE

This subroutine returns the size of the Appx screen in rows and columns.

Usage:

```
PASS        <rows>                  FIELD          SHARE? Y
PASS        <cols>                  FIELD          SHARE? Y
GOSUB     --- .ENV GET SCREEN SIZE
*         Check for errors
IF        --- .ENV GET SCREEN SIZE     NE
```

Description:

This subroutine returns the size of the Appx screen in rows and columns. All parameters are required, if any are missing the subroutine will CANCEL.

<rows> returns current setting for the numbers of rows, (Required). This must be PASSed with Share "Y" to return the value.

<cols> returns the current setting for the number of columns (Required). This must be PASSed with Share "Y" to return the value.

> Note that if either receiving field is too small to contain the numeric value returned, an Overflow runtime error will occur.

.ENV VIEW LICENSE INFO

This subroutine displays the APPX license info for the current application.

Usage:

```
GOSUB     --- .ENV VIEW LICENSE INFO
*         Check for errors
IF        --- .ENV VIEW LICENSE INFO     NE
```

Description:

This subroutine displays the APPX license info for the current application. No parameters are required, however, the user must be running the Desktop Client or an error will be returned.

The license information for the current application will be displayed. If the license has not yet been accepted, an 'Accept' button will be displayed for the user to accept the license terms. If the license was previously accepted, the date/time it was accepted and the user id that accepted it will be displayed instead.

License information for an application is entered via Application Design, Application Properties, then click the 'Licensing Info' button. You can also clear previously accepted license terms on that screen.

To check if the license terms have been accepted or not, you can use the following code:

```
      SET      --- NEXT APPLICATION          =      <your application>
      SET      --- NEXT VERSION              =      <your version>
      OPEN     0AD DOCUMENT  SHARE? Y  FAIL 0 CACHE? N
      SET      0AD DOCUMENT TYPE             =      6
      SET      0AD DOCUMENT ID               =      ACCEPTED
      SET      0AD DOCUMENT SNO              =      100
      READ     0AD DOCUMENT              HOLD 0 FT 0 BY DOCUMENT KEY
F     SET      --- TEMP 80                   =      <not accepted>
T     SET      --- TEMP 80                   =      <accepted>
```

.CLIENT CHECK FOR GUI

This subroutine returns a flag to indicate if the user is running the Desktop Client.

Usage:

```
      PASS         <gui>                     FIELD            SHARE? Y
      PASS         <type>                    FIELD            SHARE? Y
      GOSUB    --- .CLIENT CHECK FOR GUI
      *        Check for errors
      IF       --- .CLIENT CHECK FOR GUI     NE
```

Description:

This subroutine returns a flag to indicate if the user is running a GUI Client or not. The <gui> parameter is required, if it is missing the subroutine will CANCEL.

<gui> will return either a Y or N, depending on whether the user is running the Appx Desktop Client (Required). This must be PASSed with Share "Y" to return a value.

<type> will return the type of GUI client (5.4.2 & higher only). It will return "A" for Appx Desktop Client (aka Java Client) and "H" for the HTML client (Optional). This must be PASSed with Share "Y" to return a value.

The Appx Desktop Client can run in GUI or character mode. This does not indicate which mode the user is running, only that they are running the desktop client.

.CLIENT CHECK VERSION

This subroutine returns the version of the Desktop Client.

Usage:

```
PASS        <version_text>          FIELD          SHARE? Y
PASS        <version_numeric>       FIELD          SHARE? Y
GOSUB     --- .CLIENT CHECK VERSION
*         Check for errors
IF        --- .CLIENT CHECK VERSION   NE
```

Description:

This subroutine returns the version of the Desktop Client. The <version_text> parameter is required, if it is missing the subroutine will CANCEL. The <version_numeric> is optional.

<version_text> will return the Desktop Client version (Required). This must be PASSed with Share "Y" to return a value.

<version_numeric> will return a numeric value for the version number (Optional). This must be PASSed with Share "Y" to return a value. This field should be at least 999999.99 in size. If there aren't enough digits to the left of the decimal an Overflow error will occur when the subroutine ends. If there aren't enough digits to the right of the decimal, the value will be silently rounded.

If the user is not running the Desktop Client, an error will be returned in --- .CLIENT CHECK VERSION.

.CLIENT DISPLAY FILE

Usage:

```
PASS        <status_code>           FIELD          SHARE? Y
PASS        <source_file>           FIELD          SHARE? N
PASS        <display_name>          FIELD          SHARE? N
GOSUB     --- .CLIENT DISPLAY FILE
*         check for errors
IF        --- .CLIENT DISPLAY FILE    NE
```

Description:

This subroutine will download a file to the user's PC and automatically open it using either the default program (if the user is running the Desktop Client) or in a new Browser tab (if the user is running the HTML client). The first two parameters are required, if any are missing the subroutine will CANCEL. The <display_name> is optional.

<status_code> is the code returned to indicate if the transfer was successful (Required). This field must be PASSed with Share "Y" to receive the value. A value of 1 indicates the transfer was not successful and 0 indicates success. If the transfer failed, you can check --- .CLIENT DISPLAY FILE for more information.

<source_file> is the is the full path and file name on the Appx server that you want to transfer to the user's PC (Required). This must be a file readable by user 'appx' (Linux/Unix) or the current user (Windows).

<display_name> is an optional field. This has no meaning if the user is running the Desktop Client and is ignored if PASSed. If they are running the HTML client, this will be trailing part of the URL displayed in the browser window. If not passed, it will default to the file name portion of <source_file>. Note that if you supply a <display_name>, it must include the correct file extension.

If the user is running the Desktop Client, the file will be uploaded to their cache folder and automatically deleted after a period of time to avoid filling their disk. If they are running the HTML client, it will be stored on the server running the APPX Server Connector, and also automatically deleted after a period of time. If the user refreshes the tab after this period of time, they will get Error 404 as the document no longer exists.

> **NOTE:** Uploading a file to an HTML client user with this API does NOT require a Local Connector to be running on their device

---

.CLIENT DOWNLOAD FILE

This subroutine will download a file to the user's PC.

Usage:

```
PASS        <status_code>           FIELD          SHARE? Y
PASS        <dest_file>             FIELD          SHARE? Y
PASS        <source_file>           FIELD          SHARE? N
PASS        <convert_flag>          FIELD          SHARE? N
GOSUB     --- .CLIENT DOWNLOAD FILE
*         check for errors
IF        --- .CLIENT DOWNLOAD FILE      NE
```

Description:

This subroutine will download a file to the user's PC. The first three parameters are required, if any are missing the subroutine will CANCEL. The <convert_flag> is optional. If the <dest_file> exists on the user's PC, it will be overwritten without warning (if permissions allow it).

<status_code> is the code returned to indicate if the transfer was successful (Required). This field must be PASSed with Share "Y" to receive the value. A value of 1 indicates the transfer was not successful and 0 indicates success. If the transfer failed, you can check --- .CLIENT DOWNLOAD FILE for more information. Note that <status_code> might indicate success and --- .CLIENT DOWNLOAD FILE might contain a warning message. <status_code> is the final authority on whether the transfer worked or not.

<dest_file> is the destination on the user's PC (Required). You can refer to macro names in the destination, ie, you can use any of the names you see in the [LocalPaths] section of the Desktop Client preferences, just prefix them with a $ and surround them with parentheses, ie, $(userHome). If you PASS this field shared, then it will contain the expanded path after the upload. If --- .CLIENT DOWNLOAD FILE contains 'Dest filenam truncated', it means your field was too short to contain the expanded name. This does not mean the actual file name on disk was truncated.

<source_file> is the name on the Appx server that you want to transfer to the user's PC (Required). This must be a file readable by user 'appx' (Linux/Unix) or the current user (Windows).

<convert_flag> indicates if any file conversion is required (Optional). The allowable values are:

- NO - no conversion will be done. This is the default if not PASSed.
- AUTO-EXT - convert the file automatically based on the filename extension.
- AUTO-CONTENT - convert the file automatically based on the contents of the file (ie, it won't convert binary files).
- YES - Do the conversion regardless of file type.

If conversion is requested, this routine will make a temporary copy of the file, converting as necessary, then upload the converted file. The temporary copy will be deleted. The temporary copy is created in the applications 'Tmpdata' folder, same as the working files for a restructure.

The routine considers the following file extensions to be text files:

.bas
.c
.cgi
.cpp
.h
.htm
.html
.log
.nfo
.pas
.php

.sh
.tex
.txt

If a <convert_flag> of AUTO-CONTENT is passed, the routine will read approximately the first 1000 bytes of the file and look for characters in the range ASCII 0 to 9 (0x00 to 0x09), or ASCII 14 to 31 (0x0e to 0x1f). If any are found, the file is assumed to be binary and no conversion will take place.

If the file is determined to be a text file (either by extension or the lack of binary characters), the routine looks for the presense of a CR/LF pair in the first ~1000 characters of the source file to determine if it's in Unix or Windows format and then uses the following matrix to decide if the file really needs to be converted:

Host OS	Client OS	Source File Type	Conversion
UNIX	UNIX	UNIX	No conversion needed
UNIX	UNIX	WINDOWS	CR/LF to LF
UNIX	WINDOWS	UNIX	LF to CR/LF
UNIX	WINDOWS	WINDOWS	No conversion needed
WINDOWS	WINDOWS	WINDOWS	No conversion needed
WINDOWS	WINDOWS	UNIX	LF to CR/LF
WINDOWS	UNIX	UNIX	CR/LF to LF
WINDOWS	UNIX	UNIX	No conversion needed

.CLIENT GET CLIPBOARD

This subroutine gets the current content of the system clipboard.

