PeopleSoft

EnterpriseOne Development Tools 8.9 PeopleBook

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J.D. Edwards Tools

The J.D. Edwards Tools are an integrated set of application development tools. These tools allow business analysts to develop complete interactive and batch applications, such as forms and reports. The tools simplify the development process and limit the amount of programming necessary to create applications.

J.D. Edwards Tools also allow you to use the stability of J.D. Edwards methodology and the ease of the Microsoft Windows interface to create applications for client/server environments.

J.D. Edwards Acronyms

The following table describes many of the acronyms that are commonly used in J.D. Edwards software:

APPL	Application
BDA	Business View Design Aid
BSFN	Business Function
BSVW	Business View
CRP	Conference Room Pilot
DD	Data Dictionary
DLL	Dynamic Link Library
DS or DSTR	Data Structure
ER	Event Rule
FDA	Form Design Aid
NER	Named Event Rule
OCM	Object Configuration Manager
OL	Object Librarian
OMW	Object Management Workbench
QBE	Query by Example
RDA	Report Design Aid
SAR	Software Action Request

Specs	Specifications
TAM	Table Access Management
TBLE	Table
TC	Table Conversion
TDA	Table Design Aid
TER	Table Event Rule
UBE	Universal Batch Engine
UTB	Universal Table Browser
WF	Workflow

Understanding Objects and Applications

You use J.D. Edwards tools to build objects. You use objects to build applications. The following two topics describe objects and applications in more detail.

Understanding an Object

By industry standards, an object is a self-sufficient entity that contains data as well as the structures and functions that are used to manipulate that data. In J.D. Edwards software, an object is a reusable entity that is based on software specifications created by the J.D. Edwards Tools.

A specification is a complete description of a J.D. Edwards object. Each object has its own specification, which is stored on both the server and the workstation. Some specifications describe different types of objects. For example, the data structure specification is used to describe a business function data structure, a processing option structure, and a media object structure.

J.D. Edwards architecture is object-based. This means that discrete software objects are the basis for all applications, and that developers can reuse the objects in multiple applications. This use of objects (applications being broken down into smaller components) allows J.D. Edwards to provide true distributed processing. Developers create the objects using J.D. Edwards Tools.

Examples of J.D. Edwards objects include the following:

- Batch applications
- Business functions (encapsulated routines)
- Business views
- Data dictionary items
- Data structures

- Event rules
- Interactive applications
- Media objects
- Tables

Understanding an Application

An application is a collection of objects that performs a specific task. You use J.D. Edwards Tools to build the following standard groups of related applications:

- Architecture, engineering, and construction
- Distribution
- Energy and chemical systems
- Financial
- Workforce management
- Manufacturing
- Technical

These applications share a common user interface because they are all generated through J.D. Edwards Tools. Applications refer to both interactive and batch applications. For example, all of the following are applications:

- Address Book Revisions
- Sales Order Entry
- General Ledger Post
- Trial Balance Report

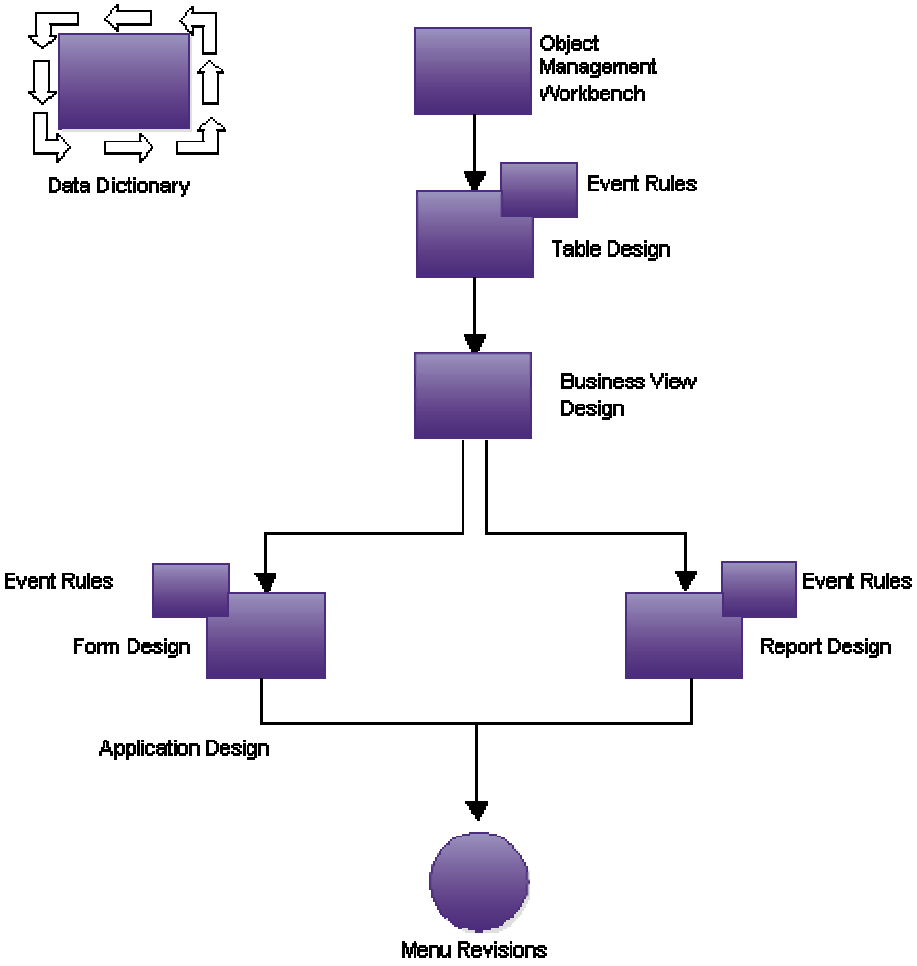
Understanding How to Build an Application

You can use the J.D. Edwards Tools to build your applications. You might not need to use every tool to create an application; however, you always begin your application development from the Object Management Workbench. For example, you might not need to add or modify data items. If so, you can proceed to Table Design from the Object Management Workbench. If one or more existing database tables already contain all of the data items that you want to include in your application, then you can skip the step of designing a table and proceed to Business View Design.

Understanding the Development Cycle

The following figure illustrates the software development cycle, showing relationships between the various tools.

Understanding the Development Cycle



Understanding How J.D. Edwards Stores Objects

J.D. Edwards stores objects in the following two places:

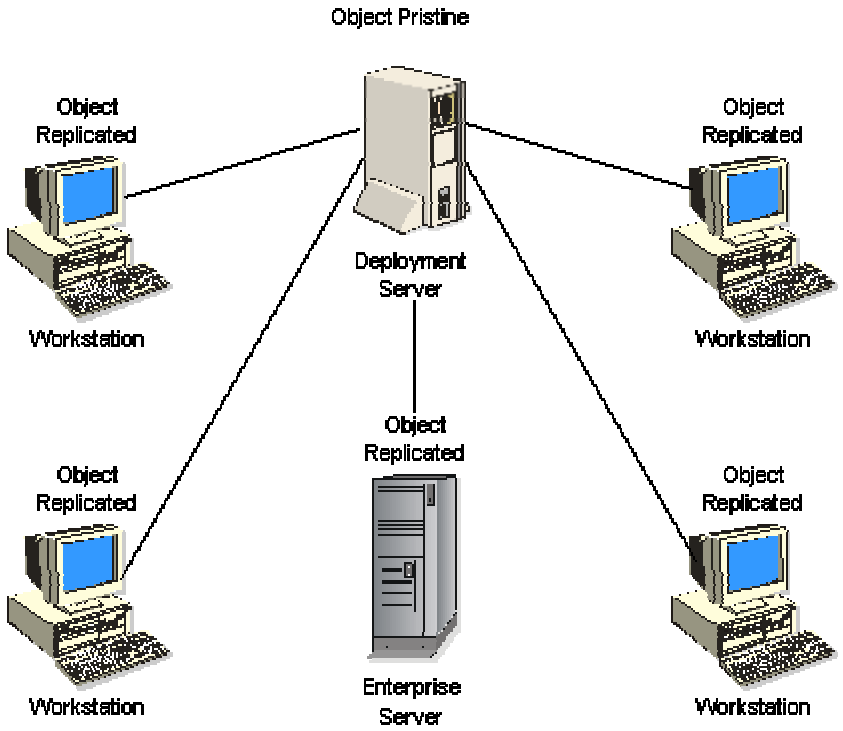
- A central-storage server, which stores central objects

  Central objects reside in a central location from which you can deploy them. Other objects, such as specifications, are stored in a relational database. Still others, such as DLLs and source code, are stored on a file server.

- Any machine (workstation or server) that runs J.D. Edwards software and stores replicated objects

  A copy (replicated) set of the central objects must reside on each workstation and server that runs J.D. Edwards software. The path code indicates the directory in which these objects are located.

How J.D. Edwards Stores Object



You move objects between the server and workstation by using the design tool for the specific object type, and by using check in and check out. When you create an object, it initially resides on your workstation. Unless you check it into the server, it is available only to you. After you check it into the server, it is available for other users to check out.

When you check out an object, all object specification records (a collection of data that defines a J.D. Edwards object) are replicated from the server to your workstation.

Understanding the J.D. Edwards Toolset

The J.D. Edwards Tools is a toolset composed of several tools that you use to create an interactive or batch application. These tools are described in more detail in the topics that follow.

Object Management Workbench

The Object Management Workbench manages all objects. Developers use the Object Management Workbench to check out objects from a central development environment and copy the objects to their desktops. They can then use the tools to revise objects and check in the objects so that others can access the objects. Developers can access only J.D. Edwards Tools through the Object Management Workbench.

Data Dictionary

Just as a dictionary contains word definitions, the J.D. Edwards data dictionary is a central repository that contains data item definitions and attributes. Attributes determine the way in which a data item does the following:

- Appears on reports and forms (factors such as the number of decimal positions and whether default values appear)
- Validates data entry within an application
- Assigns column and row descriptions
- Provides text for field-sensitive help
- Is stored in a table

The data dictionary is active because the changes that you enter in it are automatically reflected in applications; you do not need to recompile the software to see the changes.

Table Design

A relational database table stores data that an application uses. You can create one or more tables for use in an application. To create a table, you select data items for the table, and then assign key fields as indices for retrieving and updating data.

Table Design Aid creates a .H file. You use OMW to check this file into source.

Business View Design

Business views are the link between applications and data. A business view defines the data items from one or more tables that an application uses. After you create the tables, you select the data items from one or more tables that you want to include in your business view. With business views, you typically select only the columns that you need in the application, which increases performance by reducing the amount of data that must move over a network. For example, from a table that contains all employee data, you can create a business view that contains only employee names and addresses.

Form Design

An interactive application allows a user to access a database (based on a business view). Users typically use a form to access an interactive application in which they add, modify, or view data.

To create an application, you determine the type of forms that your application requires, and associate each form with a business view. To design forms, you add controls such as a grid, edit fields, push buttons, and radio buttons.

Several standard form types have much of the required processing already established. Examples include:

Find/Browse	Used for inquiry forms, such as Work with Sales Orders.
Fix/Inspect	Used to add or modify a single record. Sales Order Header is an example of a fix/inspect form.
Header Detail	Used to modify multiple records at a time (particularly on normalized tables). Sales Order Detail is an example of a header detail form.
Headerless Detail	Used to modify multiple records in a table that is not normalized. Voucher Entry is an example of a headerless detail form.
Search and Select	Used to automatically retrieve data in a visual assist field.
Parent/Child	Used to display multiple records that have a parent/child relationship in an Explorer-like tree view. Bill of Material is an example of a parent/child form.
Message	Used to display messages or request action. Delete Confirmation is an example of a message form.

Report Design

You use Report Design to create reports and batch processes. In Report Design, you design sections instead of forms. To create a report, you determine the data that you want to appear on the report. You then attach event rules that provide business logic, and specify processing options that control the format, page breaks, report totaling, and how the report processes data. Examples of reports and batch processes are:

- Sales Update
- General Ledger Post
- Trial Balance by Cost Center
- Invoices
- Table Conversions
- Financial Reporting

Business Function Design

A business function is an encapsulated reusable routine that can be called through event rules. Code for business functions can be written in most industry-standard third-generation languages. You use Business Function Design to write business functions that provide background processing to handle specialized tasks that an application needs, such as specialized editing for a field.

Event Rules

Event rules are logic statements. You create event rules and attach them to events. Events are activities that occur in an application, such as entering a form, exiting a field, exiting a row, or initiating a page break on a report. Event rules respond when the user or the system initiates an event. Events are attached to controls, such as a particular field, the entire form, the grid, or a report section.

You use event rules to create complex business logic without the difficult syntax that comes with most programming languages. Examples of business logic that you can accomplish with event rules include:

- Perform a mathematical calculation
- Perform table I/O (fetch, insert, delete)
- Pass data from a source field on a form to a target field on another form
- Connect two forms or applications
- Hide or display a control by using a system function
- Evaluate if/while and else conditions
- Assign a value to an expression in a field
- Create variables (work fields) as you are working
- Perform a batch process after completing an interactive application
- Attach a business function or system function
- Initiate workflow processes

The two types of event rules are:

- Business function event rules
- Embedded event rules

Business Function Event Rules

Business function event rules are encapsulated, reusable business logic created through event rules, rather than C programming. Business function event rules are stored as objects and are compiled.

Embedded Event Rules

Embedded event rules are specific to a particular table, interactive application, or batch application. They are not reuseable. Examples include creating form-to-form calls, hiding a field based on a processing option value, and calling a business function. You can place embedded event rules in application event rules (interactive or batch) or in table event rules. The following table explains the distinctions:

Application event rules (interactive or batch)	Allow you to add business logic that is specific to a particular application. Interactive applications connect event rules using the Form Design Aid; batch event rules use Report Design.
Table event rules	Allow you to create J.D. Edwards database triggers, or rules that are attached to a table and are executed through Table Design Event Rules. The logic attached to a table is executed whenever any application initiates that database action. For example, to maintain referential integrity, you might have rules on a master table that delete all children when a parent is deleted. Any application that initiates a delete of that table does not need to include the parent/child logic because that logic exists resides at the table level.

Processing Options

Processing options control how interactive and batch applications process data. You can have several versions of the same basic set of processing options. Each version typically differs from the other versions. For example, you can use processing options to do the following:

- Determine the sequence of the forms in an application
- Set default values
- Enable and disable special processing, such as currency or kit processing in Sales Order Entry

Fundamentals

Fundamentals discusses the basic concepts and tools that you need to know to start developing applications. It includes the preliminary steps that you must take before you actually design an application.

Data Dictionary

Just as a dictionary contains word definitions, the J.D. Edwards data dictionary is a central repository that contains data item definitions and attributes. A data item identifies a unit of information. The data item definition defines how the item can be used and includes information such as the type of item and its length. The data item attributes determine how a data item does the following:

- Appears on reports and forms (such as the number of decimal places, and whether default values appear)
- Validates data entry within an application
- Assigns column and row descriptions
- Provides text for field-sensitive help
- Is stored in a table

The data dictionary is dynamic. That is, any changes that you make to a data item are effective immediately for all applications that include the data item. Applications access the data dictionary at runtime and immediately reflect modifications to data item attributes, such as field descriptions, column headings, decimals, and edit rules.

You use the data dictionary to create, view, and update attributes for data items. You can copy a data item that has similar attributes and modify it for your specific needs. This method might be quicker and easier than creating a new data item. If you do this, you must distinguish between the copy and the original. You do so by modifying the alias.