Usage:

```
PASS        <clip_data>              FIELD          SHARE? Y
PASS        <num_chars>              FIELD          SHARE? Y
GOSUB     --- .CLIENT GET CLIPBOARD
*         check for errors
IF        --- .CLIENT GET CLIPBOARD     NE
```

Description:

This subroutine gets the current text content of the system clipboard. The first parameter is required, if it is missing the subroutine will CANCEL.

<clip_data> is the data read from the clipboard (Required). This field must be PASSed with Share "Y" to receive the value.

<num_chars> returns the number of characters on the system clipboard (Optional). This field must be PASSed with Share "Y" to receive the value.

If <clip_data> is not large enough to hold the requested number of characters, --- .CLIENT GET CLIPBOARD will contain 'Clipdb chars truncat'.

> Note that this can only retrieve text from the clipboard. Other types of data are not supported and will be ignored. Text in the clipboard is pasted character by character into the <clip_data> field. If <clip_data> already contains data and the data in the clipboard is shorter than the data in <clip_data>, the remaining characters in <clip_data> are unchanged.

.CLIENT GET CONSTANT

This subroutine returns the value of a client constant.

Usage:

```
PASS        <client_value>          FIELD          SHARE? Y
PASS        <client_name>           FIELD          SHARE? N
GOSUB     --- .CLIENT GET CONSTANT
*         Check for errors
IF        --- .CLIENT GET CONSTANT  NE
```

Description:

This subroutine returns the value of a client constant. All parameters are required, if any are missing the subroutine will CANCEL.

<client_value> will contain the value of the client constant, if it is found (Required). This must be PASSed with Share "Y" to return the value.

<client_name> is the name of the client constant for which you want the value (Required). This is case sensitive, see the list below.

If the field you passed is too short to contain the data, --- .CLIENT GET CONSTANT will be set to "Data was truncated". If the client constant does not exist, --- .CLIENT GET CONSTANT will be set to "Const. name not found".

The list of client constants you can query varies from release to release. To see the current constants, from the main Appx menu, choose System Administration/System Setup/Version Info from the pull down menu, then click the Environment Variables button. Everything that begins with 'client.' can be queried with this subroutine. Do not include the leading 'client.' in <client_name>, eg, to get the value of 'client.os.name' you would pass 'os.name'. To get the value of an environment variable, see .ENV GET ENV VARIABLE.

> NOTE: The values retrieved are not coming directly from the client. The APPX engine stores them during the initial startup of the client, and does not update them if they change while the client is running. Thus these constant variables will NOT reflect changes made to them after startup.

Here is a list of client constants available as of Release 5.1:

client.client.address
client.client.port
client.client.version
client.client.version.num
client.clientHome
client.display.0.height
client.display.0.width
client.display.0.x
client.display.0.y
client.display.count
client.file.separator
client.java.home
client.java.io.tmpdir
client.java.vm.version
client.line.separator
client.os.arch
client.os.name
client.os.version
client.path.separator
client.pref.SSLAnonAllowed
client.pref.SSLHandshakeTimeout
client.pref.SSLMismatchAllowed
client.pref.SSLMode
client.pref.SSLSelfSignedAllow
client.pref.allowAquaButtons
client.pref.allowXpTheme
client.pref.appxDoubleClick
client.pref.arrowScrollEditor
client.pref.autoDeleteTimer
client.pref.autoFontScaling
client.pref.autoSelect
client.pref.autoTabOut
client.pref.baseFontName
client.pref.baseTilingMode
client.pref.baseWallpaper1
client.pref.baseWallpaper2

client.pref.baseWallpaper3
client.pref.baseWallpaper4
client.pref.baseWallpaper5
client.pref.busyRepaintTimer
client.pref.cachePath
client.pref.cacheRoot
client.pref.caretColor
client.pref.characterEncoding
client.pref.clientHome
client.pref.colorAppletBg
client.pref.colorBoldFg
client.pref.colorButtonBg
client.pref.colorButtonFg
client.pref.colorEditBg
client.pref.colorFrameBg
client.pref.colorFrameFg
client.pref.colorScrollSelectActive
client.pref.colorScrollSelectOther
client.pref.colorStdBg
client.pref.colorStdFg
client.pref.colorWindowBg
client.pref.commandShell
client.pref.connectMode
client.pref.dataCachePath
client.pref.debugLogLevel
client.pref.debugNotifyLevel
client.pref.dockingScrollbar
client.pref.editInsetBottom
client.pref.editInsetLeft
client.pref.editInsetRight
client.pref.editInsetTop
client.pref.editorCellGridColor
client.pref.editorForceSize
client.pref.editorInchGridColor
client.pref.embedApplet
client.pref.endMappedToCtrlE
client.pref.enginePath
client.pref.guiInterface
client.pref.guiLook
client.pref.hidePrefsMenuItem
client.pref.hideStaticClientMenus
client.pref.initialFontSize

client.pref.lastHost
client.pref.lastIniFile
client.pref.lastPath
client.pref.lastPid
client.pref.lastPort
client.pref.lastTab
client.pref.lastUseSSO
client.pref.lastUser
client.pref.logBitsRecv
client.pref.logBitsSent
client.pref.logClassCreation
client.pref.logConsoleToFile
client.pref.logFileTransfers
client.pref.logGetFieldList
client.pref.logGetFileList
client.pref.logKeyboardEventStack
client.pref.logKeyboardEvents
client.pref.logObjectEvents
client.pref.logRawEventData
client.pref.logRawWidgetData
client.pref.logServerRequests
client.pref.logTokenScanList
client.pref.logTopBoxTitle
client.pref.loggingEnabled
client.pref.loginPositionX
client.pref.loginPositionY
client.pref.mapEndKey
client.pref.mapOptionKey
client.pref.mapTabKey
client.pref.memoryCheckTimer
client.pref.nationalEncoding
client.pref.netcardLockupFix
client.pref.networkEncoding
client.pref.pdfReportViewer
client.pref.printCachePath
client.pref.printColsPerInch
client.pref.printRowsPerInch
client.pref.profileName
client.pref.rawEncoding
client.pref.remoteHost
client.pref.remotePassword
client.pref.remotePort

client.pref.remoteUser
client.pref.repaintLevel
client.pref.resourceCachePath
client.pref.runApplication
client.pref.runDatabase
client.pref.runProcess
client.pref.runProcessType
client.pref.scalingQuality
client.pref.scanTooltip
client.pref.screenAspect
client.pref.screenColumns
client.pref.screenRows
client.pref.showButtonFocus
client.pref.showDateScans
client.pref.showErrorDialogs
client.pref.showGridlines
client.pref.showMenubar
client.pref.showMessageDialogs
client.pref.showOptionNumbers
client.pref.showOptionsTab
client.pref.showScanButtons
client.pref.showScrollbar
client.pref.showStatusbar
client.pref.showToolbar
client.pref.showWarningDialogs
client.pref.startX
client.pref.startY
client.pref.startupWallMode
client.pref.startupWallpaper
client.pref.tcpNoDelay
client.pref.textReverseEnterKey
client.pref.themeDir
client.pref.themeHome
client.pref.themeName
client.pref.tokenCachePath
client.pref.toolbarIconSize
client.pref.toolbarStyle
client.pref.txtReportViewer
client.pref.ucode32Encoding
client.pref.useSSO
client.pref.userClientRoot
client.pref.userData

client.pref.userHome
client.pref.widgetFontAdjust
client.pref.windowTitle
client.server.address
client.server.port
client.sun.cpu.endian
client.user.dir
client.user.home
client.user.language
client.user.name

Remember, these are case sensitive and do not pass the leading 'client.' in the <client_name> field.

.CLIENT LOAD URL

This subroutine loads a URL, document, runs a command on the user's PC or changes a client setting.

Usage:

```
PASS        <url>                    FIELD          SHARE? N
GOSUB     --- .CLIENT LOAD URL
*         Check for errors
IF        --- .CLIENT LOAD URL       NE
```

Description:

This subroutine loads a URL, document, runs a command on the user's PC or changes a client setting. The <url> parameter is required, if it is missing the subroutine will CANCEL.

<url> is the URL or document to open, or the command to run on the user's PC. It can take several forms:

- http://, https:, ftp://, mailto:, or any other valid web URL
- The name of a file accessible to the user's PC. In this case, the client will rely on the desktop O/S to determine the correct program to use. For Macintosh clients, you will need to set the client desktop preference for commandShell to the program 'open'. For Linux clients, you also need to set commandShell to some program that will examine the file type & call the appropriate program to open it. Note that different desktop O/S'es handle embedded blanks differently. If your file name includes blanks, for most Windows desktops you should enclose the name in quotes, but for most Mac desktops you should NOT enclose it in quotes. Some experimentation may be required.
- A program on the user's PC. For Windows and Linux desktops, prefix the program name with an '@' , ie, @notepad or @gedit. You can pass additional arguments after the program name, ie, @notepad somefile.txt. For Macintosh clients, just pass the complete path to the program, ie, /

Applications/Chess.app. Remember that file and program names on Linux and Macintosh desktops are case sensitive.

- A network path, such as \\<server_name\<share_name > for Windows desktops, or smb:////<server_name/<share_name> for Linux or Macintosh desktops.
- The constant '$beep:'. This will make the client play a 'beep' sound.
- The constant '$play:' followed by the path and file name of a 'wav' file accessible to the user's PC, ie, $play:/Users/bsmith/Desktop/TestSnd.wav
- The constant $display: followed by the path and file name of any file accessible to the user's PC. The file will display on screen using the default viewer.
- The constant $print: followed by the path and file name of any file accessible to the user's PC. The file will print on the default printer.
- The constant $printSetup: will display the Windows Print Setup dialog box. You could use this to allow the user to select a printer before using the $print: URL.
- The constant $newsession: followed by the necessary parameters to open a new session. This spawns a new session connected to the same server as the current session. In the parameters section, you can put any client setting. For example, you might have a program that requires a different number of rows and columns. Now you can add a menu item that starts a new session with the correct screen size, e.g., $newsession: -screenRows=28 - screenColumns=110 -runDatabase=DMO - runProcessType=INPUT - runProcess="ORDER_ENTRY" - runApplication=COE
- The constant $setprop: followed by {property}={value}. This allows you to change the client properties from ILF code.
- Not all properties can be changed while the client is running. To see what can be changed, run the client and connect to a server, then go to File/Preferences. Everything you are allowed to change there can also be changed via this URL. For example, to turn dialog boxes on for errors you would use '$setprop:showErrorDialogs=true'. The change is only for the duration of the session. Another way to change client properties is via the '$newsession:' URL. That URL will let you set any property in a new session.

.CLIENT PLAY SOUND

This subroutine plays a .wav file on the user's PC.

Usage:

```
PASS        <wave_file>                FIELD          SHARE? N
GOSUB     --- .CLIENT PLAY SOUND
*         Check for errors
IF        --- .CLIENT PLAY SOUND       NE
```

Description:

This subroutine plays a .wav file on the user's PC. The <wave_file> parameter is required, if it is missing the subroutine will CANCEL.

<wave_file> is the path & file name of a .wav file accessible to the user's PC.

Using this subroutine is equivalent using the $play: parameter of .CLIENT LOAD URL.

.CLIENT SET CLIPBOARD

This subroutine puts data on the system clipboard.

Usage:

```
PASS        <clip_data>                FIELD          SHARE? N
PASS        <num_chars>                FIELD          SHARE? N
GOSUB     --- .CLIENT SET CLIPBOARD
*         check for errors
IF        --- .CLIENT SET CLIPBOARD    NE
```

Description:

This subroutine puts data on the system clipboard. The first parameter is required, if it is missing the subroutine will CANCEL.

<clip_data> is the data you want written to the clipboard (Required).

<num_chars> is the number of characters to be written to the clipboard (Optional). The default value is the length of <clip_data>. This cannot be larger than the size of the field containing <clip_data>. If you PASS a value that is larger than the actual content of <clip_data>, the clipboard will be padded with blanks to the length specified.

> Note that this can only paste text to the clipboard. Other types of data are not supported and will be ignored.

.CLIENT UPLOAD FILE

This subroutine will upload a file from the Client to the server.

Usage:

```
PASS        <status_code>           FIELD          SHARE? Y
PASS        <source_file>           FIELD          SHARE? N
PASS        <dest_file>             FIELD          SHARE? N
PASS        <convert_flag>          FIELD          SHARE? N
GOSUB     --- .CLIENT UPLOAD FILE
*         check for errors
IF        --- .CLIENT UPLOAD FILE   NE
```

Description:

This subroutine will upload a file from the Client to the server. The first three parameters are required, if any are missing the subroutine will CANCEL. The <convert_flag> is optional. If the <dest_file> exists on the server, it will be overwritten without warning (if permissions allow it). Note that <dest_file> must be in a location writeable by user 'appx' (Linux/Unix servers) or the current user (Window servers).

<status_code> is the code returned to indicate if the transfer was successful (Required). This field must be PASSed with Share "Y" to receive the value. A value of 1 indicates the transfer was not successful and 0 indicates success. If the transfer failed, you can check --- .CLIENT UPLOAD FILE for more information. Note that <status_code> might indicate success and --- .CLIENT UPLOAD FILE might contain a warning message. <status_code> is the final authority on whether the transfer worked or not.

<source_file> is the path and file on the user's PC (Required). You can refer to macro names in the source, ie, you can use any of the names you see in the [LocalPaths] section of the Desktop Client preferences, just prefix them with a $ and surround them with parentheses, ie, $(userHome). This field can be blank, in which case a dialog box will appear and the user can choose which file to upload. If you PASS this field with Share "Y", then it will contain the path and file name after the transfer is complete. If your field is too short to contain the full path then --- .CLIENT UPLOAD FILE will contain 'Src filename truncated'.

<dest_file> is the path and file name on the Appx server the <source_file> should be transferred to (Required). This must be in a location writeable by user 'appx' (Linux/Unix) or the current user (Windows).

<convert_flag> indicates if any file conversion is required (Optional). The allowable values are:

- NO - no conversion will be done. This is the default if not PASSed.
- AUTO-EXT - convert the file automatically based on the filename extension.
- AUTO-CONTENT - convert the file automatically based on the contents of the file (ie, it won't convert binary files).
- YES - Do the conversion regardless of file type.

If conversion is requested, this routine will make a temporary copy of the file, converting as necessary, then upload the converted file. The temporary copy will be deleted. The temporary copy is created in the applications 'Tmpdata' folder, same as the working files for a restructure.

The routine considers the following file extensions to be text files:

.bas
.c
.cgi
.cpp
.h
.htm
.html
.log
.nfo
.pas
.php
.sh
.tex
.txt

If a <convert_flag> of AUTO-CONTENT is passed, the routine will read approximately the first 1000 bytes of the file and look for characters in the range ASCII 0 to 9 (0x00 to 0x09), or ASCII 14 to 31 (0x0e to 0x1f). If any are found, the file is assumed to be binary and no conversion will take place.

If the file is determined to be a text file (either by extension or the lack of binary characters), the routine looks for the presense of a CR/LF pair in the first ~1000 characters of the source file to determine if it's in Unix or Windows format and then uses the following matrix to decide if the file really needs to be converted:

Host OS	Client OS	Source File Type	Conversion
UNIX	UNIX	UNIX	No conversion needed
UNIX	UNIX	WINDOWS	CR/LF to LF
UNIX	WINDOWS	UNIX	LF to CR/LF
UNIX	WINDOWS	WINDOWS	No conversion needed
WINDOWS	WINDOWS	WINDOWS	No conversion needed
WINDOWS	WINDOWS	UNIX	LF to CR/LF
WINDOWS	UNIX	UNIX	CR/LF to LF
WINDOWS	UNIX	UNIX	No conversion needed

.FILE COPY

This subroutine will copy a file from one location to another, creating any required directories.

Usage:

```
PASS        <error_message>         FIELD        SHARE? Y
PASS        <source_file>           FIELD        SHARE? N
PASS        <dest_file>             FIELD        SHARE? N
GOSUB     --- .FILE COPY
*         check for errors
IF        --- .FILE COPY            NE
```

Description:

This subroutine will copy a file from one location to another, creating any required directories. All parameters are required, if any are missing the subroutine will CANCEL.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y".

<source_file> is the source file to be copied (Required).

<dest_file> is the location where the file should be copied to (Required). This must include the destination file name, ie, you cannot just specifiy a target directory.

If --- .FILE COPY contains 'File Copy Failed', you can check the <error_message> field for more information on why the copy failed. This routine will not overwrite an existing file, if you want to replace an existing file you can use .FILE DELETE to delete the destination first.

.FILE CREATE

This subroutine will create the specified file.

Usage:

```
PASS        <error_msg>             FIELD        SHARE? Y
PASS        <file_name>             FIELD        SHARE? N
PASS        <application>           FIELD        SHARE? N
PASS        <database>              FIELD        SHARE? N
PASS        <fms_type>              FIELD        SHARE? N
PASS        <fms_group>             FIELD        SHARE? N
GOSUB     --- .FILE CREATE
*         Check for errors
IF        --- .FILE CREATE          NE
```

Description:

This subroutine will create the specified file. This is different from using the CREATE command, which only works if the file has previously been created using Data File Management. This routine performs the same function as 'Create' in Data File Management, so you may use it for newly defined databases and newly defined files.

It has the same restrictions as Data File Management, ie, the user running the command must be either a System Administrator, or have Database Management rights for the Database/Application. The file to be created must be a Disk Permanent file, the 'Create By Database Mgmt?' flag in the Data Dictionary must be "Y", and the 'Use DB' field must be blank.

For Files that where 'Create By Database Mgmt?' is set to "N", you can still call this routine. It will not create the files, but it will add the necessary SYSDIR records so that a CREATE statement will create the file.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y". Note that this message can be up to 500 characters in length.

<file_name> is the file to be created (Required). This must be a file defined in your Data Dictionary.

<application> is the application that contains the Data Dictionary for <file_name> (Optional). If not specified, it will default to the current application.

<database> is the database in which the file should be created (Optional). If not specified, it will default to the current Database.

<fms_type> and <fms_group> are the FMS group to use when creating the file (Optional). If not specified, it will default to an Appx I/O file in the default location. If PASSed, you must PASS both of these. This will only be effective the first time the file is created. If you SCRATCH the file & use this routine to create it, it will not change the existing FMS controls on the file.

If --- .FILE CREATE contains 'Unable to Create File', you can check the <error_message> field for more information on why the create failed.

.FILE CREATE ARCHIVE

This subroutine creates an archive of the specified files, in either TAR or TGZ format.

Usage:

```
PASS        <error_message>          FIELD          SHARE? Y
PASS        <archive_file>           FIELD          SHARE? N
PASS        <source_directory>       FIELD          SHARE? N
GOSUB     --- .FILE CREATE ARCHIVE
*         check for errors
IF        --- .FILE CREATE ARCHIVE   NE
```

Description:

This subroutine creates an archive of the specified files, in either TAR or TGZ format. All parameters are required, if any are missing the subroutine will CANCEL.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y".