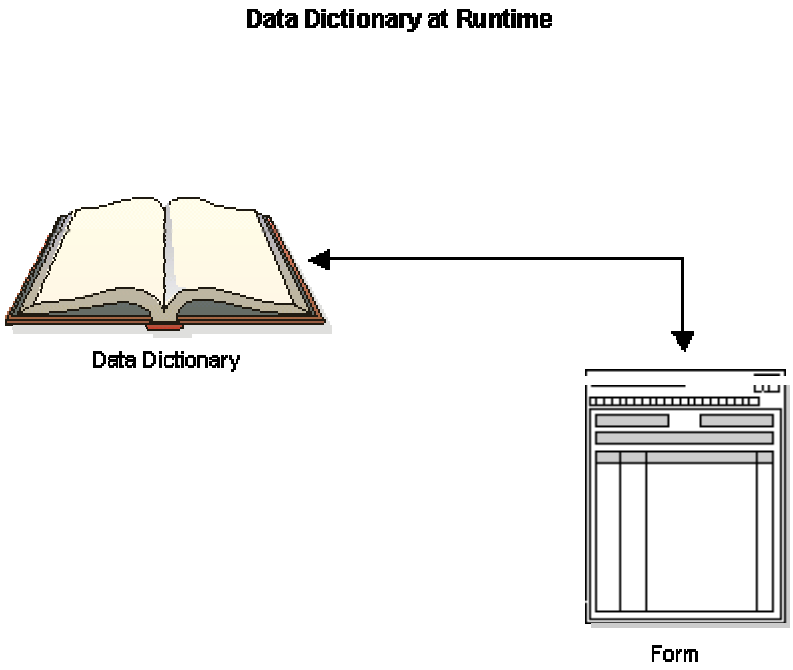
When you change a data item, the changes are immediately reflected throughout the J.D. Edwards tools at runtime. You should be aware that changing the type and any of the attributes of a data item might affect how your data is stored and cause discrepancies between records.

Caution

The data dictionary does not verify whether a data item is used by an application when you delete it. If you delete a data item that an application uses, the application will fail.

How the Data Dictionary is Used at Runtime

The following graphic illustrates how the system processes certain information about data items:



At runtime, J.D. Edwards applications (such as those in Accounts Payable or Sales Order Management) access the data dictionary and reflect the assigned attributes in any of the following fields:

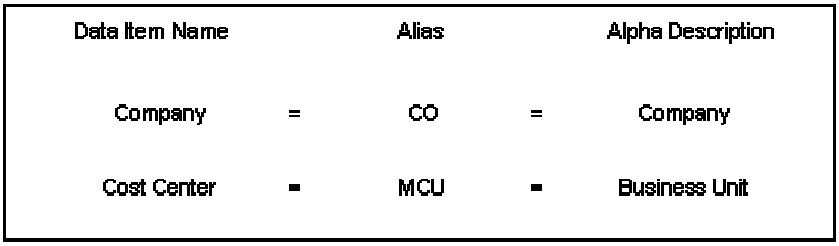
- Display Decimals
- File Decimals
- Alpha Description
- Data Type
- Size
- Glossary
- Allow Blank Entry *
- Upper Case Only *
- All Triggers *
- Row and Column Headings *

The application retrieves field information from the data dictionary. Fields marked with an asterisk (*) can be overridden in Form Design and Report Design. In these instances, the application retrieves the overrides, if any exist.

Naming Data Items

The following graphic illustrates the naming components for a data item:

Naming Components for a Data Item



After a data item is created, you can change only the alpha description; you cannot change the data item name and alias. When you add a data item, the data dictionary validates the data item and alias fields to ensure that they are unique.

Storing the Data Dictionary and Data Dictionary Items

Core data dictionary information is stored in the following two places:

- The central object data dictionary is stored in a relational database. All changes to the data dictionary that will be replicated must be done here.
- The replicated data dictionary allows each workstation to have a set of data dictionary tables stored in specification tables on the client machine.

Data dictionary items reside on enterprise (logic) servers in relational database tables. Workstations retrieve from the publisher data dictionary (the relational database tables) only those data items that are necessary for the applications that you are using. This replication occurs when you use an application for the first time after installing OneWorld. This data dictionary information is stored on your workstation in a permanent cache under the same local path code and spec directory as the following global tables:

- glbltbl.xdb (references for the data)
- glbltbl.ddb (the data items)

If data items have been changed and you want to replicate the changes to workstations immediately, you must use the Data Replication (P98DREP) application. When you have data replication set up and an item is changed, the next time that a machine that is set up as a subscriber signs on to the system, the permanent cache for that data item will be deleted. Then, the next time that a user accesses an application that has that changed data item, the system detects that the information is not in the permanent cache and retrieves the information from the publisher data dictionary (the relational database tables).

If you use J.D. Edwards ERP software in coexistence with WorldSoftware, you must maintain two data dictionaries. You cannot share one dictionary because, in WorldSoftware, the $ is reserved for business partners and is used for the beginning of an alias. The $ does not compile and thus cannot be shared with J.D. Edwards ERP software. Some of the file formats in WorldSoftware are also different.

See Also

- *Data Dictionary Administration* in the *System Administration Guide* for information about administering data dictionary items

Glossary Items

Glossary items are items that cannot be attributes in tables. Glossary items are typically used as information messages.

Error Messages

Error messages used in J.D. Edwards software are stored as data items. Use the data dictionary glossary item application to display error messages because you do not need to use all the fields that are required for regular data items.

Understanding Default Triggers

A default trigger is an editing or display routine that is attached at the dictionary level and initiated at runtime. Default triggers are reusable objects and, therefore, automatically associated with each application that uses the data item. Default triggers save time and increase the usefulness of your code because you can create the business logic only once and then use it within multiple applications. Default triggers ensure accuracy and integrity of data across all applications.

You use triggers to do the following:

- Establish field default values.
- Link data items to a user defined code (UDC) table of valid values.
- Activate a visual assist search program when a user positions the cursor in a field. The types of visual assists are:
  - Calendar
  - Calculator
  - Search for and select another file
  - UDC
- Establish rules and procedures that are embedded in the editing and formatting of the data for a field.
- Determine a next number scheme that developers should use when assigning a number to data.

Using the Data Dictionary

You can create new data dictionary items and view existing ones with the Object Management Workbench or with the Data Dictionary Application program (P92001). After you create a data dictionary item, use the Data Dictionary Application program to define jargon and language translations for it.

► To use the data dictionary

From the Data Dictionary menu (GH951), choose Work With Data Dictionary Items.

On Work With Data Items, complete any of the following fields and click Find.

- Search Description
- Data Item
- Description
- Alias
- Glossary Group
- System Code
- Product Code Reporting

Defining a Data Item

You define a data item, including its specifications, when you add, modify, or copy a database data item.

Creating a Data Item

Data dictionary items are the foundation of J.D. Edwards objects. You create data dictionary items so that they can be used as fields on a form of an application, columns in a table, fields in a business view, members of a data structure, fields on a UBE, and so on.

► To create a data item

Open Object Management Workbench.

1. From the Object Management Workbench, click Add.
2. On Add J.D. Edwards Object to the Project, click the Data Item option in the Control Table Objects portion of the form, and then click OK.

   The system prompts you whether you want to create a normal data dictionary item or a glossary data item. Glossary data items are used primarily for batch error messages.

3. To create a normal data dictionary item, click No.
4. On Data Items Specification, complete the steps to name a data item.

Naming a Data Item

After you have created a base data item, you must assign a unique name and attributes to this new data dictionary item before it can be included in an application.

► To name a data item

1. On Data Item Specifications, complete the following fields:
   - Data Item
   - Alias
   - Glossary Group
2. Complete the steps to define general information.

Data Dictionary Naming Conventions

You must adhere to data dictionary naming conventions to ensure database integrity and prevent data items from being overwritten by other data items.

Data Item Name

The data item name is a 32-character, alphabetical field that identifies and defines a data item. You must allow enough room in the field name for a 30 percent expansion of the English text for translation.

The data item name forms the C-code data name (for example, AddressNumber) that is used in business functions, data structures, and event rules. You can also identify a data item by its alias or alpha description.

When creating a J.D. Edwards data dictionary item, do not use a Y or Z in the first character of the data item name. Y and Z are reserved for Partners in Development business partners. (J.D. Edwards data items beginning with Y or Z might already exist because they were created before the B73.2 release of J.D. Edwards ERP software. These items will remain as *J.D. Edwards* items.)

Blanks and the following characters are not allowed in the data item name in J.D. Edwards software:

%

&

+

Note

After you add a data item, you cannot change its name.

Data Item Name for an External Data Dictionary Item

When you create an external data item, you must use a Y or Z in the first character of the data item name to distinguish an external data dictionary item from a J.D. Edwards data dictionary item.

The data item name can be a maximum of 32 alphanumeric characters, and it uses the following format:

Ysssddddddddddddddddddddddddddddd

The following explains the variables:

Y or *Z* designates an external data dictionary item and is the first digit of any J.D. Edwards-assigned *external* system code.

sss is the system code number. This number is either 55*xx* through 59*xx* for enterprise-level development of new modules, 60*xx* through 69*xx* for J.D. Edwards custom development, or another number that the Partners in Development system administrator assigns.

ddddddddddddddddddddddddddddd is a unique name for the data item.

Data Item Alias

The data item alias is an 8-character alpha code. If the data dictionary item is exclusive to J.D. Edwards applications, the alias is from five to eight characters in length. When you add a data item that will be used in a table by an RPG program, the data item alias must not exceed four characters. You can also identify a data item by its data item name or alpha description.

The data item alias is used in searches, database routines (application program interfaces used in business functions), and Table Design when you create a table. For each table, a prefix is added to the alias, which makes it unique to the table. For example, ABMCU indicates that MCU is within the Address Book Master table (F0101).

When you assign an alias, do not begin the alias with TIP or TERM. Aliases that begin with TIP are reserved for J.D. Edwards tips information; aliases that begin with TERM are reserved for term glossaries that are included in J.D. Edwards guides.

Blanks and the following characters are not allowed in the data item name in J.D. Edwards software:

%

&

+

Note

After you add a data item, you cannot change its name.

Alias for an External Data Dictionary Item

An external data dictionary item is one that is created by a developer outside of J.D. Edwards for use within J.D. Edwards software. For external data items, the data dictionary alias can contain a maximum of eight alphanumeric characters. External data items use the following format:

Ysssdddd

The following describes the variables:

Y or *Z* designates the item as an external data dictionary item and is the first digit of any JDE-assign external system code.

sss is the system-code number. This number is either 55*xx* through 59*xx* for enterprise-level development of new modules, 60*xx* through 69*xx* for J.D. Edwards custom development, or another number that the Partners in Development system administrator assigns.

dddd is a unique name for the data item.

Defining General Information

After you name a data item, you must provide additional general information on Data Item Specifications.

► To define general information

1. On Data Item Specifications, click the Item Specifications tab.
2. Complete the following required fields:
   - Description
   - Data Type
   - Product Code
   - Control Type
   - Row Description

     This description is for the base language only, unless you update the description for another language.
   - Column Title

     This description is for the base language only, unless you update the description for another language.
   - Size
   - File Decimals
   - Display Decimals
3. Complete the following optional fields:
   - Class
   - Item Occurrences

     Item occurrences is used for arrays. It allows you to create an item as a child of another item. The data dictionary verifies that attributes are consistent between the parent and the child. If you change the parent item, the changes are duplicated in the child items. The data item names use the parent data item

name and a number, such as a parent item ABC and child items ABC1, ABC2, and so on.

4. Click any of the following options:
   - Upper Case Only
   - Row Security
   - Allow Blank Entry
   - Auto Include
   - Do Not Total
5. Complete the steps to attach default triggers.

Attaching Default Triggers

You use triggers to initiate display and edit routines that are associated with data items at application runtime.

► To attach default triggers

1. On Data Item Specifications, click any of the following tabs to attach the applicable triggers to a data item:
   - Default Value
   - Visual Assist
   - Edit Rule
   - Display Rule
   - Next Number
2. On each tab, click the appropriate option for the type of default value that you want to attach.

   After you click certain options, the system displays additional fields into which you supply the appropriate default values.

Although you can override any of these triggers in Form Design in the Edit Control Properties, you should anticipate how they would most often be used.

Attaching a Default Value Trigger

You use the default value trigger for fields in which a default value is appropriate for most situations. If a value other than the default value is passed to this field through a processing option, business function, form interconnection, or data structure, or if the user enters a different value, the default value will not be used. A default value trigger automatically inserts a specified default value in a field when the following conditions are met:

- Control is exited
- Dialog is initialized

► To attach a default value trigger

1. On Data Item Specifications, click the Default Value tab.
2. Click the following option:
   - Default Value
3. Enter the default value.

Attaching a Visual Assist Trigger

The following types of visual assist triggers are available:

- Search form
- Calculator
- Calendar

Use a search form trigger to link a field to a search form for locating valid values. The search form must exist before you attach a search form trigger.

► To attach a visual assist trigger

1. On Data Item Specifications, click the Visual Assist tab.
2. On Visual Assist, click one of the following options:
   - Calculator
   - Calendar
   - Search Form
   - JDE UTime
3. If you click Search Form, click the Browse button to choose the form that you want to appear for valid values.

   If you attached a Search Form assist trigger, when a user clicks the Search Form button at runtime, the form that you specify here appears. The user enters search criteria, and the system returns valid values. These Search and Select forms are based on files, not UDC tables.

Attaching an Edit Rule Trigger

You use edit rule triggers to validate field values based on business functions or rules. For example, you can define a rule that does the following:

- Validates and compares a field with a particular value
- Ensures that a field value is within a specified range of values
- Links a field to a specific UDC Search and Select form
- Checks for Y and N values

► To attach an edit rule trigger for a business function

1. On Data Item Specifications, click the Edit Rule tab.
2. On Edit Rule, click one of the following options:
   - Business Function
   - Rule
3. If you clicked the Business Function option, click the Browse button to choose from available business functions.
4. On Business Function Search, locate a business function.
5. To verify the purpose of the function, choose the function and choose Attachments from the Row menu.

   The system displays a Media Objects form that contains usage notes for the business function. Close the form after you have reviewed the information.

   Note
   You must create the business function if it does not exist.

6. On Business Function Search, click Select to choose the business function.
7. If you clicked the Rule option, click the search button to choose from the available rules.

These rules can include user defined codes such as:

EQ Equal

GE Greater or Equal

GT Greater

HNDL Table Handle

LE Less Than or Equal

LT Less Than

NE Not Equal

NRANGE Not Between

RANGE Between

UDC User Defined Code

VALUE In a List

ZLNGTH Allocated Length (VARLEN flds)

Attaching a Display Rule Trigger

You use a display rule trigger to format data. You attach a display rule trigger based on either a business function or a user defined code. The following two types of display rule triggers are available:

- Business Function
- Rule

► To attach a display rule trigger

1. On Data Item Specifications, click the Display Rule tab.
2. On Display Rule, click the following option:
   - Rule
3. Click the Search button (for the field that appears) to locate the appropriate code from available user defined codes.

   Choose from the following values:

***RAB** Right-adjusts the value and precedes it with blanks. Data items that define business units use this rule.

***RABN** Right-adjusts the value and precedes it with blanks. Data items that do not define business units use this rule.

***RAZ** Right-adjusts the value and precedes it with zeroes. For example, Company appears as 00001.

CODE Uses the specified Edit Codes to format numeric fields. See UDC 98/EC for a list of valid codes. The code should be entered into the parameter field.

MASK Embeds the specified characters within the data when it appears. For example, to display Social Security number (SSN_) with embedded dashes, the mask parameter would appear as follows:

bbb-bb-bbbb, where *b* corresponds to each digit in the Social Security number

Mask can be used only with char or string data item types.

Attaching a User Defined Code Trigger

You attach a user defined code trigger to use a UDC table to validate data for a specific field. If you attach such a trigger to a field, only the values in the UDC table that you specify are valid for that field.

► To attach a user defined code trigger

1. On Data Item Specifications, click the Edit Rule tab.
2. On Edit Rule, click the following option to turn it on:
   - Rule
3. Click the Visual Assist and choose a UDC in the detail area.
4. Tab out of the Rule field and complete the following fields:
   - Product Code
   - Record Type
5. On Data Item Specifications, click OK.

Attaching a Next Number Trigger

The next numbers feature controls the automatic numbering for such items as new general ledger account numbers, voucher numbers, and address numbers. It allows you to specify the numbering system code that you want to use and allows you to automatically increment numbers to reduce transpositions and keying errors.

You use the next number feature when you want the system to enter a default value in a numeric data item if the user does not enter a number. Next numbers are assigned from an array. The combination of system code and index defines how the next number will be assigned.

Next Numbers

The Next Numbers table is F0002, and it has the following logic:

- 1 record per system and 10-element array

  The key to the Next Numbers table (F0002) is system code. The table includes 10 columns for individual next number elements. The system uses each of these elements for a specific hard code within the applications for that system code.

  For example, if you specify system code 09 in the Next Numbers program, six rows are populated and four are blank. The system uses each of these coded, populated rows as hard code. The first row defines New Account ID. Within J.D. Edwards applications that create new accounts, the system retrieves the account number from system 09, row 1 of the Next Numbers table. Row 2 contains Journal Entries. In a master business function (MBF) that creates journal entry documents, the system retrieves the document number from system 09, row 2 of the Next Numbers table.

  If you specify system 04 in the Next Numbers program, the system uses a completely separate set of rows that have hard codes for use within system 04.

- Modulus 11 check optional

  The check digits options allows you to specify whether the system adds a number to the end of each next number that it assigns.

  For example, if you are using check digits and the next number is 2, the system adds a check digit such as 7, making the last two numbers 27. Check digits provide a method of randomly incrementing numbers to prevent the assignment of transposed numbers. In the algorithm in the following topic, the system would never assign next number 72 while the check digits feature is activated.

IBM Modulus 11 Self-Check Algorithm

Each position in the base number has a weight factor. Modulus 11 counts positions from the rightmost digit (not including the check digit).

The Modulus 11 weight factors are 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7, ...2, 3, 4, 5, 6, 7, 2 for positions 1, 2, ... 31, respectively.

After you set next numbers, do not change it. If you change next numbers, the following might occur:

- System performance is affected.
- Next numbers will not duplicate numbers; when it reaches the maximum, it starts over.
- You cannot change position or add a new entry without performing programming modifications.

Next numbers connects to the data dictionary. A data item in the data dictionary points to the Next Number system. You can access the Next Numbers program (P0002) from the J.D. Edwards software menu G00.

► To attach a next number trigger

1. On Data Item Specifications, click the Next Number tab.
2. On Next Number, click the following option:
   - Next Number

3. Complete the following fields:
    - System Code
    - Index

Attaching a Smart Field Trigger

Smart Fields are data dictionary items with attached business functions. The business functions that are attached include named mappings, which simplify the process of choosing a data item with particular functionality. End users do not need to know which business function to use and what parameters to pass; instead, the user simply chooses a data item that has this information. Smart fields can be used in all section types in Report Design. For example, you can use smart fields to derive a column heading or an object value in a tabular section. Smart fields are always in glossary group K.

► To attach a smart field trigger

1. On Data Item Specifications, click the Item Specifications tab.
2. Complete the following required fields:
    - Description
    - System Code
    - Data Type
    - Control Type
    - Row Description
    - Column Title
    - Size
    - File Decimals
    - Display Decimals
3. Complete the following optional fields:
    - Class
    - Item Occurrences
4. Click any of the following options:
    - Upper Case Only
    - Row Security
    - Allow Blank Entry

- Auto Include
- Do Not Total

5. From the Form menu, choose Smart Fields.
6. On Smart Field, complete the following fields:
   - Business Function

     Enter the business function that was created for the smart field.
   - Event Name

     Specify the event in which the smart field should be triggered.
   - Named mapping

     Enter the named mapping that is associated with the business function data structure.

     On Smart Fields, you can click the Browse button to choose a business function. You can also click the visual assist on Named Mapping to choose a value.

Updating the Glossary

Each data item is described within the glossary. The end user of an application sees this text at runtime. Thus, it should explain how the field is used in the application. Within an application, you can access this glossary description in field-level help. You can also do the following:

- Add glossary text for new data items
- Create form-specific or system-specific glossary text
- Create glossary text for different languages
- Customize J.D. Edwards glossary text to suit your needs

► To update the glossary

1. On Data Item Specifications, click the Item Glossary tab.
2. Enter the glossary information in the media object window.

Adding Glossary Text for Languages

For any data dictionary item, you can add glossary text for different languages. For example, you can create glossary text for the base English language item and also add glossary text for French, Spanish, and German. Glossary text for languages must be added after the data dictionary item has been created.

► To add glossary for an item with languages

1. On Work with Data Items, locate the item that you want to change.
2. From the Row menu, choose Glossary Overrides.
3. On Work With Data Item Glossary Overrides, click Add.
4. On Data Item Glossary Header, complete the following fields, and then click OK:

- Language
- Form

  Enter a form name if you want the glossary to apply to a specific form only.

  If you do not enter a form name, the glossary applies to all forms that use this item.

5. Click OK.
6. On Work with Data Item Glossary Overrides, choose the row that you just added.
7. From the Row menu, choose Glossary.
8. On Data Item Glossary, enter the glossary text that you want to appear.

You can also change the glossary for an item with existing language overrides.

Defining Jargon and Alternate Language Terms

When you create a data dictionary item, you assign descriptions to the row, column, and glossary. Because these descriptions might not offer the flexible terminology that you need, you can assign alternate jargon or language descriptions to each item. Alternate descriptions allow the same data dictionary item to appear with different row, columns, and glossaries for different users, depending on the system (product) code of the object that they are using.

For example, the cost center field MCU is widely used throughout the system. Its row description is Business Unit, which is a term used by financial applications. However, in distribution applications, this data item appears as Branch/Plant. Likewise, in warehousing applications, the data item appears as Warehouse.

In addition to any alternate terms that you define, users can implement their own language overrides at the application level. The system checks for and resolves overrides in the following order:

1. If a user applies a language override in the application (such as the Form Director Aid or Report Design), the system uses the term indicated by the language override, if one exists.
2. If the user did not specify a language override in the application, then the system determines at runtime whether a system code has been attached to the menu selection. If the menu selection has an attached system code, then the system displays the alternate term dictated by the system code, if one exists.
3. If no alternate term has been indicated for the menu selection, the system determines at runtime whether a system code has been attached to the application. If the application has an attached system code, then the system displays the alternate term that is dictated by the system code, if one exists.
4. If no alternate term has been indicated for the application, then the data dictionary text appears.

In all cases, the system first checks the user's preferred language for an alternate term before checking without language. Language and language overrides always take precedence over nonlanguage overrides. For example, assume that, in an environment in which English is the base language, all the forms have French translations that a user can view by selecting the French override. A form might contain a data dictionary item that in English has an alternate term; in this example, however, the French version of the data dictionary item does not have an alternate term. When it appears in English, the form displays either the main term or the alternate term, as appropriate. When it appears in French, however, the form displays only

the main term, even when an alternate term is called for, because the language override takes precedence over displaying the alternate term.

Jargon and alternate language terms must be added after the data dictionary item has been created.

See Also

- *Updating the Glossary* in the *Development Tools Guide* for information about how to create alternate language glossary items for a data item

► To define jargon

1. On Work With Data Dictionary Items, locate the item for which you want to define jargon.
2. From the Row menu, choose Descript. Overrides.
3. Click Add.

   The Data Item Descriptions form appears.

4. On Data Item Descriptions, complete the following fields, and then click OK:
   - Application Override

     Enter the system code with which you want to associate the current jargon. Different system codes are associated with specific categories and applications in the system.

   - Row Description
   - Column Title
5. Repeat this process for each jargon term that you want to associate with the data item.

► To update a data item for languages

1. On Work With Data Dictionary Items, locate the item that you want to update.
2. From the Row menu, choose Descript. Overrides.
3. Click Add.

   The Data Item Descriptions form appears.

4. Complete the following fields and click OK:
   - Language
   - Row Description
   - Column Title
5. Repeat this process for each language that you want to associate with the data item.

You can change the row and column text for all applications (interactive or batch) that use a data item.

► **To change row and column text for all applications**

1. On Work With Data Dictionary Items, locate the item that you want to update.
2. From the Row menu, choose Descript. Overrides.
3. On Work With Data Item Descriptions, choose a language record and modify it.

You can change the alpha description by clicking Glossary Overrides and creating a record. You then use the Glossary form to change the description.

Changes to row and column descriptions are not replicated through data replication. To deploy row and column changes to workstations, you must deliver a new full or partial package, or an update package that includes the affected applications. The new or update package deletes the existing row and columns that are stored in a cache on the workstation.

Table Design

A relational database table stores data that an application uses. A table stores a set of data in columns and rows. Each column is a data item. Each row is a record. You can create one or more tables for use in an application. To create a table, you select data items (the data items must already exist in the data dictionary) to include in the table and assign key fields as indices for retrieving and updating data. You must define your table so that J.D. Edwards software recognizes that the table exists.

You must use Table Design to generate the table whenever want to do the following:

- Create a new table
- Add or delete a data item
- Add or modify an index

An index identifies records in a table. A primary index identifies unique records in a table. An index is composed of one or more keys, or data items, within the table. An index enables a database management system (DBMS) to sort and locate records quickly.

Adding a Table

Before you add a new table, you should determine whether an existing table contains the data items required by your application. If an existing table does not exist, you must add a new table.

When you add a new table, you must include the following audit trail columns:

- User ID (USER)
- Program ID (PID)
- Machine Key (MKEY)
- Date Updated (UPMJ)
- Time of Day (UPMT)

► **To add a table**

1. On Object Management Workbench, click Add.

2. On Add J.D. Edwards Object to the Project, click the Table option, and then click OK.
3. On Add Object, complete the following fields and click OK:
    - Object Name
    - Description
    - Product Code
    - Product System Code

Column Prefix

    - Object Use

4. On Table Design, click the Summary tab and revise the data in the following fields to alter the table properties:
    - Description
    - Product Code
    - Product System Code
    - Object Use
5. To document the table, click the Attachments tab, and then add attachments.

J.D. Edwards recommends you use the following naming conventions when you add a table:

The Object Librarian name for a table can be a maximum of 8 characters and should be formatted as follows: *Fwwxx*

F = data table

ww (second and third digits) = the system code, such as

00 - OneWorld Foundation environment

01 - Address Book

03 - Accounts Receivable

xx (fourth and fifth digits) = the group type, such as

01 - Master

02 - Balance

1X - Transaction

Note Concerning World Naming Table Conventions
If you are using an AS/400 Table, the following naming conventions apply:

LA through LZ - Logical file

JA through JZ - Table join

The table description is the topic of the table and should be the same name as the file it represents, such as Address Book Master (F0101) and Item Master (F4101).

You can provide up to a 60-character description for a table.

The column prefix is a two-character code used to uniquely identify table columns. The first character must be numeric and the second character must be alpha-numeric.

Table Naming Conventions

The Object Librarian name for a table can be a maximum of 8 characters and should be formatted as follows:

Fxxxxyyy

where the following apply:

F = data table

xx (second and third digits) = the system code, such as:

00 - OneWorld Foundation environment

01 - Address Book

03 - Accounts Receivable

xx (fourth and fifth digits) = the group type, such as:

01 - Master

02 - Balance

1X - Transaction

yyy (sixth through eighth digits) = object version, such as programs that perform similar functions but vary distinctly in specific processing

LA through LZ - Logical file

JA through JZ - Table join

J.D. Edwards recommends that you use the following naming conventions when you add a table:

Provide up to a 60-character description for a table.

Ensure that the table description is the topic of the table. If it came from the AS/400, it should be the same name as the file that it represents, such as Address Book Master (F0101) and Item Master (F4101).

Note that the column prefix is a two-character code used to uniquely identify table columns.

The first character must be alphabetic. The second character can be alphanumeric. You cannot assign special characters (for example, $, #, or @).

The data item name follows the column prefix. For example, Address Number in the Address Book Master table (F0101) is ABAN8. The prefix does not have to be unique in J.D. Edwards software because the Tool Design Aid makes it unique. For example, the system references ABAN8 as F0101_ABAN8.

Indices

List the field as the index name, such as Address Number, if only one field exists in the index.

For coexistence, ERP indices must match logicals on the AS400. When you run the Generate Table command in Table Design, OneWorld automatically determines whether a matching file exists on the AS400. If a matching AS400 file does not exist, then ERP creates logical files on the AS400. If a matching AS400 file exists, OneWorld does not create any logicals on the AS400.

If an index has two fields, list them consecutively (for example, Address Number, Line Number ID).

List the first two fields and followed them by an alpha character (A) (for example, `Address Number, Line Number, A)`, if more than two fields are in the index and the first two fields are the same as the first two fields of another index. Otherwise, list the fields and follow them by a plus sign (+) (for example, `Item Number, Branch, +)`.

Place a comma and space between each index field and between the last index field and the plus sign. In addition, do not include more than 10 fields in an index.

The total length of the index name cannot exceed 19 characters if the index has two or more fields. If you exceed 19 characters, the compiler displays the warning *Re-definition is not identical...*. This situation affects fetches that use the wrong index ID in business functions.

Working with Table Design

Table Design presents the following views within a single window:

- Table Columns, which displays the data items that make up your table.
- Data Dictionary Browser, which locates data items for selecting and moving to the Column view.
- Indices, which defines the unique data items for quicker sorting and updating of the table.
- Properties, which displays data item attributes for a selected data item in the Column view. This is a display view only and is primarily used when you define indices.

When you modify or delete data items or indices, you must reconfigure the table. Changes might affect business views and forms that reference that table.

You use Generate to generate a newly modified table. The existing data in the table will be overwritten.

Caution

If you delete a table or delete columns from that table, any business views that reference the table or the deleted table columns will be invalid, and the system will display error messages when you generate the application.

If you use Table Design to delete a table, it deletes only the specifications; it does not delete the physical table.

Choosing Data Items for the Table

Table columns are the data items that store information used by an application. A data item must exist in the data dictionary before you can use it in a table. Tables can contain data items from multiple system codes.

► To choose data items for the table

1. Complete the steps to add a table, or, in Object Management Workbench, choose a table and click the Design button in the center column.
2. On Table Design, click the Design Tools tab, and then click Start Table Design Aid.
3. In the Data Dictionary Browser view, use QBE fields to locate the data dictionary items that you want to include in your table.
4. To include a data item in your table, drag it from the Data Dictionary Browser view to the Table Columns view.
5. To remove a column from a table, choose it and choose Delete from the Edit menu.

   After you choose all of the data items for your table, you must define an index.

Defining Indices

You use indices to find specific records and to sort records faster. Table indices are like tabs in a card file. Each index is made up of one or more keys, which are individual data items. You use indices to access data in the most simple manner so you do not have to read the data sequentially.

A table can have multiple indices; however, every table must have only one primary, unique index. The primary, unique index is the one unique identifier for each record in the table. The database should use the index that returns the most detail. It does not always use the primary index. Additionally, you use the primary index to build business views.

See Also

- *Performance* in the *Development Tools Guide* for information about performance issues regarding indices
- *Business View Design* in the *Development Tools Guide* for information about how business views use the primary index from a table

► To define indices

1. On Table Design, arrange the Indices form so that it is active and the Indices menu is visible.

2. From the Indices menu, choose Add New.

   You can also drag indices from the column view into the index view.

   The index description is Untitled; it is marked with a key that displays the letter P to indicate a primary index.

3. Double-click the index title, enter a name for the index, and then press Enter.
4. On the Table Columns view, choose one or more columns from the columns view and drag them to the index.

   A unique index is marked with a single key. You can toggle the unique/not unique status of a key by clicking your right mouse button and choosing Unique from the Index menu. The Unique Primary Index cannot be changed to nonunique status.

5. Right-click the item and choose or deselect the Ascending selection to indicate the ascending or descending sort order for an index column.

   An arrow pointing upward indicates that the index column is sorted in ascending order.

J.D. Edwards Design Standards

Use the following guidelines to name an index.

- List the field as the index name, such as Address Number, if the index contains only one field.
- For coexistence, J.D. Edwards indices must match logicals on the AS/400. When you run the Generate Table command in Table Design, J.D. Edwards software automatically determines whether a matching AS/400 file exists. If a matching AS/400 file does not exist, then J.D. Edwards software creates logical files on the AS/400. If a matching AS/400 file exists, J.D. Edwards software does not create any logical files on the AS/400.
- If the index contains two fields, list them consecutively (for example, `Address Number, Line Number ID`).
- List the first two fields followed by an alpha character (A) (for example, `Address Number, Line Number, A`), if the index contains more than two fields and the first two fields are the same as the first two fields of another index. Otherwise, list the fields followed by a plus sign (+) (for example, `Item Number, Branch, +`).
- Place a comma and space between each index field and also between the last index field and the plus sign.
- Do not include more than 10 fields in an index.
- The total length of the index name cannot exceed 19 characters if the index has two or more fields. If you exceed 19 characters, the compiler displays the warning *Re-definition is not identical...*. This situation affects fetches that use the wrong index ID in business functions.