<archive_file> is the archive to be created (Required). This should include the full path to the file. Any required directories will be created. If the file does not have a '.tgz' extension (case sensitive), it will be created in Unix Tar format. If this file already exists, it will be overwritten.

<source_directory> is the source directory to be archived. (Required). Note that this must be a directory name, wild cards or specific files are not supported.

If --- .FILE CREATE ARCHIVE contains 'Archive create failed', you can check the <error_message> field for more information on why the create failed.

This command is run by the appx engine, not by 'shelling out' to the O/S level, therefore the archive file will have the permissions of the engine. On Linux/Unix systems, if the 'setuid' bit is set, then those will be the permissions of user 'appx'. If you do not have the 'setuid' bit set, then the those will be the permissions of whatever user you have the engine configured to impersonate. On Windows the permissions will be that of the current user.

.FILE DELETE

This subroutine is called to remove a file from the filesystem.

Usage:

```
PASS        <error_message>          FIELD          SHARE? Y
PASS        <pathname>               FIELD          SHARE? N
GOSUB     --- .FILE DELETE
*         check for errors
IF        --- .FILE DELETE           NE
```

Description:

This subroutine is called to remove a file from the filesystem. Both parameters are required, and the subroutine will CANCEL if they are not received.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y".

<pathname> is the file to be deleted (Required). This must be a specific file, wildcards are not supported.

If --- .FILE DELETE is not blank, you can check <error_message> for more information.

.FILE EXISTS

This subroutine is called to check if a file exists in the filesystem.

Usage:

```
PASS        <exists?>                FIELD        SHARE? Y
PASS        <pathname>               FIELD        SHARE? N
GOSUB     --- .FILE EXISTS
*         check for errors
IF        --- .FILE EXISTS           NE
```

Description:

This subroutine is called to check if a file exists in the filesystem. Both parameters are required, the subroutine will CANCEL if they are not received.

<exists?> is the result, indicating if file exists or not (Required). This must be PASSed with Share "Y". Returns Y if the file exists, N if not.

<pathname> is pathname to test (Required).

> **Notes:**

The subroutine tries to open the file for Read access, and if it cannot, it returns a "N". It cannot distinguish between a file that does not exist and a file it cannot open due to file permissions, both cases will return "N".

You can also use this to test if a directory exists by passing a directory name (Unix/Linux only).

.FILE EXTRACT ARCHIVE

This subroutine extracts all the files from a previously created archive.

Usage:

```
PASS        <error_message>          FIELD        SHARE? N
PASS        <archive_file>           FIELD        SHARE? N
PASS        <dest_directory>         FIELD        SHARE? N
GOSUB     --- .FILE EXTRACT ARCHIVE
*         check for errors
IF        --- .FILE EXTRACT ARCHIVE  NE
```

Description:

This subroutine extracts all the files from a previously created archive (see .FILE CREATE ARCHIVE). All parameters are required, if any are missing the subroutine will CANCEL.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y".

<archive_file> is the archive to be extracted (Required). This should include the full path to the file.

<dest_directory> is the target directory where the files should be extracted (Required). Any required directories will be created.

If --- .FILE EXTRACT ARCHIVE contains 'Archive extract failed', you can check the <error_message> field for more information on why the extract failed.

This command is run by the appx engine, not by 'shelling out' to the O/S level, therefore the extracted files will have the permissions of the engine. On Linux/Unix systems, if the 'setuid' bit is set, then those will be the permissions of user 'appx'. If you do not have the 'setuid' bit set, then the those will be the permissions of whatever user you have the engine configured to impersonate. On Windows the permissions will be that of the current user. **The extracted files will be owned by the current user, who must have sufficient permission in the destination directory to take ownership of the files.**

.FILE MAKE DIR

This subroutine is called to create a directory in the filesystem.

Usage:

```
PASS        <error_message>          FIELD          SHARE? N
PASS        <directory_name>         FIELD          SHARE? N
PASS        <dest_directory>         FIELD          SHARE? N
GOSUB     --- .FILE MAKE DIR
*         check for errors
IF        --- .FILE MAKE DIR         NE
```

Description:

This subroutine is called to create a directory in the filesystem. Both parameters are required, the subroutine will CANCEL if they are not received.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y".

<directory_name> is the directory name to create (Required).

If .FILE MAKE DIR is not blank, you can check <error_message> for more information on why the command failed.

This command is run by the appx engine, not by 'shelling out' to the O/S level, therefore the directory will have the permissions of the engine. On Linux/Unix systems, if the 'setuid' bit is set, then those will be the permissions of user 'appx'. If you do not have the 'setuid' bit set, then the those will be the permissions of whatever user you have the engine configured to impersonate. On Windows the permissions will be that of the current user.

.FILE MOVE

This subroutine will move a file or directory from one location to another, creating any required directories.

Usage:

```
PASS        <error_message>          FIELD          SHARE? Y
PASS        <source_file>            FIELD          SHARE? N
PASS        <dest_file>              FIELD          SHARE? N
GOSUB     --- .FILE MOVE
*         check for errors
IF        --- .FILE MOVE             NE
```

Description:

This subroutine will move a file or directory from one location to another, creating any required directories. All parameters are required, if any are missing the subroutine will CANCEL.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y".

<source_file> is the source file or directory to be moved (Required).

<dest_file> is the location where the file should be moved to (Required).

If <source_file> is a directory, then <dest_file> must also be a directory. If <source_file> is a file, then <dest_file> must also be a file.

If --- .FILE MOVE is not blank, you can check the <error_message> field for more information on why the move failed.

File permissions and ownership are not changed by the move.

.FILE RESTRUCT

This subroutine will restructure the specified file.

Usage:

```
PASS        <error_msg>              FIELD          SHARE? Y
PASS        <file_name>              FIELD          SHARE? N
PASS        <application>            FIELD          SHARE? N
PASS        <database>               FIELD          SHARE? N
GOSUB     --- .FILE RESTRUCT
*         Check for errors
IF        --- .FILE RESTRUCT         NE
```

Description:

This subroutine will restructure the specified file. This routine performs the same function as 'Restructure' in Data File Management.

It has the same restrictions as Data File Management, ie, the user running the command must be either a System Administrator, or have Database Management rights for the Database/Application. The file to be created must be a Disk Permanent file, the 'Create By Database Mgmt?' flag in the Data Dictionary must be "Y", and the 'Use DB' field must be blank.

<error_message> contains additional error information if the command fails (Required). Must be PASSed with Share "Y". Note that this message can be up to 500 characters in length.

<file_name> is the file to be restructured (Required). This must be a file defined in your Data Dictionary.

<application> is the application that contains the Data Dictionary for <file_name> (Optional). If not specified, it will default to the current application.

<database> is the database in which the file should be restructured (Optional). If not specified, it will default to the current Database.

If --- .FILE RESTRUCT contains 'Unable to Restructure', you can check the <error_message> field for more information on why the restructure failed.

If it contains 'Restructure Complete', <error_message> will contain additional information, such as 'Restructure Not Required', 'Structure File Rebuilt', or 'Restructured'. If <error_message> contains 'Restructured', that indicates that an actual restructure was performed.

.FILE SPLIT FILENAME

This subroutine is called to separate a filename into it's name and extension parts.

Usage:

```
PASS        <filename_part>          FIELD          SHARE? Y
PASS        <extension_part>         FIELD          SHARE? Y
PASS        <full_filename>          FIELD          SHARE? N
GOSUB     --- .FILE SPLIT FILENAME
*         check for errors
IF        --- .FILE SPLIT FILENAME   NE
```

Description:

This subroutine is called to separate a filename into its name and extension parts. All parameters are required, if any are missing the subroutine will CANCEL.

<filename_part> will contain the filename part (Required). This must be PASSed with Share "Y".

<extension_part> will contain the file extension part, including its leading period (Required). This must be PASSed with Share "Y".

<full_filename> is the full filename to separate (Required).

The subroutine identifies the <extension_part> by locating all the characters after the last period in <full_filename>. If there are no periods in <full_filename>, then <full_filename> will be returned in <extension_part> and <filename_part> will be empty (the entire name is considered the extension). If <full_filename> contains a leading path, that will also be returned in <filename_part>. See .FILE SPLIT PATHNAME to split the pathname from the base file name.

A 'Data was truncated' error will be returned in .FILE SPLIT FILENAME if the fields you pass are too short to contain either the file name or file extension.

.FILE SPLIT PATHNAME

This subroutine is called to separate a full pathname into it's path and name parts.

Usage:

```
PASS        <path_part>              FIELD          SHARE? Y
PASS        <file_part>              FIELD          SHARE? Y
PASS        <full_pathname>          FIELD          SHARE? N
GOSUB     --- .FILE SPLIT PATHNAME
*         check for errors
IF        --- .FILE SPLIT PATHNAME   NE
```

Description:

This subroutine is called to separate a full pathname into it's path and file name parts. All parameters are required, if any are missing the subroutine will CANCEL.

<path_part> will contain the path portion of the full file and path name, including the trailing slash (/ or \). (Required). This must be PASSed with Share "Y".

<file_part> will contain the file name portion of the full file and path name (Required). This must be PASSed with Share "Y".

<full_pathname> is the full path and file name to separate (Required).

The subroutine identifies the <file_part> by locating all the characters after the last / or \ in <full_filename>. If there aren't any in <full_pathname>, then <full_pathname> will be returned in <file_part> and <path_part> will be empty. See .FILE SPLIT FILENAME to split a file name and extension. Note that results may not be accurate if <full_pathname> contains both \ and / (ie, a Linux path that includes \ to escape characters). A Linux path like "/usr/local/\$money" will correctly return "$money", but a path like "/usr/local/\$mon*ey" will only return "*ey".