Previewing Tables

You can preview how tables will look when you print them.

▶ **To preview your table**

On Table Design, arrange the Columns form so that it is active and choose Print Preview from the File menu.

A print preview of your table appears.

Working with Tables

The Object Management Workbench (OMW) provides a central location from which you can manage your tables.

Generating Tables

After you have selected data items and assigned indices for your table, you are ready to configure the table for a specific data source. If you have not established an index, the generation process will fail.

You must generate a table to create the physical table. You cannot add to or update the table until it is generated. Table generation also creates a .H file that is used for compiling in business functions and table event rules.

OMW accesses the Object Configuration Manager application (P986110) to configure tables. You can configure the table within any existing data source. If you do not indicate a data source, J.D. Edwards software automatically configures the table for the default map. You can change the path code to generate the table in a different location. Doing so causes the system to perform a drop statement,similar to the remove table, after which the table is recreated. If you regenerate the current table, the data in it will be lost.

You must regenerate a table after you modify it, such as when you delete or add data items. To ensure that data is not lost, you must export your data, generate the table, and copy the data back into the table.

▶ **To generate tables**

1. On Table Design, click the Table Operations tab, and then click Generate Table.
2. On Generate Table, complete the following fields, and then click OK:
   - Data Source
   - Password

   The system displays a message that indicates whether the generation was successful.

Generating Indexes

If you create additional indices or modify existing ones, you must regenerate them. Doing so modifies the .H file, but you will not lose existing data as you do when you regenerate the entire table.

▶ To generate indexes

1. On Table Design, click the Table Operations tab, and then click Generate Indexes.
2. On Generate Indexes, complete the following fields, and then click OK:
   - Data Source
   - Password

Generating Header Files

Occasionally, a table might have no header files. You can generate header files without having to generate the entire table.

▶ To generate header files

On Table Design, click the Design Tools tab, and then click Generate Header File.

The system generates the header file.

Copying Tables

You can copy tables from one data source to another. Doing so does not copy table specifications. You can also use table conversion to copy tables from one data source to another.

See Also

- *Data Copy with Table Input* in the *Table Conversion Guide* for more information about using the Table Conversion tool to copy tables

▶ To copy tables

1. On Table Design, click the Table Operations tab, and then click Copy Table.
2. Complete the following fields, and then click OK:
   - Data Source
   - Data Source
   - Object Owner ID
   - Password

Removing Tables from the Database

To completely remove a table from the system, you must use the OMW function entitled Remove Table from Database. If you use Table Design to delete a table, it deletes only the specifications. Table Design cannot physically delete a table.

► To remove tables from the database

1. On Table Design, click the Table Operations tab, and then click Remove Table from Database.
2. On Remove Table, complete the following fields, and then click OK:
   - Data Source
   - Password

Viewing the Data in Tables

To view the data in tables in different databases, you can use the Universal Table Browser. This tool lets you verify the existence of data in a table, as well as to determine the structure of the table. The Universal Table Browser uses JDEBASE APIs to retrieve data from the database, making it independent of the database that you access.

Note

If you need to secure users from the Universal Table Browser, you cannot use J.D. Edwards security to directly do so because the Universal Table Browser is a Windows executable application, not a J.D. Edwards tools-generated application. However, you can place form security on the Table and Data Source Selection form (W98TAMC). This secures the Universal Table Browser because the Windows executable cannot function without this J.D. Edwards form. All column and row security that you set up through Security Workbench applies to the Universal Table Browser.

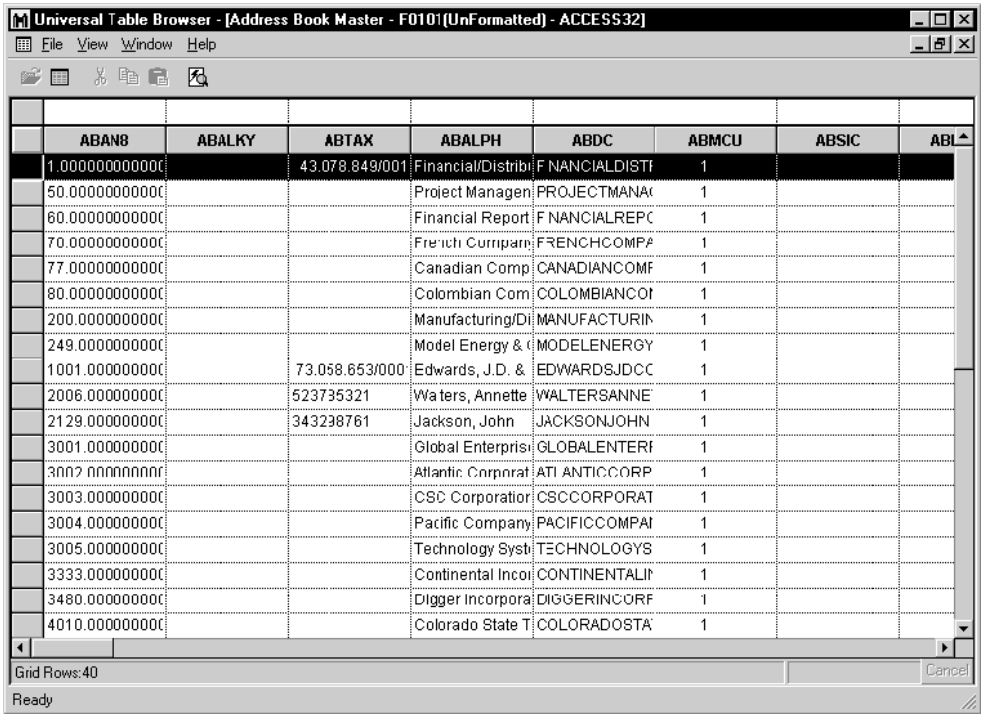
► To view the data in tables

From Cross Application Development Tools (GH902), choose Universal Table Browser.

1. On Universal Table Browser, choose Open Table from the File menu.
2. Complete the following required fields:
   - Table
   - Data Source Name
3. Click the following option:
   - Format Data
4. Click OK.

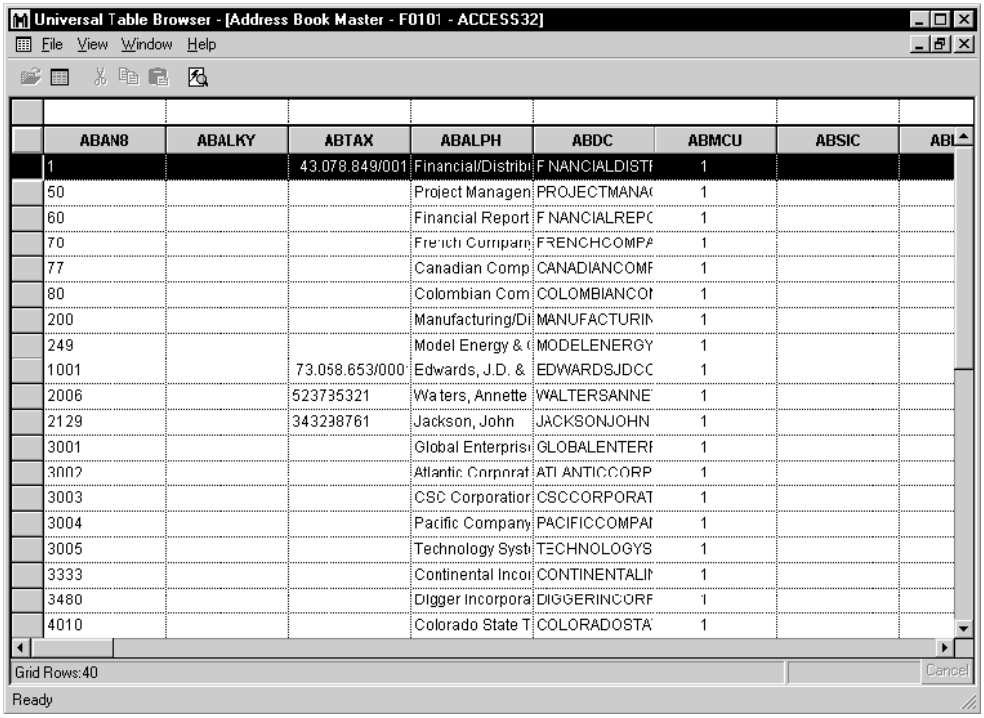
Example: Universal Table Browser (Unformatted Data)

In this example, a database table appears as it was opened with the Format Data option turned off. Note the structure of the information in the ABAN8 column of table F0101. This information is not formatted and appears exactly as it is stored in the database.



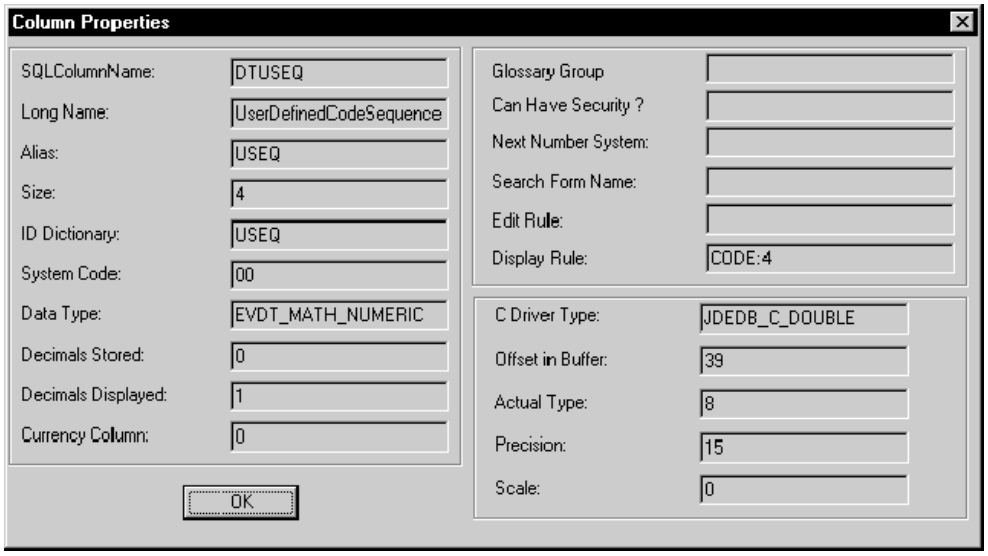
Example: Universal Table Browser (Formatted Data)

In this example, a database table appears as it was opened with the Format Data option enabled. Notice that the structure of the information in the ABAN8 column of table F0101 is formatted using the data dictionary specifications.



Example: Column Properties

In this example, the column properties appear for the J.D. Edwards data dictionary item USEQ. The SQL database name for this J.D. Edwards item is DTUSEQ.



Business View Design

A business view is a selection of data items from one or more tables. After you create a table, use Business View Design to choose only the data items that are required for your application. J.D. Edwards software uses the business view that you define to generate the appropriate SQL statements necessary to retrieve data from any of the supported J.D. Edwards software databases. After you define a business view, you can create a form that updates data (in an interactive application) or design a report that displays data. Because you choose only those data items that an application requires, less data moves over the network.

In addition to being required to create applications or generate reports, business views have the following characteristics:

- They can contain some or all of the data items from one or more tables
- They link a J.D. Edwards application to one or more tables
- They define the data items from multiple tables that an application uses (as in table joins or table unions)

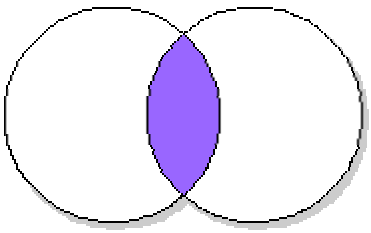
Table Join

A table join combines data from individual rows of joined tables. The joining columns satisfy a join condition, such as when the rows have the same values in key columns. The primary table is the table that you are starting from (usually the table on the left in Table Design) and the secondary table is the table that you are going to (usually the table on the right in Table Design). Several types of joins exist, including the following:

- Simple joins, which are also known as inner joins. They include only rows that match both the primary and secondary tables.

The following graphic illustrates a simple table join.

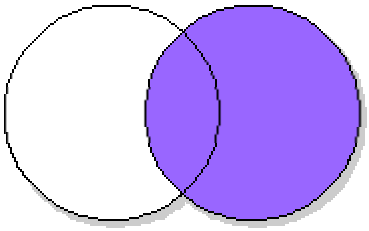
Simple Joins



- Right outer joins, which include rows common to both the primary and secondary tables, and unmatched rows from the secondary table.

The following graphic illustrates a right outer table join.

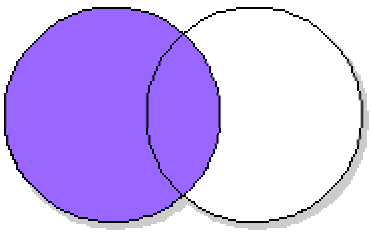
Right Outer Join



- Left outer joins, which include rows common to both the primary and secondary tables, and unmatched rows from the primary table.

The following graphic illustrates a left outer table join.

Left Outer Join



Note Concerning Left Outer Joins and SQL 92 Left Outer Joins

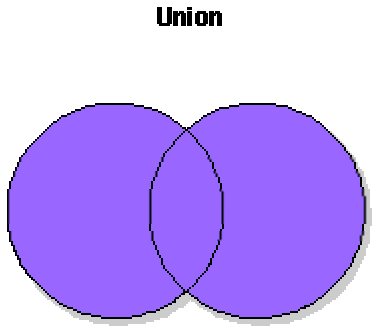
A Left Outer Join is the same as the standard SQL 92 Left Outer Join except that records without a matching right side are always included, ignoring any query against right-side columns.

In other words, records with null as values for the right-side columns are always included in the section regardless of any WHERE clause against the right-side columns.

Table Union

A table union joins entire tables. The system first checks for rows from the primary table, and then rows with corresponding columns from the secondary table. If the rows from the two tables contain identical data, then only one of the records is retrieved in the union.

Unions include rows from the primary table and corresponding columns from the secondary table.



Select Distinct

You can use the Select Distinct feature to help eliminate duplicate rows in the business view query.

Indices

You use the primary index from a table to build business views. Business views then carry information from the table to an application. If you need to carry forward additional information other than the primary key to the application, you might need to change the business view index.

Adding a Business View

Before you begin designing a business view, consider the purpose of your application and the data items that it requires. Identify which J.D. Edwards table or tables contain those data items. Adding a new business view does not impact performance. However, using an existing view that contains many more columns than you need might negatively affect performance.

Business views usually contain more fields than are used on the form or grid. If you need a field that is in a business view, but not on a form or a grid, you can add the field without changing the business view.

You use different business views for each form type. For forms with grids, the grid should contain fewer fields than the business view to allow for business-specific issues that might affect performance. Typically, search and select forms should have the minimum number of items that you need, to keep them small. They should include only the basic fields that are necessary for filtering searches, as well as the necessary output fields, such as descriptions.

Find/browse and parent/child forms have a few more items and are more moderately sized. They should include only those fields needed for filtering, and the necessary output fields.

Input-capable forms have all of the items from the table and tend to be large. They should include all of the fields necessary to add or update a record, including audit information.

See Also

- *Performance* in the *Development Tools Guide* for performance information about business views

► To add a business view

1. On Object Management Workbench, click Add.
2. On Add J.D. Edwards Object to the Project, choose the Business View option, and then click OK.
3. On Add Object, complete the following fields and click OK:
   - Object Name
   - Description
   - Product Code
   - Product System Code
   - Object Use

J. D. Edwards Naming Standards

J.D. Edwards recommends that you use the following guidelines when you name a business view.

The Object Management Workbench name for a business view can be no longer than 10 characters and should be formatted as follows:

VzzzzzzzzA

where:

V = Business view

zzzzzzzz = The characters that represent the primary table

A = A letter that designates the view.

For example, V0101A is the first view of table F0101, V0101B is the second view of the same table, V0101C the third, and so on.

External Developer Considerations

External development refers to creation of applications by developers who do not work for J.D. Edwards, such as Partners in Development and J.D. Edwards consultants who create custom applications for specific clients. To prevent interference between J.D. Edwards and non-J.D. Edwards objects, you must use caution when naming an external business view. When you create a new business view for an external application, format the business view name as follows:

Vssss9999

where

V = Business view

ssss = The system code for the enterprise

9999 = A unique next number or character pattern within the enterprise

Provide up to a 60-character description for a business view. It should reflect the application description followed by the form type, such as Item Master Browse and Item Master Revisions.

Primary unique key fields should remain in the business view. Do not reorganize the primary unique key fields.

Note

At least one business view for each table should include all columns. Use this business view for the level 01 section in all reports upon which the file is based. Also, only one business view is allowed for each form type, except for a header/detail form. For header/detail forms, you can use two business views—one for the header portion of the form and one for the detail portion.

Joined Views

To format the name for a joined view, use the names of the two tables being joined, separated by a forward slash. Place the primary table first.

For example, where F4101 is the primary table in the join view between F4101 and F4102, use the following naming standard:

F4101/F4102

Working with Business View Design

The Business View Design tool displays the following views:

- Table Joins, which defines the tables over which you create the business view
- Available Tables, which locates tables for moving to the Table Joins view
- Selected Columns, which lists the data items from your table that are included in your business view
- Properties

You should generate the business view when you create a new business view or when you add a data item to the business view. In addition, you should be aware of the following when working with business views:

- When you delete a data item from a business view, and that data item is used in an application, an error results when you attempt to run the associated application. If this occurs, you must open the application and delete the item from the application or reselect the column in the current business view to fix the control.
- When you delete an entire table from a business view, any application that uses the business view will not run. If this occurs, you must fix all items that refer to the business view.
- If you delete a business view, any forms that use the business view will fail. If this occurs, you must associate the forms to a new business view and connect all of the controls.

Choosing Tables for a Business View

You must choose one or more tables from which to create the business view. Although you can create a business view over one large table to retrieve and update only those columns that the application needs, performance is diminished when the system retrieves and updates a very large table. Whenever possible, consider joining two smaller tables rather than creating one large table that contains many data items.

► To choose tables for a business view

1. On Object Management Workbench, create a new business view or choose an existing business view, and then click the Design button in the center column.
2. Click the Design Tools tab, and then click Start the Business View Design Aid.
3. On the Available Tables pane of Business View Design, complete the following fields, and then click Find.
   - Description
   - Object Name
   - Product Code
4. Choose one or more tables and drag them to the Table Joins pane. The pane is called Table Join regardless of whether you are joining multiple tables.

   The Table Joins pane displays the tables that you chose, along with the columns that comprise each table. Key symbols appear next to columns that are index keys in the table. The primary table supplies the key to the business view. This is where an application begins a search.

Note
To ensure maximum performance in your application, J.D. Edwards limits the number of table joins to:

- Five tables, if all joins are simple joins
- Three tables, if any of the joins is an outer join or in the event of a union

5. Designate a table as primary by double-clicking the title bar of the desired table.

   This step is optional. If the business view contains multiple tables, the system automatically designates the first table added as the primary table. A crown symbol appears in the upper left corner of the window to indicate the primary table. If a business view contains only one table, that table is, by default, the primary table.

Note
To delete a table from a business view, choose it and choose Delete from the Table menu, or right-click the table and choose Delete from the pop-up menu.

Choosing Data Items for a Business View

After you choose one or more tables for the business view and indicate the primary table, you must choose the data items to include in the business view. All data items in the primary table, along with any tables to which the primary table is joined, are available for the business view.

Choose the data items that you want to use in an interactive application or batch job. When you create an application, you do not have to use every item in the business view.

Important Notes Regarding Data Item Selection

- If you have two tables in a join, the primary index is automatically selected for both. Index keys of selected tables are automatically highlighted for use in the business view. Except for the primary table index keys, you can remove index keys if they are not going to be used in the business view. You cannot remove index keys for the primary table from the business view.
- If you create a join, items from both tables are automatically selected. If the same data item appears in multiple tables, you need to select the data item from only one table.
- You cannot join unlike items.
- Do not select the same data item from two different tables because doing so causes the data item to appear twice in the business view.

► To choose data items for a business view

1. On the Table Joins pane of Business View Design, double-click the data items to include in the business view.

Selected data items appear highlighted in the Table Joins window. As you choose each item, the system adds it to the Selected Columns window.

Caution
Do not select more than 256 columns for your business view. An application that uses a business view that contains more than 256 columns will fail at runtime.

2. To delete a data item from your business view, double-click the item in the Table Joins window to remove it from the business view.

Using Select Distinct

If a business view includes the primary key of the primary table (default implementation), then every row of the business view query is unique. The primary key has a different value in each row of the primary table. If the business view does not have a primary key in the primary table, then duplicate rows can occur during the business view query. You can eliminate duplicate rows in the business view query by using the Select Distinct feature while designing a business view.

For example, Journal Entry is unique by line number within a document. You need only the first document number with Line 1, not all line numbers within the document. The Select Distinct feature fetches only the first occurrence of the document number, not all the line numbers within it.

Any business view with a primary table that contains one or more of the following columns, which are used for currency support or security features, might cause the Select Distinct feature to output duplicate values:

CO Company

CRCD Currency Code - From

CRDC Currency Code - To

CRCX Currency Code - Denominated In

CRCA Currency Code - A/B Amounts

LT Ledger Type

AID Account ID

MCU Business Unit

KCOO Order Company (Company Code)

EMCU Business Unit Header

MMCU Branch

AN8 Address Number

▶ To use Select Distinct

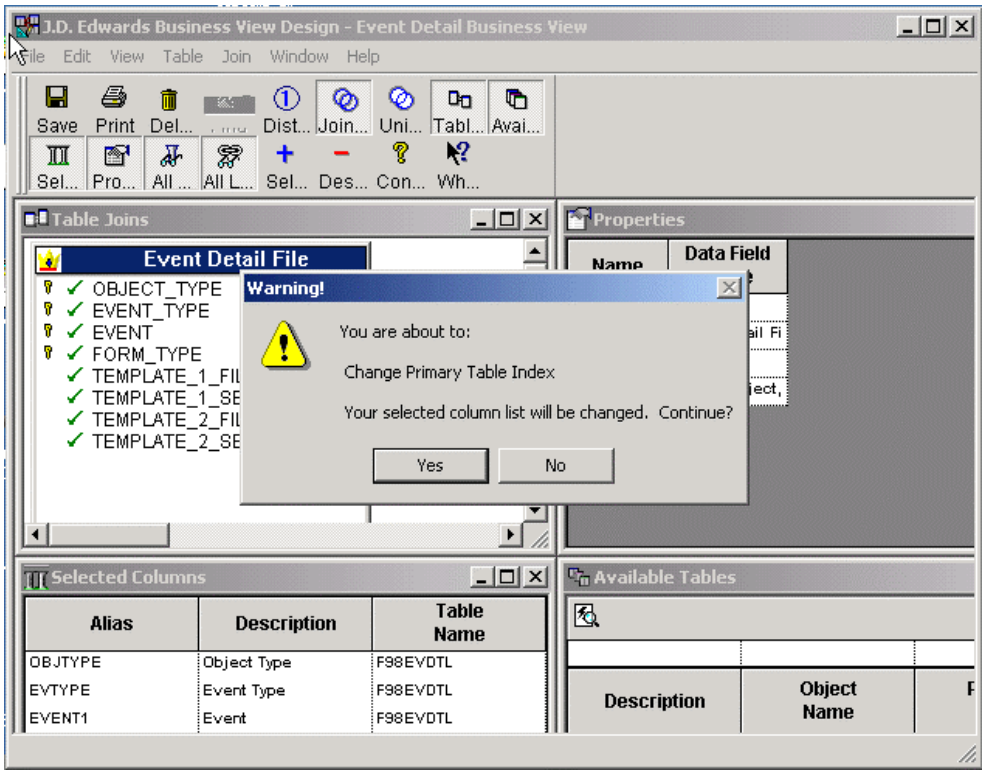
1. On Business View Design Aid, choose the primary table of your view.
2. Choose Distinct Mode from the Table menu.
3. From the Table menu, choose Change Index to change the index of the primary table to a non-unique index.

ExampleTask: Select Distinct Feature

This example illustrates the Select Distinct feature. The business view used for this example, Event Detail Business View (V98EVDTL), uses the primary index of the primary table by default; in this example, it is the Event Detail File table (F98EVDTL). The primary index of a J.D. Edwards table must be unique. A unique primary index ensures that the system does not return duplicate values when the business view query is generated. Business View Design Aid also allows you to use any other index of the primary table when you process the business view. Complete the following steps to review how the Select Distinct feature works.

4. Choose the primary table in Business View Design Aid.
5. From the Table menu, choose Change Index to change the primary table index.

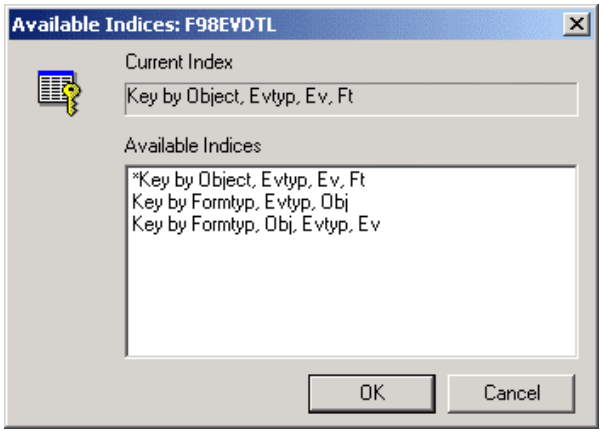
   Change Index is available only for the primary table.



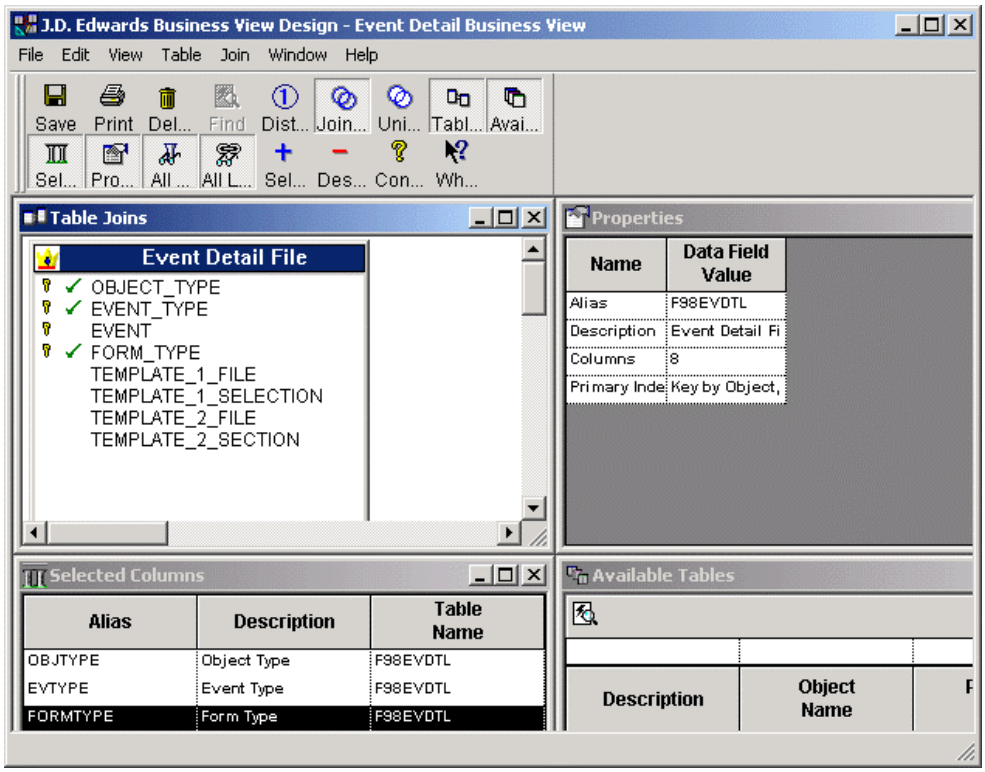
The system displays a warning, indicating that your selected column list will be changed.

6. Click Yes to continue.

   The Available Indices form appears. The first edit field on the form displays the current index of the table used by the business view. The default is the primary index.



7. For this example, choose Key by Formtyp, Evtype, Obj from Available Indices, and then click OK.



The Table Joins list and Selected Columns list change to reflect the keys of the new index.

8. Save the changes and exit Business View Design Aid.

   Now, if you run an application that uses the V98EVDTL business view, with Select Distinct off, and the changed business view index, Key by Formtyp, Evtyp, Obj, the generated SQL statement is:

   ```
   SELECT EDOBJTYPE, EDEVTYPE, EDFORMTYPE FROM PVC. F98EVDTL
   ```

   Using this example, you might now have 281 rows of data from table F98EVDTL.

9. Reopen the V98EVDTL business view.
10. Choose Select Distinct from the File menu.
11. Choose Change Index to reselect the Key by Formtyp, Evtyp, Obj index from Available Indices and then click OK.
12. Save the business view and exit Business View Design Aid.

    You might need to exit and restart the software. Because the software stores the business view in cache memory, even though you have changed the business view, the previous business view will run until it is cleared from cache memory.

    Generate and rerun the same application using the V98EVDTL business view that you just completed (with Select Distinct on and the changed business view index Key by Formtyp, Evtyp, Obj). The generated SQL statement is:

```
SELECT DISTINCT EDOBJTYPE, EDEVTYPE, EDFORMTYPE FROM PVC.
F98EVDTL
```

Using this example, you might now have only 53 rows of data from table the Event Detail File (F98EVDTL).

Creating a Table Join

Create table joins to access multiple tables in a single application.

You typically use joins for non-input-capable forms, such as find/browse forms, and reports. You do not usually use them for forms that update and add to the database because the relationship between the records must be precise. Use joins for input capable forms when the relationship between two tables is simple. Joins are faster than using individual fetches to retrieve data.

If a business view uses multiple tables, link them by establishing joins between columns in those tables. The links indicate how rows between a table correspond to rows in another table.

Data item attributes are defined in the data dictionary. Use the Properties form to view attributes for a column when determining whether you can use it in a join. The highlighted data item in the Selected Columns form displays the properties of that data item in the Properties form.

Review each table and decide how the data in each table is related to the data in other tables for your application or report. You might need to add columns, build indexes, or even create new tables. If you build new indexes, consider your needs carefully before you do so.

► To create a table join

1. In Business View Design, click and draw a line that links a column in the primary table to a column in a related table.

   You can create table joins only between similar columns. The name of the columns can be different, but the attributes for Data Type and Decimals must be identical. To determine whether data items are candidates for a join, click a data item in the Table Join pane and view the data item attributes that appear in the Hover Hints for each data item.

2. To delete a join, choose it and then choose Delete from the Join menu; alternatively, right-click the join and choose Delete from the pop-up menu.
3. From the Join menu, choose Types and then choose one of the following join types:
   - Simple
   - Left Outer
   - Right Outer

   The default join type is simple.

4. From the Join menu, choose Operators, and then choose one of the following operators:
   - Equal (=)
   - Less than (<)

- Greater than (>)
- Less or equal (< =)
- Greater or equal (> =)

The default operator is equal.

5. Click the Selected Columns view to sequence the columns.

Creating a Table Union

Unions are used to pull rows from tables that have the same structure. Unions pull rows that exist in either table.

► To create a table union

1. On Business View Design, choose Union Mode from the Table menu.

   Alternatively, use the appropriate icon on the toolbar.

   The view indicates Table Joins.

2. Choose the tables for which you want to create a table union.

Data Structures

Data structures are a key element of any programming language or environment. A data structure is a list of parameters that passes data between applications and tables or forms. J.D. Edwards uses data structures in the following instances:

- The system generates a data structure.
- You create a data structure.