A 'Data was truncated' error will be returned in .FILE SPLIT PATHNAME if the fields you pass are too short to contain either the file name or path.

.STREAM CLOSE

This subroutine is called close a file stream and free up it's resources.

Usage:

```
PASS        <stream_name>           FIELD          SHARE? N
GOSUB     --- .STREAM CLOSE
*         check for errors
IF        --- .STREAM CLOSE         NE
```

Description:

This subroutine is called to close a file stream previously opened via .STREAM OPEN.

This <stream_name> parameter is required. The subroutine will CANCEL if it is not received.

To close all open streams, use .STREAM CLOSE ALL.

.STREAM CLOSE ALL

This subroutine is called close all file streams and free up their resources.

Usage:

```
GOSUB     --- .STREAM CLOSE ALL
*         check for errors
IF        --- .STREAM CLOSE ALL     NE
```

Description:

This subroutine is not passed any fields. It cycles through all currently open stream files and performs a close on each.

To close a specific stream file, see .STREAM CLOSE.

.STREAM OPEN

This subroutine is called to open a file stream.

Usage:

```
PASS        <stream_name>          FIELD        SHARE? N
PASS        <pathname>             FIELD        SHARE? N
PASS        <open_mode>            FIELD        SHARE? N
PASS        <line_termination>     FIELD        SHARE? N
GOSUB     --- .STREAM OPEN
*         check for errors
IF        --- .STREAM OPEN        NE
```

Description:

This subroutine is called to open a file stream. A file stream can point to an actual file on the filesystem, or it can be output from an O/S command (eg, opening a 'pipe' via a file name of "|dir" or "|ls- l"), or it can be a URL (eg, http://www.appx.com).

The first three parameters are required, and the subroutine will CANCEL if they are are not all received. The <line_termination> parameter is optional.

<stream_name> is the symbolic name of the stream used to open the file (Required). This can be any name you desire. All subsequent operations on this stream will be via this name.

<pathname> is the actual file to be opened (ie, /tmp/appx-registration.txt), the pipe to be read (ie, "|ls -l /tmp") or the URL to be read (ie, http://www.appx.com) (Required). If you are opening a file for WRITE or APPEND, Appx will also create the path if necessary.

<open_mode> determines how the file will be opened. Valid values are READ, WRITE, and APPEND. You may also just use the first letter of each word (R, W, A).

<line_termination> determines how each line will be terminated. Valid values are LF, CR/LF or NONE. This parameter is optional, and if not specified will default to CR/LF for Windows based servers and LF for all other servers. These characters will be added to the end of every line when you write it, or removed from every line when you read it.

You can open more than one stream file at at time, so long as the <stream_name> is different. Once opened, a stream file stays open until either it is explicitly closed via .STREAM CLOSE or .STREAM CLOSE ALL or your session ends.

This command is run by the appx engine, not by 'shelling out' to the O/S level, therefore the file will have the permissions of the engine (if you are creating a file) or must be readable by the engine (if you are reading a file). On Linux/Unix systems, if the 'setuid' bit is set, then the permissions will be those of user 'appx'. If you do not have the 'setuid' bit set, then the permissions will be those of whatever user you have the engine configured to impersonate. On Windows the permissions will be those of the current user.

There are 3 special file names: STDIN:, STDOUT: and STDERR:. These allow you to pipe data into an Appx session or pipe data out, or both. For example, you could write a subroutine that opens STDIN: for reading and STDOUT: for writing. You can then pipe data to a command that starts appx and runs this subroutine:

date | appx -a=<your application id> -d=<your database id> -t=SUBR -p="NAME_OF_YOUR_SUBROUTINE"

Your subroutine will then be able to read the output from the 'date' command. If your subroutine opened STDOUT: and wrote data to it, you could pipe the output from appx to another command:

appx -a=<your application id> -d=<your database id> -t=SUBR -p="NAME_OF_YOUR_SUBROUTINE" -s | more

> Note the use of -s on the command line. This prevents Appx from outputting special terminal control characters to STDOUT:

.STREAM READ

This subroutine is called to read a file stream.

Usage: (Option 1)

```
PASS        <read_buffer>          FIELD        SHARE? Y
PASS        <stream_name>          FIELD        SHARE? N
PASS        <read_length>          FIELD        SHARE? Y
GOSUB     --- .STREAM READ
*         check for errors
IF        --- .STREAM READ         NE
```

Usage: (Option 2, 5.3.2 or later only)

```
PASS        <read_buffer>          FIELD          SHARE? Y
PASS        <stream_name>          FIELD          SHARE? N
PASS        <read_length>          FIELD          SHARE? N
PASS        <length_read>          FIELD          SHARE? Y
GOSUB     --- .STREAM READ
*         check for errors
IF        --- .STREAM READ         NE
```

Description:

This subroutine is called to read a file stream previously opened for READ access via .STREAM OPEN.

The first two parameters are required, and the subroutine will CANCEL if they are are not all received. The <read_length> and <length_read> parameters are optional.

<read_buffer> contains the data read from <stream_name> (Required). This subroutine can read lines up to a maximum of 32000 characters long. This must be passed SHARED to return any data.

<stream_name> is the name of the previously opened stream (Required).

<read_length> is the number of bytes to read (optional). If not passed it will read up until a line termination character to a maximum of 32000 characters. If a value is passed it will read up to that number of characters or until a line termination character is encountered, whichever comes first. In Option 1, if passed shared, it will return the number of characters actually read, however, you should set it back to 32000 before the next GOSUB --- .STREAM READ, otherwise this subroutine will only read that number of characters (or less). If you PASS <length_read> as in Option 2, this will value not return anything and will not change, even if passed SHARED. In this case, the number of bytes read will be returned in <length_read>.

<length_read> is the number of characters actually read (5.3.2 and higher only). This must be passed SHARED to return a value.

If --- .STREAM READ contains 'Data was truncated', it means the <read_buffer> field you passed was not large enough to contain all the data that was read. If --- .STREAM READ contains 'EOF', then there is no more data to be read.

.STREAM WRITE

This subroutine is called to write data to a file stream.

Usage:

```
PASS        <write_buffer>          FIELD          SHARE? N
PASS        <stream_name>           FIELD          SHARE? N
GOSUB     --- .STREAM WRITE
*         check for errors
IF        --- .STREAM WRITE         NE
```

Description:

This subroutine is called to write data to a file stream previously opened for WRITE or APPEND access via .STREAM OPEN.

The first two parameters are required, and the subroutine will CANCEL if they are are not all received.

<write_buffer> contains the data to be written (Required). This subroutine can write lines up to a maximum of 32000 characters. The <line_termination> character you specified when you opened the file will automatically be appended to your data.

<stream_name> is the name of the previously opened stream (Required).

.XML IMPORT

Usage:

```
SET       0DX .XML IMPORT           =
PASS        <key>                   FIELD          SHARE? Y
PASS        <XML_file>              FIELD          SHARE? N
PASS        <XML_Map>               FIELD          SHARE? N
PASS        <Import_Flag>           FIELD          SHARE? N
PASS        <Delete_Flag>           FIELD          SHARE? N
SUBR      0DX .XML IMPORT                  DETACHED     END? N  FAIL 0
*         Check for errors
IF        0DX .XML IMPORT           NE
```

Description:

This subroutine processes an XML file and optionally imports it. The first 2 parameters are required. If any required parameters are missing, the subroutine will CANCEL.

<key> is the numeric key that will be assigned to this import (Required). This must be PASSed with Share "Y" to return the value.

<XML_file> is the XML file to be processed and optionally imported (Required). This must be a file accessible to the Appx session on the server.

<XML_Map> is the mapping to use (Optional). If PASSed, must refer to a previously defined mapping. If you want the API to import your data, the mapping must include a subroutine name and the subroutine must exist. If you are planning to process the extracted identifiers and data yourself, you do not need to pass a map name.

<Import_Flag> A Y/N flag to indicate if the data import subroutine specified on the mapping should be run (Optional). If you pass Y, you must pass a valid Map Name in the previous parameter.

<Delete_Flag> A Y/N flag to indicate if the XML Source File should be deleted (Optional - Release 5.4 and later only). This flag is not present in releases 5.3.3 and earlier, your XML file will be automatically deleted. In 5.4 and up, if you do not pass this flag, the XML Source File will not be deleted.

After the API is complete, your extracted data will be available in the 0DX XVALUE file. This is true, regardless of whether the API imported the data or not. The XVALUE file is keyed on the <key> that is returned from the API. Remember that there can be more than one imported file in XVALUE, you should use <key> in a BEG AT/END AT to only read the data records for this import.

XVALUE is a temporary file and the contents will be lost when the session ends.

> NOTE: This subroutine must be invoked DETACHED, and cannot be invoked via GOSUB. The 0DX .XML IMPORT field must be intialized in your process before invoking the API, or you will not get a return value.

.XML PURGE

Usage:

```
SET     0DX .XML PURGE                  =
PASS        <key>                       FIELD           SHARE? N
SUBR    0DX .XML PURGE                        DETACHED     END? N  FAIL 0
*       Check for errors
IF      0DX .XML PURGE                  NE
```

Description:

When importing large XML files, the work files used by 0DX can get very large. This API gives you a way to remove a particular import session.

<key> is the numeric key of the import session to be removed (Required).

If there is only one session to in the import work files, the API will use SCRATCH/CREATE to clear the data which will execute very quickly.

If there is more then one session, then the records have to be deleted individually, which may take some time to complete if there is lots of data.

> NOTE: This subroutine must be invoked DETACHED, and cannot be invoked via GOSUB. The 0DX .XML PURGE field must be intialized in your process before invoking the API, or you will not get a return value.