System-Generated Data Structures

The two types of system-generated data structures are as follows:

- Form
- Report

Form Data Structures

Each form with an attached business view has a default data structure. Data structures receive parameters from or send parameters to other forms during Form Interconnects. You maintain the data structure by using the Form/Data Structure menu option in Form Design.

Report Data Structures

A batch application with an attached business view can receive parameters from or send parameters to a data structure. You can create and maintain the data structure from the Report/Data Structure menu option in Report Design. Unlike a form data structure, this type of data structure is not automatically populated with data items.

User-Generated Data Structures

As a user, you can create three types of data structures, as follows:

- Media object data structures
- Processing options data structures
- Business function data structures

Media Object Data Structures

To enable an application for media objects, you must create a data structure to pass arguments from the application table to the media object table. To work with a data structure for media objects, create a GT object type, or select an existing one to modify in Object Management Workbench.

Processing Options Data Structures

You use processing options to create an input property sheet. You use a parameter list to pass processing options to an application. You can create a processing option data structure template or modify an existing template in Object Management Workbench.

Business Function Data Structures

Any business function, whether it uses C or Business Function Event Rules as its source language, must have a defined data structure to send or receive parameters to or from applications. You can create a DSTR object type, or choose an existing object type to work with in Object Management Workbench. You can also create data structures for text substitution messages. Additionally, you can attach notes, such as an explanation of use, to any data structure or data item within the structure.

See Also

- *Messaging* in the *Development Tools Guide* for more information about text substitution messages

Working with Interconnection Data Structures

The Form Design or Report Design tool, not Object Management Workbench, maintains interconnection data structures. The data structure enables an application or report to pass values between interconnection forms or sections.

For interactive applications, the default data structure contains only the keys from the business view selected for a form. If you want to pass a value for a data item that is not in the default data structure, you must add the data item to the data structure.

The system creates a default data structure at the report level for a report with an attached business view. The default data structure is empty. If you add data items to the data structure, both the structure and the report itself is maintained by Report Design.

Interconnecting Forms

You create the default data structure by using keys from the business view selected for the form. You can access the form data structure from Form Design. From the Form menu, you can choose Data Structure to display the Form Data Structures form.

The items in the existing data structure appear in the Structure Members list. Two tabs appear for modifying the data structure. The Available Objects tab lists data items in the attached business view. If you want to add an item to the data structure that is not in the Available Objects list, then you can select it from the Dictionary Items list. The Dictionary Items tab accesses items from the Data Dictionary.

► To change form data structures

1. On Form Design Aid, focus on the form with the data structure that you want to modify, and then choose Data Structure from the Form menu.

   The Form Data Structure form appears.

2. To add an object from the attached business view or grid column, click the Available Objects tab, and then drag the object into Structure Members on the left side of the form.
3. To add a specific data dictionary item, complete the following:
   a. Click the Dictionary Items tab.
   b. In the QBE row, complete any of the following fields, and then click Find.
   - Alias
   - Data Item
   - Description
   - Product Code
   - Data Type
   - Item Size

   c. Click the data item in the detail area.
   d. Drag the desired data dictionary item into Structure Members on the left side of the form.
4. To remove an object from the data structure, choose the item in Structure Members, and then click Delete.
5. Click OK.

Changing Report Data Structures

The system creates an empty default data structure for any report section with an attached business view. This data structure receives values from another report in a report interconnection. If a required item is not in the existing data structure, you can choose it from the data dictionary and include it in the Structure Members list. To modify a report data structure, use Report Design and follow the steps for changing a form data structure.

Example: Changing Interconnection Data Structures

The following example describes a situation in which you might want to change an interconnect data structure.

Assume that you have created two fix/inspect forms, both of which use the same business view. The second form shows more detail, such as additional columns from the same record. If you do not want to refetch the record in the second form, you should change the data structure for the second form.

The data structure for the second form should contain all of the information (fields on the form) and data items in the data structure, in addition to the keys in the business view. In this case, you should set the form options to *No fetch on form business view* for that form. This also applies if you are not updating the record with new information on the second form, but you are passing that information back to the first form and allowing the first form update the database. In this case, you should turn off the *Update on form business view* option.

Depending on your configuration, you might want to fetch the entire record once in the first form and pass it to the second form, or let the second form refetch the record. In either case, you will have two separate business views, with different columns from the same record. If the second form is a form that will not be accessed often, do not fetch the fields in the business view of the first form. For the first form, use a business view that has only the columns needed for that form. If you fetch all of the columns needed for both forms, you perform only one *Select* from the database and all the data is passed over the network once, instead of having two separate *Select* statements generated by two different business views traversing the network. If hardware or memory limitations for the workstation do not prevent you from doing so, then fetch all columns for that record for both forms and allow that information to reside in the workstation's memory.

Displaying Type Definitions

You can display the type definition for a data structure. The type definition is stored in the clipboard. You can paste it into another application, such as a word processing application, to save or review the definition.

Creating a Data Structure

A data structure object is required to create a business function. A data structure is used to pass data between an application and a business function. J.D. Edwards Development Tools allows you to create an encapsulated data structure object. You can create several types of data structures that are maintained independently as objects in Object Management Workbench.

Creating a Business Function Data Structure

Business function data structures are used by C business functions and business function event rules to pass data between the business functions or application event rules.

▶ To create a business function data structure

1. On Object Management Workbench, click Add.
2. On Add J.D. Edwards Object to the Project, choose the Data Structure option, and then click OK.
3. On Add Object, complete the following fields:
   - Object Name

     The J.D. Edwards naming convention for business function data structures is D*xxxxyyyyA* where:

     D = Data structure

xxxx = The system code

yyyy = A next number

A = A multiple data structure differentiator (A, B, C, and so forth), used when a function has more than one data structure

- Description
- Product Code
- Product System Code
- Object Use

4. Click the following option and click OK.
   - Regular Data Structure

See Also

- *Understanding J.D. Edwards Naming Conventions* in the *Development Guidelines for Application Design Guide* for J.D. Edwards naming conventions

Creating a Media Object Data Structure

A special data structure object is required to work with media objects. The Media Objects storage table (F00165) contains information used to determine how to access specific media object attachments. This information is stored in the Object Name and Media Object Key (GDTXKY) fields. For example, in the Sales Order application, GDTXKY stores the key for each sales order that is entered. The F00165 table contains the following:

- Object Name, such as GT4201A
- GDTXKY (Key), such as sales order number|order type|company
- GDTXVC (Media Object Attachment)

The media object key contains the actual key to the location in which a specific record in the application is stored. This key typically is the same as the keys to the table that is used by the grid or form. The media object key must have a unique value for each media object attachment so that the system retrieves the correct attachment.

► To create a media object data structure

1. On Object Management Workbench, click Add.
2. On Add J.D. Edwards Object to the Project, choose the Media Object Data Structure option and click OK.

   The Add Object form appears.

3. On Add Object, complete the following fields and click OK:
   - Object Name

     The J.D. Edwards standard format for naming a media object data structure is *GtxxxxyyA*, where:

GT = Media object

xxxx = The table name, excluding the letter F

yy = A next number

A = A letter that differentiates multiple media objects, if the table has multiple media objects.

- Description

  Provide up to a 60-character description that reflects the subject of the media object.

- Product Code

- Product System Code

- Object Use

4. On Data Structure Design, click the Design Tools tab, and then click Data Structure Design.
5. To add a specific data dictionary item, complete the following:
   a. Click the Dictionary Items tab.
   b. In the QBE row, complete any of the following fields, and then click Find.

      Alias

      Data Item

      Description

      Product Code

      Data Type

      Item Size

   c. Click the data item in the detail area.
   d. Drag the desired data dictionary item into Structure Members on the left portion of the form.
6. To change the Structure Member Name, double-click the row in the detail area and enter a new name.

Note Concerning Data Structure Naming Conventions
Use Hungarian notation rules.

---

7. Click OK.

Creating a Processing Options Data Structure

Processing options are used to create an input property sheet.

▶ To create a processing options data structure

1. On Object Management Workbench, click Add.
2. On Add J.D. Edwards Object to the Project, choose the Data Structure option, and then click OK.
3. On Add Object, complete the following fields:
   - Object Name

     The J.D. Edwards naming convention for processing option data structures is *Txxxxyyyy* where:

     T = Processing option data structure

     xxxxyyyy = The program number for the application or report

   - Description
   - Product Code
   - Product System Code
   - Object Use
4. Click the following option and click OK.
   - Processing Option Template

Defining a Data Structure

After you create a data structure, you must define the data objects to include in the data structure. You can modify an existing data structure by adding new data objects to it or deleting data objects from it.

See Also

- *Processing Options* in the *Development Tools Guide* for information about working with processing options and their data structures and templates

Designing a Data Structure

After you create a data structure with OMW, use the following process to specify how it will function.

▶ To design a data structure

1. On Object Management Workbench, check out the data structure with which you want to work.
2. Choose the data structure, and then click the design button in the center column.

3. On Data Structure Design, click the Design Tools tab, and then click Data Structure Design.

   a. To add a specific data dictionary item, complete the following:

      i. Click the Dictionary Items tab.

      ii. In the QBE row, complete any of the following fields, and then click Find.

      Alias

      Data Item

      Description

      Product Code

      Data Type

      Item Size

   c. Click the data item in the detail area.

   d. Drag the desired data dictionary item into Structure Members on the left side of the form.

4. In the Structure Members area, to change the structure member name, double-click the row in the detail area and enter a new name.

   Note Concerning Data Structure Naming Conventions
   Use Hungarian notation rules.

   If you are unsure about which data dictionary item you want, click Data Dictionary to search for data dictionary items and then view details about the data items that you select.

   You can view detailed information about a data item in the data structure by choosing it, and then clicking Data Dictionary Detail.

5. In the Structure Members area, you can indicate the required status by leaving the Required Member/Req option blank or choosing one of the following:
   - Choose X to indicate that the field is optional.
   - Choose the checkmark to indicate that the field is required.
6. Choose a direction for the data flow by clicking the arrow for the Input/Output/IO option until it changes to the appropriate direction and type.
7. To remove an object from the data structure, select the item in Structure Members and then click Delete.
8. To define attachments for the data structure, click Data Structure Attachments.
9. To define attachments for a data structure item, click Data Structure Item Attachments.
10. To launch the Cross Reference utility, click Cross Reference.
11. When you are finished, click OK.

Creating a Type Definition

After you design a data structure, you create a type definition, which is a C code representation of a data structure definition used in business functions. It is stored in the clipboard after you create it so that you can then paste it into the appropriate section of the .h file. This process saves you time because you do not have to type the code in the .h file.

► To create a type definition

1. On Data Structure Design, click the Design Tools tab.
2. Click the Create a type definition button.

   Your type definition is stored in the clipboard. You can now paste it into the appropriate section of the .h file.

Cross Reference Facility

You can use the Cross Reference Facility to determine where and how specific kinds of objects are used. You can also view relationships between objects and their components. For example, you can do the following:

- Identify each instance in which a business function is used
- View a list of forms within an application
- Display all fields within a business view or form interconnection
- Cross-reference all applications in which a specific field, event rule, or control is used

You can rebuild cross-reference relationships when you change an object or a component.

Searching for Objects

You can search for objects by search type and object name.

► To search for objects

From the Cross Application Development Tools menu (GH902), choose Cross Reference Facility.

Click one of the following tabs:

- Data Items
- Interactive Applications
- Batch Applications (the batch application object type in Cross Reference is UBE)
- Business Functions
- Business Views
- Data Structures
- Tables
- Forms

Searching for Data Items

You can determine where specific data items are used. You can search for the following:

- Forms that use a data item
- UBEs that use a data item
- UBE event rules that use a data item as a variable
- Applications that use a data item as a variable
- Named event rules that use a data item as a variable
- Functions called by smart field data items
- Edit rule functions called by a data item
- Display rule functions called by a data item
- Search forms used by data items
- Processing options that use a data item
- Generic text data structures that use a data item
- Business function data structures that use a data item
- All data structures that use a data item
- Tables that use a data item
- Indices that use a data item
- Business views that use a data item
- Table event rules that use a data item

Searching for Interactive Applications

You can locate a variety of information about interactive applications. You can search for the following:

- Applications that call an application
- Applications that call a business function
- Data structures that are used by an application
- Tables that are used by an application
- Forms for an application
- Data items for an application
- Data items that are used as variables in an application
- Processing options for an application
- Business views for an application

Searching for Batch Applications

You can locate information about batch applications (often referred to as UBEs) and how they are used. You can search for the following:

- UBEs that call a business function
- Tables that are used by a UBE
- Data structures that are used by a UBE
- UBEs that are called by a UBE
- UBEs that call a UBE
- Processing options for a UBE
- Business views for a UBE
- Data items that are used by a UBE
- Data items that are used as variables in a UBE

Searching for Business Functions

You can locate a variety of information about business functions and how they are used. You can search for the following:

- The places in which a business function is used
- Data structures that are used by a named event rule
- Business functions that are called by an application
- Business functions that are called by a UBE
- Tables that are used by a business function
- Business functions that are called by a business function
- Business functions that call a business function
- Data items that are used as variables in a named event rule
- Tables that are used by a named event rule
- Business functions that are called by a named event rule
- Smart field data items that call a column header function
- The places in which a function is used
- Smart field data items that call a value business function
- Data items that call edit rule functions
- Data items that call display rule functions
- Source and header files by string
- Table event rules that use a business function

Searching for Business Views

You can locate information about business views and how they are used. You can search for the following:

- Applications that use a business view
- UBEs that use a business view
- Forms that use a business view

- Data items for a business view
- Tables for a business view

Searching for Data Structures

You can locate a variety of information about data structures and how they are used. You can search for the following:

- Applications that use a data structure
- Business functions that use a data structure
- UBEs that use a data structure
- Data items for a processing option
- Data items for generic text data structures
- Data items for a business function data structure
- Data items for all data structures
- Table event rules that use a data structure

Searching for Tables

You can locate a variety of information about tables and how they are used. You can search for the following:

- Business functions that use a table
- Applications that use a table
- UBEs that use a table
- Named event rules that use a table
- Forms that use a table
- Data items for a table
- Indices for a table
- Business views that use a table
- Data items that are used by table event rules
- Business functions that are used by table event rules
- Data structures that are used by table event rules
- Tables that are used by table event rules

Searching for Forms

You can locate a variety of information about forms and how they are used. You can search for the following:

- Forms that are called by an application
- Tables for a form
- Data items for a form

- Business views for a form
- Data items that use a search form

Searching for Event Rules

You search for event rules to help you find an existing event that you can use.

► To search for event rules

1. On the Cross Reference Facility search form that you have chosen, choose Event Rules from the Form menu.
2. On ER Search, complete the following fields and click Find:
   - Object Name
   - Form Name
   - Data Field Name

Viewing Field Relationships

The Field Relationships form is meaningful only for the following cross-reference search types:

DA Data items that are used by an application

FA Forms for an application

FI Forms that use a data item

SA Data structure for an application

In these instances, the Field Relationships form displays the control type for a field, such as one of the following:

- BC for a business view column
- FI for a form interconnect control
- GC for a grid control
- FC for a form control

► To view field relationships

On the Cross Reference search form that you chose, choose Field Relationships from the Form menu.

1. On Field Relationships, complete the following fields as necessary:
   - Object

- Form Name
- Field
- Control

  The control field does not have a Search button. The possible control types are as follows:

  - BC - Business View Field
  - PO – Processing Option
  - FI - Form Interconnect
  - VAR - Variable
  - FC – Form Control
  - FCW - Form Control Work field
  - GC - Grid Column
  - GCW - Grid Column Work field

2. Click Find.

   All of the controls that appear on a given application or form appear in the detail area.

Rebuilding Cross Reference Information

When developers modify objects, cross-reference information might become out-of-date with objects in the system. Because the cross-reference files are not automatically rebuilt when objects are modified, you must do so at the time of inquiry. You can also regularly schedule cross-reference builds to ensure that the cross-reference information is updated regularly.

View the date on which a record was built in the far right column of the grid on each cross-reference form of the Cross Reference utility. If information is out-of-date, use the Rebuild option from any of the cross-reference forms.

Cross-reference builds use relational database tables, not local specifications.

► To rebuild cross reference information

1. On Cross Reference, choose Rebuild Relationships from the Form menu.
2. Choose the objects that you want to rebuild.

Note
The rebuild process can take several minutes.

Event Rules

Event Rules discusses using event rules and logic. It also describes how to use BrowsER.

Event Rules Design

Use Event Rules Design to create business logic for an application. For example, you can create event rules that do the following:

- Perform a mathematical calculation.
- Pass data from a field on a form to a field on another form.
- Count grid rows that are populated with data.
- Interconnect two forms.
- Hide or display a control using a system function.
- Evaluate If/While and Else conditions.
- Assign a value or an expression to a field.
- Create variables or programmer-defined fields at runtime.
- Perform a batch process upon completion of an interactive application.
- Process table input and output, validate data, and retrieve records.

Before You Begin

- ❑ Create an application with one or more forms.
- ❑ Understand the difference between database items and data dictionary items.
- ❑ Understand the relationship between controls, events, and event rules.
- ❑ Determine the purpose of each form used in the application.
- ❑ Answer the following four questions:
  - What logic is required?
  - For which control are you creating logic?
  - For which event will the logic occur?
  - Which runtime structures are affected?

Understanding Controls

A control is a reusable object that appears on a form. Examples include push buttons, edit fields, and grids. A form itself is also considered a control.

Controls can be simple or complex. Simple controls have few event points to which logic can be attached. Complex controls can have many event points to which logic can be attached.

Understanding Events

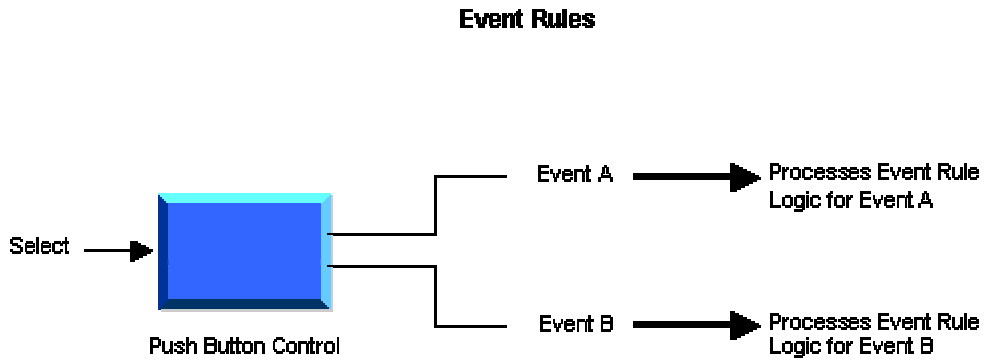
Events are activities that occur on a form, such as entering information a form or exiting a field by using the Tab key. Events can be initiated by the user or the application. A single control might initiate multiple events. The system also initiates some events, such as *Last Grid Record Read*, when certain actions occur.

Understanding Form Processing

Form processing refers to the business logic associated with each form. By default, each type of J.D. Edwards form automatically processes various events. You specify additional logic by using Event Rules Design. Form processing depends on the occurrence of specific events, such as initializing a form or changing the value of a field.

Understanding Event Rules

Event rules are logic statements that you can create and attach to events. J.D. Edwards software uses two types of event rules: business function event rules and embedded event rules. Event rules are initiated when events occur at runtime. The following illustration shows this relationship:



You can attach multiple event rules to one event. The various types of event rules include:

- Conditional statements such as If/Else/End If
- While loops
- Assignments to statements
- Calls to encapsulated functions
- Form or report interconnections
- Calls to system functions
- Table I/O operations

Business Function Event Rules

Business function event rules are encapsulated, reusable, business logic that you create using Event Rules Design, rather than C programming. Business function event rules are stored as objects and are compiled. Business function event rules are sometimes called Named Event Rules (NERs).

Embedded Event Rules

Embedded event rules are specific to a particular table, interactive application, or batch application. They are not reusable. Examples include using form-to-form calls, hiding a field that is based on a value in a processing option, and calling a business function. Embedded event rules can be in application event rules (interactive or batch) or in table event rules. They can be compiled or uncompiled.

Application Event Rules

You can add business logic that is specific to a particular application. Interactive applications connect event rules via Form Design, while batch event rules use Report Design.

Table Event Rules

You can create *database triggers*, or rules that you attach to a table by using Table Design Event Rules. The logic that is attached to a table is run whenever any application initiates that database event. For example, to maintain referential integrity, you might attach rules to a master table that delete all children when a parent is deleted. Any application that deletes information from that table does not need to have the parent/child logic embedded in it because that logic exists in the table.

See Also

- The *Published API* section of the online help for information about individual events

Understanding the Event Rule Buttons

The Event Rules Design form displays the following buttons for generating different types of business logic:

Business Function	Attaches an existing business function.
System Function	Attaches an existing J.D. Edwards system function.
IF/While	Creates an If/While conditional statement.
Assignment	Creates an assignment or a complex expression.
Report Interconnect	Establishes a connection to a batch application or report.
Form Interconnect	Establishes a form interconnection.
Else	Inserts an Else clause, which is valid only within the bounds of If and Endif.
Variable	Creates a programmer-defined field, which has data dictionary characteristics for application-specific purposes, but does not reside in the data dictionary.
Table I/O	Allows event rule support for database access. Performs table input and output, data validations, and record retrieval.

Event Rules Based on Form Type

Each form type has specific event rules that you typically use for that form type, as indicated by the following table:

Form Type	Event Rules
Find/browse	Form-level and grid level
Fix/inspect	Form-level only
Header detail and headerless detail	Form-level and grid level

Runtime Processing

Runtime processing refers to how, at runtime, the system evaluates various events (such as initializing a form, clicking a button, and using the Tab key to move between fields) and their attached event rule logic. Event rule logic is attached to events, which, in turn, are attached to controls.

Form Design provides several different form types, each of which includes predefined fields and features that are specific to the form type. For example, a find/browse form automatically includes a Find menu option or toolbar button with appropriate functions attached to it. When you type search text in a filter field or Query by Example (QBE) field, and then click the Find button on the toolbar, the runtime engine processes logic to fetch a record.

To avoid generating unnecessary event rules, you should understand the different field types and associated capabilities that characterize each form type. You can also customize existing event rules.

Runtime Data Structures

Runtime data structures are structures or blocks of memory that hold data in memory as the system reads, processes, and writes the data to the database. You should know what is happening to each form at runtime. You should know what is in a runtime structure at a given event point.

The runtime system dynamically creates runtime data structures. For example, if a form contains hidden controls, the system allocates memory for those controls even though they are not visible on the form. When you pass processing option values in a form, the system allocates memory to store the processing option value.

Available Objects and Runtime Data Structures

An available object is represented by a two-character, alphabetical code that characterizes the source of data and determines how the object data is used in an interactive application at runtime. Available objects make up the runtime data structure for a form.

During runtime processing, the system stores data in memory in an internal data structure. A data structure enables data to pass to another field on the same form or between forms. Certain fields of the data structure temporarily store data during runtime. When the data is no longer needed, it is deleted so that the system can process another record.

Available objects include following:

BC A column in the business view. Business view columns for both the form view and the grid view appear in this list. The system fills these columns with values from the database when it performs a fetch. The system writes the values to the database during an add or update.

GC A column in the grid. The row that the value references depends on which event is accessing the GC. During the fetch cycle, the system fetches the row. It is usually the selected row. In some circumstances, grid column objects also denote a particular physical column in the grid instead of a value. An example is the Set Grid Line Font system function.

GB The grid buffer. This buffer is one row of data space that is independent of the lines that the system reads from the database and writes to the grid. The grid buffer allows you to manipulate column data for a line that you want to insert or update without affecting the grid's present state. You access the grid buffer through the available object Grid Buffer Column (GB), which appears after the Grid Columns (GC) in the list of available objects in event rules. Each grid contains only one instance of each GB column. The grid buffer is not associated with any particular line.

FC A control on the form. If the control is a database item, this field corresponds to a BC object. Furthermore, if the control is not a filter, the FC object represents the same value as the BC object, and changing one of these results in changing both.

FI A value passed through a form interconnection. You access this object either to read values that are passed into the form or to set values to be passed back. These objects correspond to the elements of the form data structure.

PO A value passed from a processing option. These values are passed into the application when a user launches it. Any form in that application can access them. Processing options can either be entered by the user, or they can be set up in a particular version of an application.

QC A column from the Query by Example (QBE) line in the grid. These objects represent the values

in any QBE cell on the grid. They include wildcards, but do not include any comparison operators. Likewise, assignments to these objects can include wildcards, but not comparison operators. You can use a system function to set comparisons. QC objects do not affect the data selection on an update grid.

HC Hypercontrol item. These objects represent hypercontrol items on the form's hypercontrol. They can be used to enable and disable those items on the form menu and on the toolbar, as well as invoke them through event rules.

VA Event rules variables. These objects represent any variables that the developer set up in event rules. The system does not manipulate event rules.

SV System variables. These objects represent some environment variables that are accessible to event rules.

SL System literals. These objects represent some constant system values that are accessible to event rules.

TP Tab page object.

TK A column in the table that contains the table event rule.

CO A constant, such as the return code for an error.

TV Text variable.

RC Report constant (UBE).

RV Report variable (UBE).

IC Input column (table conversion).

OC Output column (table conversion).

BC and FC share the same internal structure if an FC is associated with a database item; filter fields are an exception.

Event Rule Manipulation

To automatically tailor searches to certain situations without adding filter form controls, you can use event rules to assign values to QBE columns. Unlike filters, event rules allow you to change comparison operators at runtime instead of during design time.

Processing Available Objects

When the value of an available object changes during event rule processing, the following actions occur:

- The new value is copied to the business view data, grid data, form control data, form-interconnect data, or processing option data immediately after that ER line is processed (internal runtime structure).

- Form control data and grid data are copied to the appropriate form control or grid cell (external screen).

Form control data that is associated with database items share the runtime data structure with business view data. (Filter fields are an exception to this rule.) This situation means that:

- FC data and BC data are always identical.
- Whenever FC runtime data is changed, any reference to BC reflects the same value.
- Whenever the BC value is changed, the FC runtime value also changes. This change in the FC is not reflected on the form until the FC runtime value moves to the screen.
- On Control is Exited processing, the value entered into the form control is captured in the runtime data structure that is shared by BC and FC.

Control is Exited Processing

Control is Exited processing includes the following:

- The value in the control is saved to internal runtime structures.
- The *Control is Exited* event is processed.
- If the value has changed since the previous time that the control was exited, the following occurs:
  - The system processes the *Control is Exited and Changed - Inline* event.
  - The system launches the asynchronous process (the next three steps are executed on a thread).
  - The system processes the *Control is Exited and Changed - Async* event.
  - The system validates the Data Dictionary.
  - The form control data is formatted and copied back to the control.

For fix/inspect and transaction forms, this logic is also performed for each control on the OK Button.

Grid Processing

You can use system functions to manipulate the selection or sequencing in a grid. These functions give you direct access to the database APIs and the selection and sequencing structures that you use when the runtime engine populates the grid. You can use the following system functions for this purpose:

Set Selection	Creates one element in the select structure.
Set Lower Limit	Creates one element in the select structure. This system function is similar to Set Selection.
Clear Selection	Removes all system-function-defined selection information.
Set Selection Append Flag	Determines whether the system-function-defined information appends to or replaces QBE and filter field information.
Set Sequencing	Creates one element in the sort structure.
c	Removes all system-function-defined sequencing information.

If a headerless detail form contains at least one equal filter or one nonfilter database form control, the system updates the grid records for the form only if they change.

You can also use the *Get Custom Grid Row* event, and system functions, such as *Continue Custom Data Fetch,* for page-at-a-time processing for custom grids. This processing allows you to fetch only a page of data at a time to limit the number of possible records. This is particularly useful for grids in which you might be fetching thousands of records.

Grid columns have type-ahead capability. When a user enters a character in the field, the system searches a history list for a match. If a match exists, it appears in the field with highlighted text. This feature is particularly useful for data entry work because it can reduce the amount of typing required.

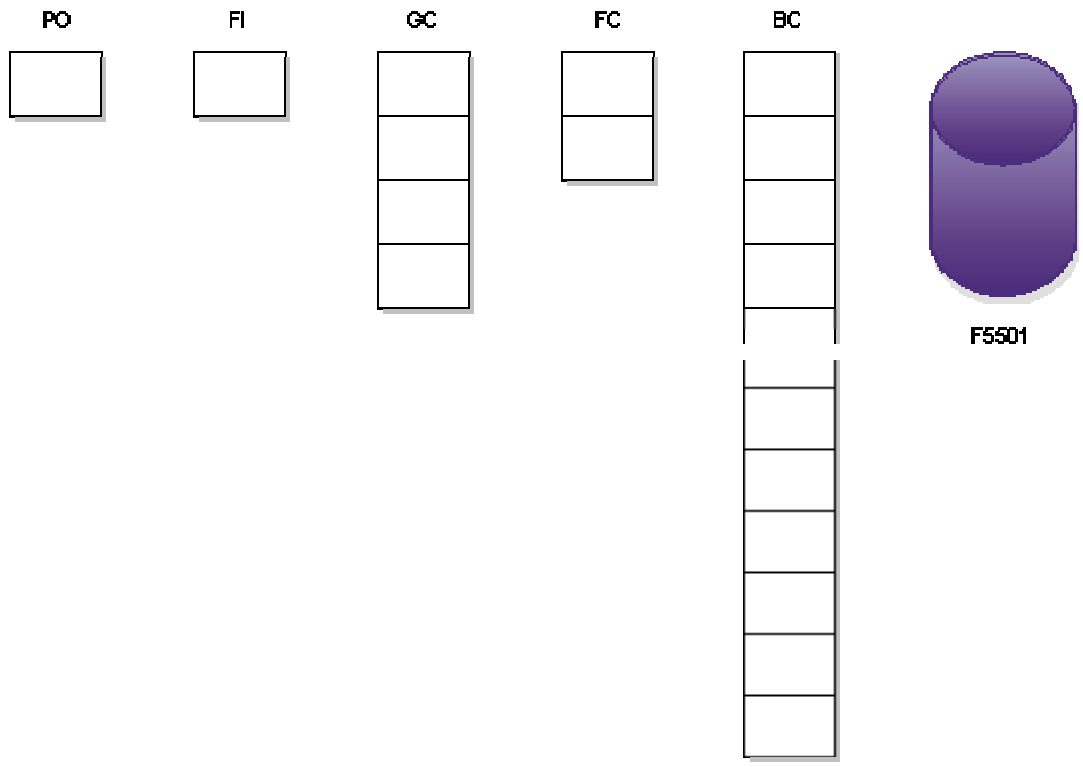
Form Flow

Each form type has its own properties and its own event flow. Processing occurs regardless of whether you add event rule logic. However, the engine pauses at specific events, such as *Dialog Is Initialized,* so that you can add logic or manipulate values. Event rule logic and user interaction determine how the system processes events.

Some of these events occur on each form, although the order and number of events varies depending on the form type. For example*,* you can use *Dialog Is Initialized* to add logic on all types of forms. Similarly, you can use *Post Dialog is Initialized* to add logic on a fix/inspect form, but not on a find/browse form. For a forms with updateable grids, the events *Dialog is Initialized* and *Post Dialog is Initialized* perform something different than they do for forms without a grid. For forms with an updateable grid, the system performs a Find and reads the database between these two events.

Typical Event Flow for a Find/Browse Form

The following example represents how values in the runtime structures are stored in memory compared to how they appear on the form. This example uses the Find/Browse form when it is called directly from a menu.



The runtime engine processes events in a certain order. The following topics describe the typical events for the Find/Browse form and the order in which they are processed. This process flow can vary depending on specific user interaction and the event rule logic that you use.

Pre Dialog Is Initialized

The following steps occur before the *Dialog is Initialized* event is processed and the form appears:

- Initialize runtime structures (or clear memory) as follows:

  BC = 0

  FC = 0

  GC = 0

  FI = Values passed from a calling form (if any)

  PO = Values passed from processing options

- Initialize form controls.
- Initialize error handling.

- Initialize static text.
- Initialize helps.
- Create toolbar.
- Load form interconnect data into corresponding BC columns and filter fields (if any exist).
- Initialize thread handling.
- Use filter controls to build a WHERE clause of an SQL SELECT statement.