CHAPTER 4-9

Appx Chart Director API

Overview

Release 5.1.0 of the APPX Utility includes a new designer API which can be used to create charts within an APPX application. This API provides APPX Designers with a robust set of subroutines which can be called to design charts, define datasets, and render charts using datasets. These charts can then be dynamically embedded in APPX menus, input screens, and PDF reports.

The following pages in this manual continue to define the overview of the Chart Director API. See Appx wiki for detailed processes to implement and utilize this feature.

Using the API

Key Concepts

This page describes de key concepts you should know before using the API's.

Description:

The API's have been designed so that you have a minimum number of parameters to pass. They use the concept of the "current object", where Object can refer to a label, dataset, chart, etc. In other words, when adding data to a chart, you do not have to tell the API which chart you are adding it to, it will automatically add it to the "current" chart. Similarly, when telling the API to render a chart, you do not have to tell it which chart, it will also automatically render the "current" chart. Or, when you create a label for your chart, the label just created will become the 'current' label and when you call other API routines to set the font, color or other attributes, it will automatically apply to that label. If you are working with more than one chart at a time, you can name each chart as you initialize it, and use an API to switch the current chart to one of the named charts. You can also name datasets, shapes and other objects. Normally you only need to do this if you are working with more than one of these at a time; otherwise, leaving the name blank will suffice.

The API's may have one or more required parameters and one or more optional parameters. If you fail to PASS a required parameter, the API will CANCEL with an error message indicating which parameter is missing. When PASSing optional parameters, you may have to PASS dummy parameters to fill in any gaps. For example, if an API takes 3 optional parameters, and you want to PASS a value to the second parameter, then you will have to PASS something for the first optional parameter, then the value you want for the second parameter. Otherwise, the API will associate your value with the first optional parameter, not the second.

The parameters for the API's are case insensitive, so TOPLEFT is the same as tOpLeFt or tOPLEFt.

For every API, there is a work field of the same name that will contain any return codes from the API. You can test this work field for a non blank value after returning to see if an error occurred. The work fields are tokenized, so you can SCAN the possible values in the ILF editor.

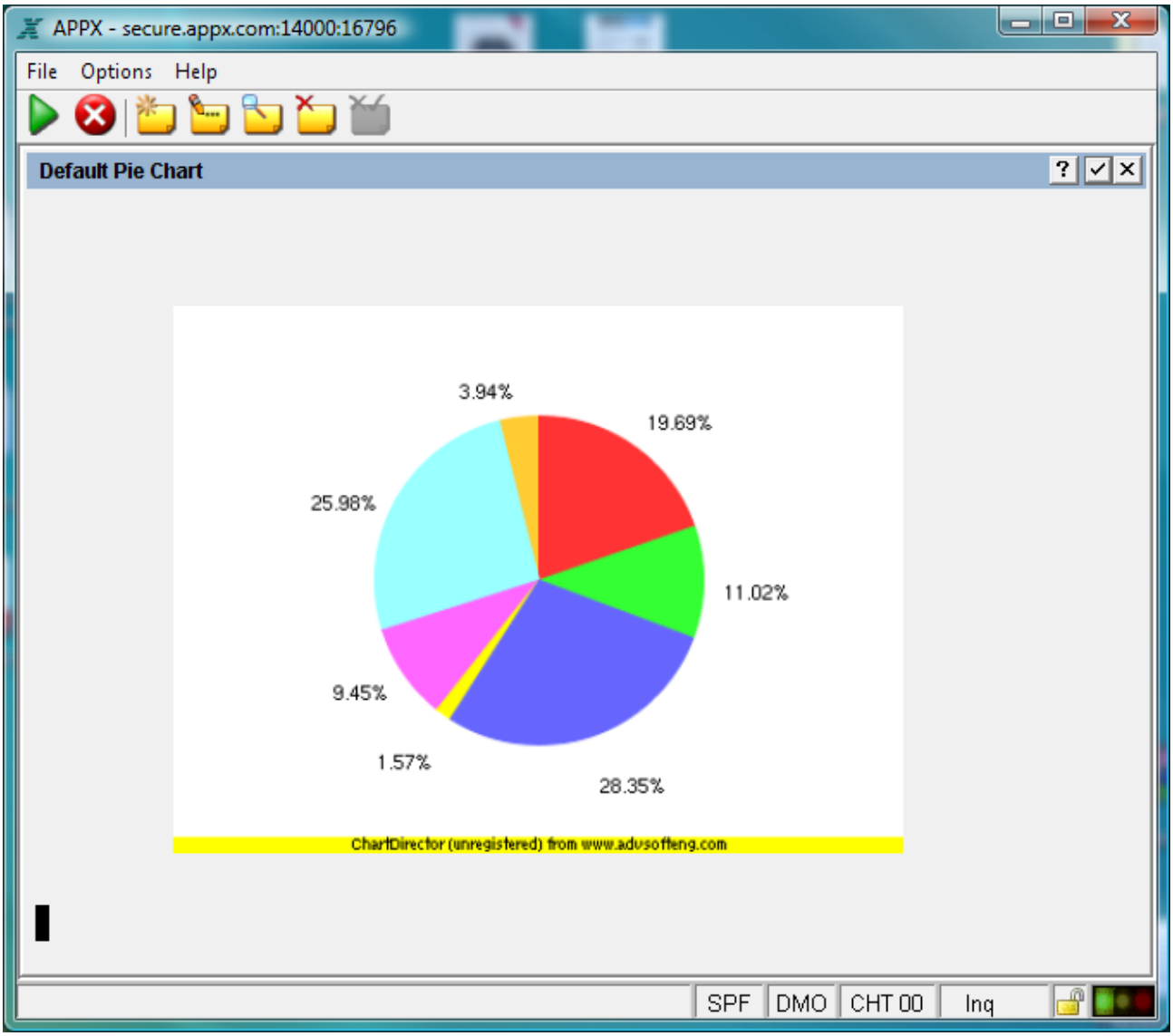
The API names begin with a period to distinguish the external routines from the internal ones. You will notice a number of other subroutines in the 0CD application that do not begin with a period. These are the internal subroutines used by the API itself, do not try to call them directly.

The 1CD application contains a number of examples. Use it as a reference until you are familiar with using the API's. The examples come directly from the samples in the Chart Director documentation. **Although the examples use a GOSUB command to call the API, you might want to consider using a SUBR with SUBPROCESS invocation instead. This will greatly reduce the size of the executable module and the time it takes to create the Em. There is a slight performance trade off, but unless you are generating several charts at a time, it won't be noticed.**

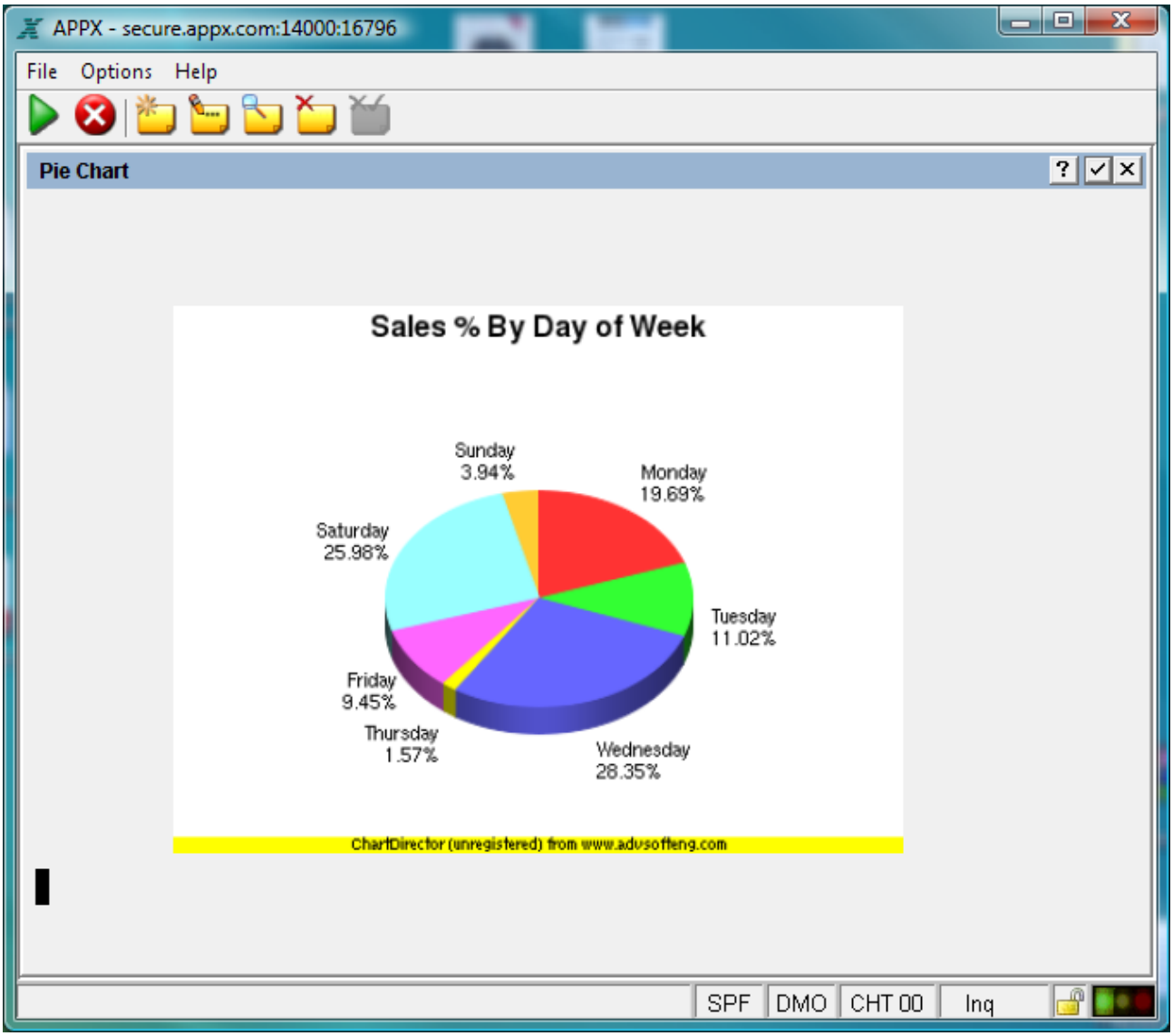
Designing a Chart

Designing a chart can be as simple as calling two subroutines - one to initialize a new chart specification (.CHART INITIALIZE) and one to render the chart (.CHART RENDER). The following example illustrates the ILF statements needed to initialize and render a default pie chart (/tmp/piechart.png) using a previously defined dataset consisting of seven data values

```
*       Initialize Pie Chart
PASS        PIE CHART                   FIELD           SHARE? N
GOSUB   0CD .CHART INITIALIZE
*       Note: We aren't showing the steps to supply the data,
*       see the next example
*       Render chart
SET     --- TEMP 256                    =      /tmp/piechart.png
PASS    --- TEMP 256                    FIELD           SHARE? Y
SUBR    0CD .CHART RENDER                     SUBPROCESS   END? N  FAIL 0
```


APPX - secure.appx.com:14000:16796
File Options Help
Default Pie Chart
3.94%
19.69%
25.98%
11.02%
9.45%
1.57%
28.35%
ChartDirector (unregistered) from www.advsofteng.com
SPF
DMO
CHT 00
Inq

```
*       ================================================================
*       Create Pie Chart
*       ================================================================
*       Initialize a Pie Chart
PASS        PIE CHART                   FIELD           SHARE? N
GOSUB   0CD .CHART INITIALIZE
*       Set a title
PASS        Sales % By Day of Week      FIELD           SHARE? N
GOSUB   0CD .CHART SET TITLE
*       Set 3D view
PASS        3D                          FIELD           SHARE? N
GOSUB   0CD .PIE SET VIEW
*       Add pie sectors with day of week labels and data values
PASS        25                          FIELD           SHARE? N
PASS        Monday                      FIELD           SHARE? N
GOSUB   0CD .PIE SECT ADD NEXT
PASS        14                          FIELD           SHARE? N
PASS        Tuesday                     FIELD           SHARE? N
GOSUB   0CD .PIE SECT ADD NEXT
PASS        36                          FIELD           SHARE? N
PASS        Wednesday                   FIELD           SHARE? N
GOSUB   0CD .PIE SECT ADD NEXT
PASS        2                           FIELD           SHARE? N
PASS        Thursday                    FIELD           SHARE? N
GOSUB   0CD .PIE SECT ADD NEXT
PASS        12                          FIELD           SHARE? N
PASS        Friday                      FIELD           SHARE? N
GOSUB   0CD .PIE SECT ADD NEXT
PASS        33                          FIELD           SHARE? N
PASS        Saturday                    FIELD           SHARE? N
GOSUB   0CD .PIE SECT ADD NEXT
PASS        5                           FIELD           SHARE? N
PASS        Sunday                      FIELD           SHARE? N
GOSUB   0CD .PIE SECT ADD NEXT
*       ================================================================
*       Render chart
*       ================================================================
SET     --- TEMP 256                    =       /tmp/piechart.png
PASS    --- TEMP 256                    FIELD           SHARE? Y
SUBR    0CD .CHART RENDER                     SUBPROCESS   END? N  FAIL 0
```



Also notice the use of SUBR instead of GOSUB to call the chart rendering subroutine. This is a large process and compile times/sizes will be reduced if you call it as a separate process instead of including it in your process with a GOSUB.

Defining a Dataset

Data and the presentation of data on a chart is separated into distinct areas, by design. This allows you to have a process that produces a chart, but does not have to know anything about the data that is being charted. A separate process can accumulate the data to be charted, then simply run the other process to produce the chart. The actual data is organized into a particular structure: a 'data point' is the smallest unit and represents one unit of data and a 'data set' is a collection of related 'data points'. For presentation purposes, there is a 'data set template', a 'data group', which is a collection of 'data set templates' and a 'layer', which is a collection of 'data groups'.

All of the above can be named, or not. If you are working with multiple layers, data groups, data set templates, or data sets, you can name them to make charting easier. If you only need one layer, data group, data set template, etc, then you can leave the names blank when you create them.

Attributes of 'layers', 'data groups', and 'data set templates' can all be set individually; i.e., you can change the color or shape of all the bars in a 'data group' to make it different from other bars. The Layer type will determine how the data will be presented; i.e., you can have an XY layer type for bar charts, an Area layer for area charts, etc. You can render more than one layer on a chart, combining the various chart types.

The data to be plotted on a chart is kept in a 'data set'. There is no specific limit to the number of 'points' in your dataset. You can also manage more than one dataset at a time by giving each dataset a unique name when you initialize it.

The general flow is to initialize a dataset, then use various subroutines to add data to your dataset. When you initialize a Pie chart, a dataset is initialized automatically for you. If you already have a dataset initialized when you call the chart initialization routine for a Pie chart, then that dataset will be associated with the new chart.

Certain chart types have specific routines for defining layers of data; e.g., a bar chart that plots more than one set of data. These are discussed under the API's for that particular chart type. Pie charts have a specific API that lets you add a datapoint and a label for it at the same time (see Chart design example).

The following code illustrates adding a layer of data to a bar chart:

```
*    ================================================================
*
*    Add a bar chart layer to the chart
GOSUB  0CD .XY ADD BAR LAYER
*
*    Add data group
GOSUB  0CD .LAYER ADD DATA GROUP
*
*    Add dataset template
GOSUB  0CD .LAYER ADD DATASET TM
*    ================================================================
*    Initialize dataset
*    ================================================================
PASS    1             FIELD      SHARE? N
GOSUB  0CD .DATASET INITIALIZE
*
*    Link dataset template to dataset
GOSUB  0CD .LAYER LINK DATASET TM
*
*    ================================================================
*    Add data to dataset
*    ================================================================
*
PASS    85            FIELD      SHARE? N
GOSUB  0CD .POINT ADD NEW
*
PASS    156            FIELD      SHARE? N
GOSUB  0CD .POINT ADD NEW
*
PASS    179.5           FIELD      SHARE? N
GOSUB  0CD .POINT ADD NEW
*
PASS    211            FIELD      SHARE? N
GOSUB  0CD .POINT ADD NEW
*
PASS    123            FIELD      SHARE? N
GOSUB  0CD .POINT ADD NEW
```

In this example, there was only one set of data, so the default names were used for creating and linking the data. A more complicated example would be where we have network usage for 3 different servers for a one week period (Mon - Fri). First we would initialize a 'data set' for one of the servers (possibly naming it 'SERVER1') via .DATASET INITIALIZE. Then we would add each days network usage for that server via .POINT ADD NEW. We would repeat the steps for the second and third server, naming each 'data set' as appropriate. We now have three 'data sets' that contain the 'data points' of the network usage for each server. To plot this on a bar chart, we would create a 'Layer' for our chart via .XY ADD BAR LAYER, then add a 'data group' via.LAYER ADD DATA GROUP. Next we would add 'data set templates' for each of the 3 servers via .LAYER ADD DATASET TM. This defines the presentation of our chart, without referring to the actual data. To add the data to our chart, would use .LAYER LINK DATASET TM to link our previously entered data with the 'data set templates.

The following illustrates this example:

```
GOSUB        :DEFINE CHART
GOSUB        :DEFINE LAYER
GOSUB        :DEFINE GROUPS
GOSUB        :DEFINE LABELS
*
GOSUB        :CREATE DATA
*        Link the data to the data set templates
PASS         SERVER1                    FIELD            SHARE? N
PASS         DS1                        FIELD            SHARE? N
GOSUB    0CD .LAYER LINK DATASET TM
PASS         SERVER2                    FIELD            SHARE? N
PASS         DS2                        FIELD            SHARE? N
GOSUB    0CD .LAYER LINK DATASET TM
PASS         SERVER3                    FIELD            SHARE? N
PASS         DS3                        FIELD            SHARE? N
GOSUB    0CD .LAYER LINK DATASET TM
*
GOSUB        :RENDER CHART
END
*
LABEL    :DEFINE GROUPS
*        ================================================================
*        Add a group to link datasets to
PASS         GROUP1                     FIELD            SHARE? N
GOSUB    0CD .LAYER ADD DATA GROUP
*
PASS         DS1                        FIELD            SHARE? N
GOSUB    0CD .LAYER ADD DATASET TM
*
*        Set Legend Title
PASS         Server # 1                 FIELD            SHARE? N
GOSUB    0CD .XY SET LEGEND TXT
*
*        Set dataset template color
PASS         RED                        FIELD            SHARE? N
GOSUB    0CD .XY SET BAR CLR
```

```
*        ================================================================
*        Add second dataset to group
*
PASS         DS2                        FIELD            SHARE? N
GOSUB    0CD .LAYER ADD DATASET TM
*
*        Set Legend Title and Layer Name
PASS         Server # 2                 FIELD            SHARE? N
GOSUB    0CD .XY SET LEGEND TXT
*
*        Set dataset template color
PASS         GREEN                      FIELD            SHARE? N
GOSUB    0CD .XY SET BAR CLR
*        ================================================================
*        Add third dataset to group
*
PASS         DS3                        FIELD            SHARE? N
GOSUB    0CD .LAYER ADD DATASET TM
*
*        Set Legend Title and Layer Name
PASS         Server # 3                 FIELD            SHARE? N
GOSUB    0CD .XY SET LEGEND TXT
*
*        Set dataset template color
PASS         BLUE                       FIELD            SHARE? N
GOSUB    0CD .XY SET BAR CLR
RETURN
*
*
*        Set Legend Title
PASS         Server # 1                 FIELD            SHARE? N
GOSUB    0CD .XY SET LEGEND TXT
*
*        Set dataset template color
PASS         RED                        FIELD            SHARE? N
GOSUB    0CD .XY SET BAR CLR
```

```
        LABEL    :RENDER CHART
        *        ================================================================
        *        Render chart
        *        ================================================================
        SET      --- TEMP 256                  =
        PASS     --- TEMP 256                  FIELD            SHARE? Y
        SUBR     0CD .CHART RENDER                   SUBPROCESS   END? N  FAIL 0
        IF       0CD .CHART RENDER             EQ
F       TRAP
        SET      1CD WORK CHART FILENAME    001 =  --- TEMP 256
        RETURN
        *
        LABEL    :CREATE DATA
        *        ================================================================
        *        Initialize and name a dataset
        *        ================================================================
        PASS         1                         FIELD            SHARE? N
        PASS         SERVER1                   FIELD            SHARE? N
        GOSUB    0CD .DATASET INITIALIZE
        *        ================================================================
        *        Add data points to dataset
        *        ================================================================
        PASS         100                       FIELD            SHARE? N
        GOSUB    0CD .POINT ADD NEW
        *
        PASS         125                       FIELD            SHARE? N
        GOSUB    0CD .POINT ADD NEW
        *
        PASS         245                       FIELD            SHARE? N
        GOSUB    0CD .POINT ADD NEW
        *
        PASS         147                       FIELD            SHARE? N
        GOSUB    0CD .POINT ADD NEW
        *
        PASS         67                        FIELD            SHARE? N
        GOSUB    0CD .POINT ADD NEW
        *        Second data set
        PASS         1                         FIELD            SHARE? N
        PASS         SERVER2                   FIELD            SHARE? N
        GOSUB    0CD .DATASET INITIALIZE
```

```
*        ================================================================
*        Add data points to dataset
*        ================================================================
PASS         97                          FIELD            SHARE? N
GOSUB    0CD .POINT ADD NEW
*
PASS         87                          FIELD            SHARE? N
GOSUB    0CD .POINT ADD NEW
*
PASS         56                          FIELD            SHARE? N
GOSUB    0CD .POINT ADD NEW
*
PASS         267                         FIELD            SHARE? N
GOSUB    0CD .POINT ADD NEW
*
PASS         157                         FIELD            SHARE? N
GOSUB    0CD .POINT ADD NEW
RETURN
*
LABEL    :DEFINE CHART
*        Create a Multi-Bar Chart
*
*        ================================================================
*        Initialize chart
*        ================================================================
*
*        Initialize an XY chart
PASS         XY CHART                    FIELD            SHARE? N
GOSUB    0CD .CHART INITIALIZE
*
```

```
*        ================================================================
*        Set chart attributes
*        ================================================================
*
*        Set chart size
PASS         500                        FIELD            SHARE? N
PASS         320                        FIELD            SHARE? N
GOSUB    0CD .CHART SET BG SIZE
*
*        Set the plot area
PASS         100                        FIELD            SHARE? N
PASS         40                         FIELD            SHARE? N
PASS         280                        FIELD            SHARE? N
PASS         240                        FIELD            SHARE? N
GOSUB    0CD .XY SET PLOT AREA
*        ================================================================
*        Add titles
*        ================================================================
*        Chart title
SET      --- TEMP 80                    =      Weekday
APPEND   --- TEMP 80                    1      Network Load
PASS     --- TEMP 80                    FIELD            SHARE? N
GOSUB    0CD .CHART SET TITLE
*        Y axis title
PASS         Y                          FIELD            SHARE? N
GOSUB    0CD .AXIS SET CURRENT
SET      --- TEMP 80                    =      "Average\n
APPEND   --- TEMP 80                    1      Workload\n
APPEND   --- TEMP 80                    1      (Mbytes\n
APPEND   --- TEMP 80                    1      Per Hour)"
PASS     --- TEMP 80                    FIELD            SHARE? N
GOSUB    0CD .AXIS SET TITLE
*        ================================================================
*        Add a legend box
*        ================================================================
PASS         400                        FIELD            SHARE? N
PASS         100                        FIELD            SHARE? N
GOSUB    0CD .CHART SET LEGEND BOX
*
RETURN
```

```
LABEL    :DEFINE LAYER
*        ================================================================
*        Add a layer to chart and set layer attributes.
*        ================================================================
SET      --- TEMP 1                    =
PASS         SIDE                      FIELD            SHARE? N
PASS     --- TEMP 1                    FIELD            SHARE? N
PASS         OFF                       FIELD            SHARE? N
GOSUB    0CD .XY ADD BAR LAYER
*
*        Set layer to be in 3D
PASS         5                         FIELD            SHARE? N
GOSUB    0CD .XY SET BAR 3D DEPTH
RETURN
*
LABEL    :DEFINE LABELS
*        ================================================================
*        Add X axis labels
*        ================================================================
*        Set the axis we are going to add labels to.
PASS         X                         FIELD            SHARE? N
GOSUB    0CD .AXIS SET CURRENT
*
PASS         Mon                       FIELD            SHARE? N
GOSUB    0CD .AXIS LABEL ADD NEXT
*
PASS         Tue                       FIELD            SHARE? N
GOSUB    0CD .AXIS LABEL ADD NEXT
*
PASS         Wed                       FIELD            SHARE? N
GOSUB    0CD .AXIS LABEL ADD NEXT
*
PASS         Thu                       FIELD            SHARE? N
GOSUB    0CD .AXIS LABEL ADD NEXT
*
PASS         Fri                       FIELD            SHARE? N
GOSUB    0CD .AXIS LABEL ADD NEXT
*
RETURN
```

In this example, when we defined the data set templates, we gave each of them a name (DS1, DS2, DS3), and when we added our data sets, we gave each of them a name as well (SERVER1, SERVER2, SERVER3). We were then able to link the data set template with the data set via .LAYER LINK DATASET TM, passing it the specific names we wanted linked. If we wanted to render this chart with a different set of data, all we have to do is create 3 new data sets, relink them using .LAYER LINK DATASET TM, and then render the chart again. Notice when we called .XY ADD BAR LAYER, we passed the OFF parameter to suppress the automatic creation and linking of data groups, data set templates and data sets. Since we are managing this ourselves, we did not want the routine to do it for us. Also notice the technique of passing an empty field to .XY ADD BAR LAYER. We wanted to pass the first and third parameters, so we had to have a dummy field to pass as the second parameter (--- TEMP 1 in this case).

Also notice the use of SUBR instead of GOSUB to call the chart rendering subroutine. That is a large process and compile times/sizes will be reduced if you call it as a separate process instead of including it in your process with a GOSUB.

Rendering a Chart

After you have initialized your chart, provided the data to plot and set any other desired attributes, you render the chart by calling the .CHART RENDER routine. This requires just one argument, a field to contain the name of the generated graphic file. The routine will then invoke Chart Director, which will create the graphic file. You can also pass a file name, in which case it will create that file in the default chart directory. If you pass a complete path and file name, the chart will be rendered to that location. If you pass a blank field, the API will assign a unique name for you, using the settings in the parameter file.

If you have standard colors or other attributes that should be the same across all charts, you can create your own subroutine that sets all these attributes before calling .CHART RENDER. In your applications, you would call this subroutine instead of calling .CHART RENDER directly. This would give all your charts a common look and feel.

To use the chart in an input or output process, place an alpha field on your image, drag it out to the appropriate size, and set the GUI attributes to PICTURE, Location Type of SERVER, Position to EXPAND PROP'L and check the Transparent flag. You can then pass this field to the .CHART RENDER routine, and Appx will display the completed chart on your image. Make sure the alpha field is long enough to contain the complete path and file name.

The rendered chart file is not automatically removed, it is your responsbility to clean up any chart files that are no longer needed. The End of Process Event point (for both Inputs and Outputs) is a logical choice, if you are only rendering one chart in the process. If you are rendering more than one chart in the process, you will have to use another technique.

Troubleshooting Tips

This page describes some troubleshooting tips.

- When creating a new chart, find an example chart that is close to the layout you want and use that as a starting point.
- If an API is not doing what you expect, check the return code. Checking the return codes is probably not necessary once your chart is working, but during development can help you track down a problem. For example, 0x00ff000 looks like a valid color code at first glance, but it's not and if you pass it to a color routine, the routine will return an error code.
- You should always check the result code from .CHART RENDER. If an error occurs, your program may display a previously rendered chart instead of the one you expect. In particular the result code

"Error Creating Image" means there was an error in the generated PHP script. This could be a possible CDML formating error in your process or an API bug. The work field .CHART RENDER ERROR may contain additional information, so try displaying this as well. It might be in HTML format, so use an HTML VIEWER control to display the field.

- If you cannot determine why your chart doesn't render, you can set the variable 0CD SESSION VIEW PHP to Y and try again. This will download and display the generated PHP code to your desktop. You can then review the code yourself, or paste it into a file & run it thru PHP directly. This will show you the exact line the error is occuring on. Note that 0CD SESSION VIEW PHP is a detached variable, so all charts will do this until you either turn it off or log off.