If a form interconnection to the form exists, the computer memory contains information in the FI structure. The FI value is copied to the BC runtime structure.

Dialog Is Initialized

The engine pauses for the event to be processed. The system processes all event rule logic that is attached to the *Dialog Is Initialized* event. When the engine pauses, the runtime structures contain the following values:

BC = Any FI values passed

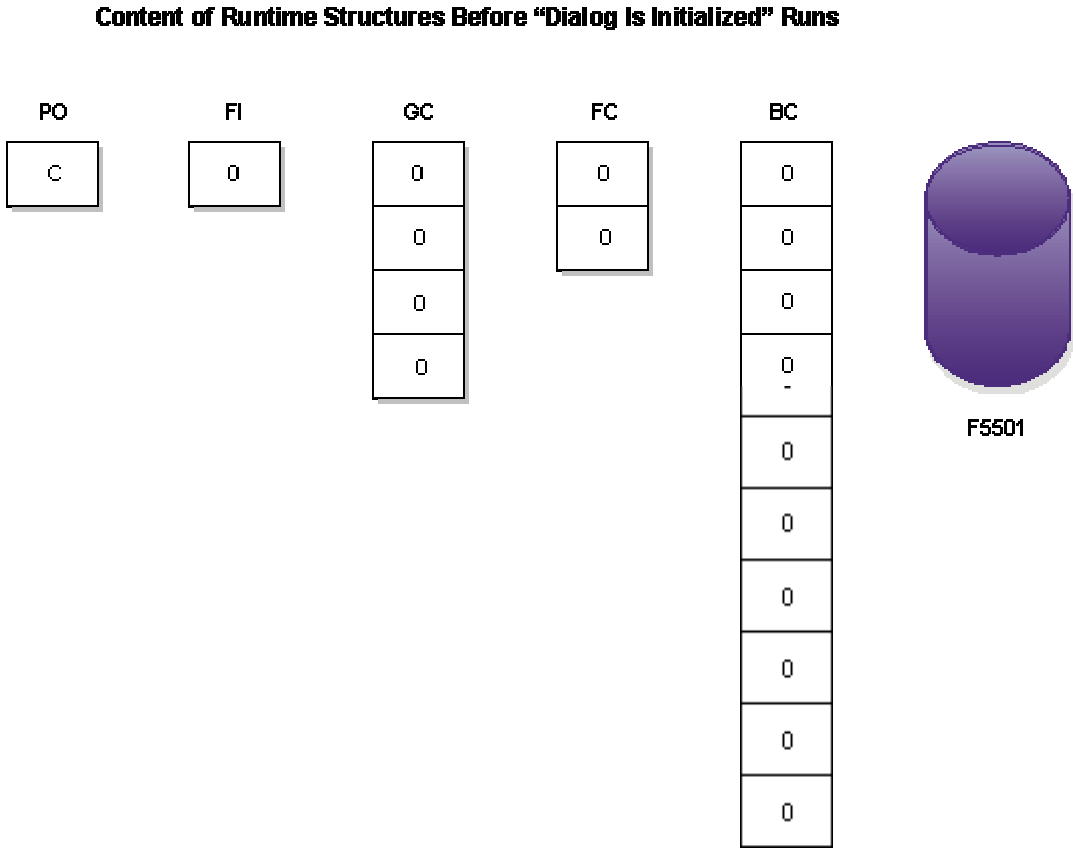
FC = Any FI values passed

GC = 0

FI = Values passed from a calling form (if any)

PO = Values passed from processing options

The following illustration represents the information in the runtime structures just before the system runs *Dialog Is Initialized:*



The *Dialog is Initialized* event is commonly used to do the following:

- Hide or show controls on a form.
- Disable controls.

After the system processes *Dialog Is Initialized*, it displays the form.

Post Dialog Is Initialized

The engine pauses again for the event to be processed. You can add logic to be processed when the system runs *Post Dialog Is Initialized*. When the engine pauses, the runtime structures contain the following values:

BC = 0 (or values already passed in)

FC = 0 (or values already passed in)

GC = 0 (or values already passed in)

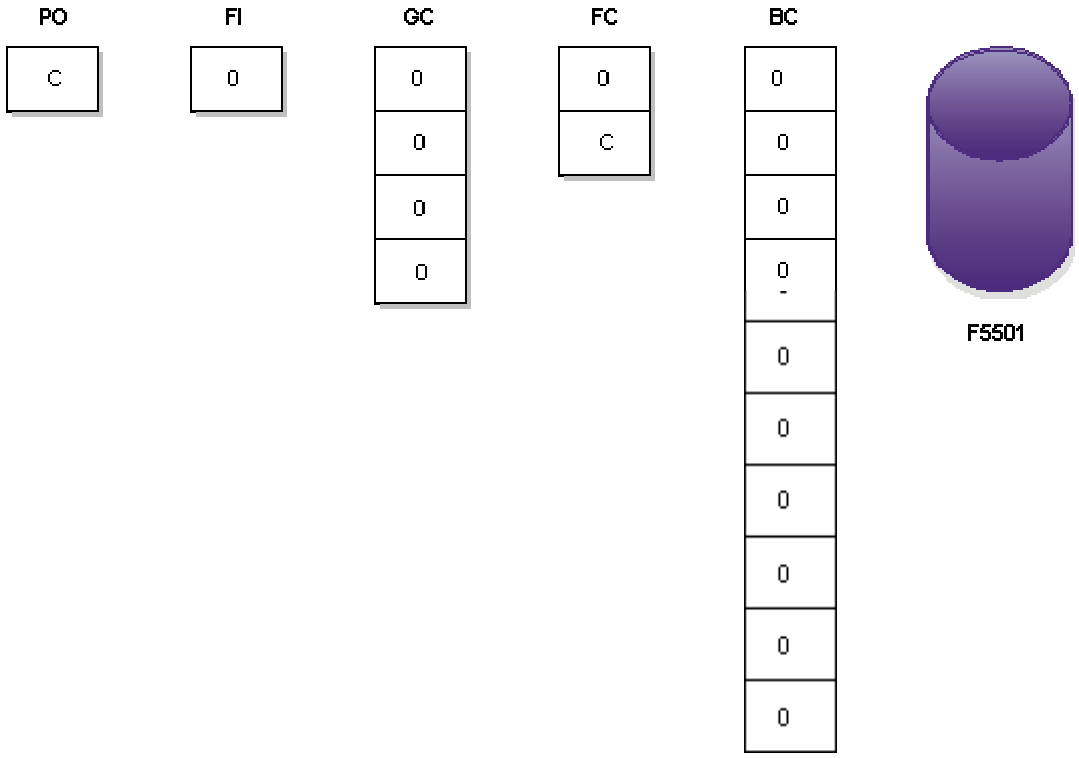
FI = Values passed from a calling form (if any)

PO = Values passed from processing options

At this point, the system has not yet fetched records. To allow you to add logic or manipulate the runtime structure values, the engine pauses just before the Fetch process. You can also perform an assign process from the filter field here.

The following illustration represents the information in the runtime structures just before the system runs *Form Record is Fetched*:

Content of Runtime Structures Before "Form Record is Fetched" Runs



The *Post Dialog is Initialized* event is commonly used to do the following:

- Load filter fields that will be used for the WHERE clause in the SQL SELECT statement.
- Load processing option values into filter fields.
- Perform any one-time logic for the form, such as fetching a system date.

The *Post Dialog is Initialized* event runs even when a record does not exist.

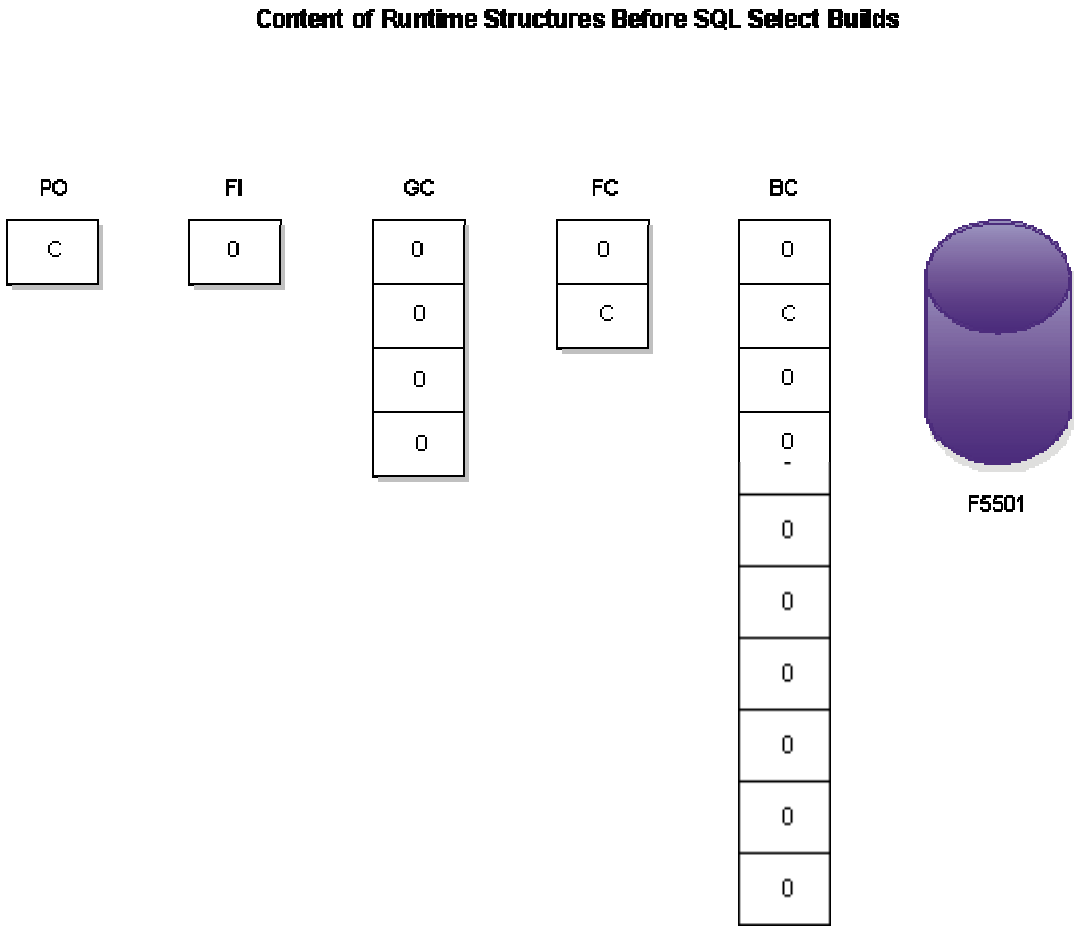
At this point, the user must click the Find button to populate the grid (the J.D. Edwards standard is to disable autofind). Then the system builds the SQL SELECT.

SQL SELECT

After the user clicks the Find button, the system builds a SELECT statement with a WHERE clause. The SQL SELECT statement marks all columns in the business view.

The WHERE clause includes any values in the QBE line or in filter fields. The WHERE clause is then used to get all records that meet the QBE and filter criteria.

The following illustration represents the information that appears in the runtime structures just before the system builds the SQL SELECT and the FETCH occurs:



Do in While Loop

Records are fetched one at a time in a WHILE loop. The following occurs during the WHILE loop:

- The system finds WHILE database records, and WHILE grid rows are available on the form.
- The system performs page-at-a-time processing.
- SQL FETCH gets one record.

Page-at-a-Time Processing

Page-at-a-time processing means that the system fetches only the number of records that can visibly appear in a grid. For example, if the grid displays only three rows, then three

records are fetched, one after the other. To fetch the next three, the user must click the down arrow key on the grid scroll bar. You can size the grid when you design the form.

When page-at-a-time processing occurs, the grid display is cached in memory. (This memory cache is different than the runtime structure in memory.) Because the grid is cached, the user can load all records into the grid and then use the up arrow to display a previously fetched record. The cache does not cause a new `FETCH`. For example, assume that records 45 through 47 are loaded and the user clicks the down arrow, the system loads records 48 through 50. If the user then presses the up arrow and highlights record 45, a new `FETCH` is not necessary to retrieve record 45 because it is retrieved from the grid cache.

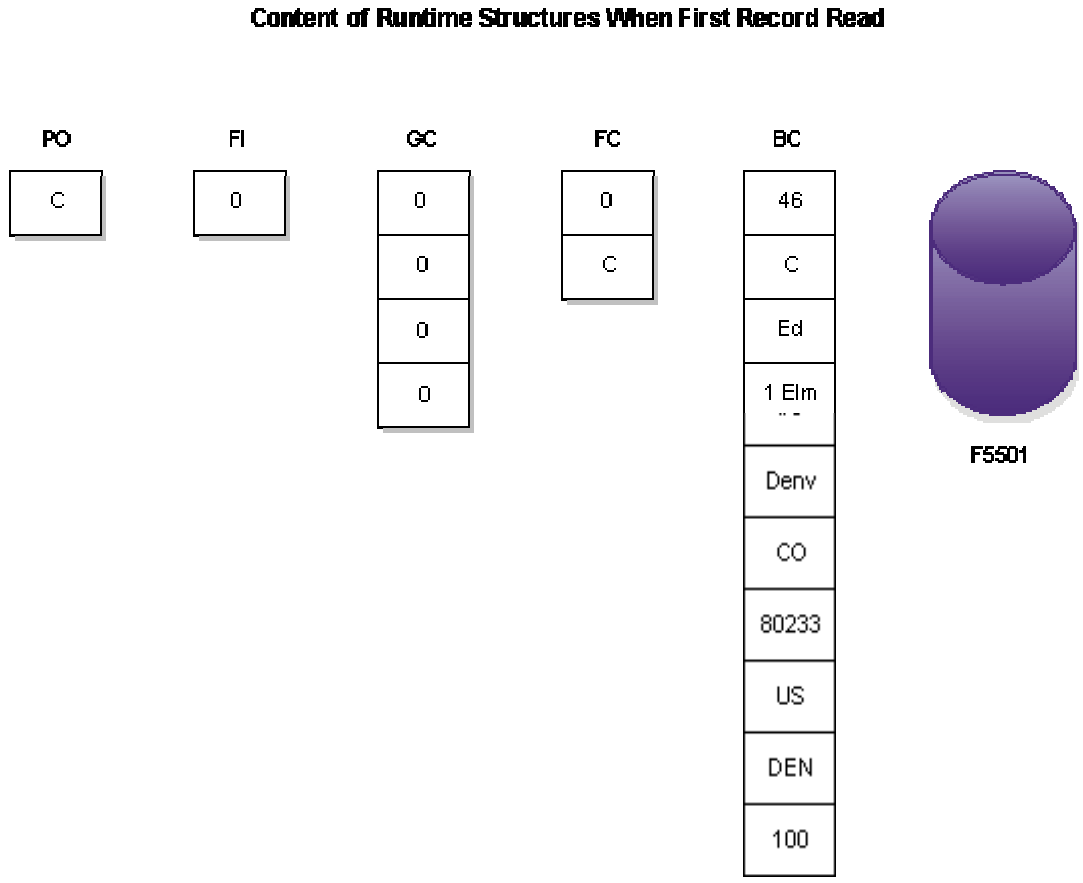
When page-at-a-time processing is turned on, event rule logic that is attached to the *Last Grid Rec Has Been Fetched* event is not executed unless the user clicks the down arrow key on the grid scroll bar enough times to fetch the last record.

Page-at-a-time processing typically improves performance. Although it can be disabled, the J.D. Edwards standard states that you should not disable it unless you have a valid business reason to do so or the form type is Headerless Detail.

BC Assigned Database Values

After the system fetches the first record in the `WHILE` loop, it copies the database values to the BC runtime structure. Values from each marked column in the table appear in the BC runtime structure elements.

The following illustration represents the information in the runtime structures when the system reads the first record in the `WHILE` loop:



Grid Rec Is Fetched

The engine pauses again for the event to be processed. You can add logic to be processed when the system runs *Grid Rec Is Fetched*. When the engine pauses, the runtime structures have the following values:

BC = Values from the database (for the first record read)

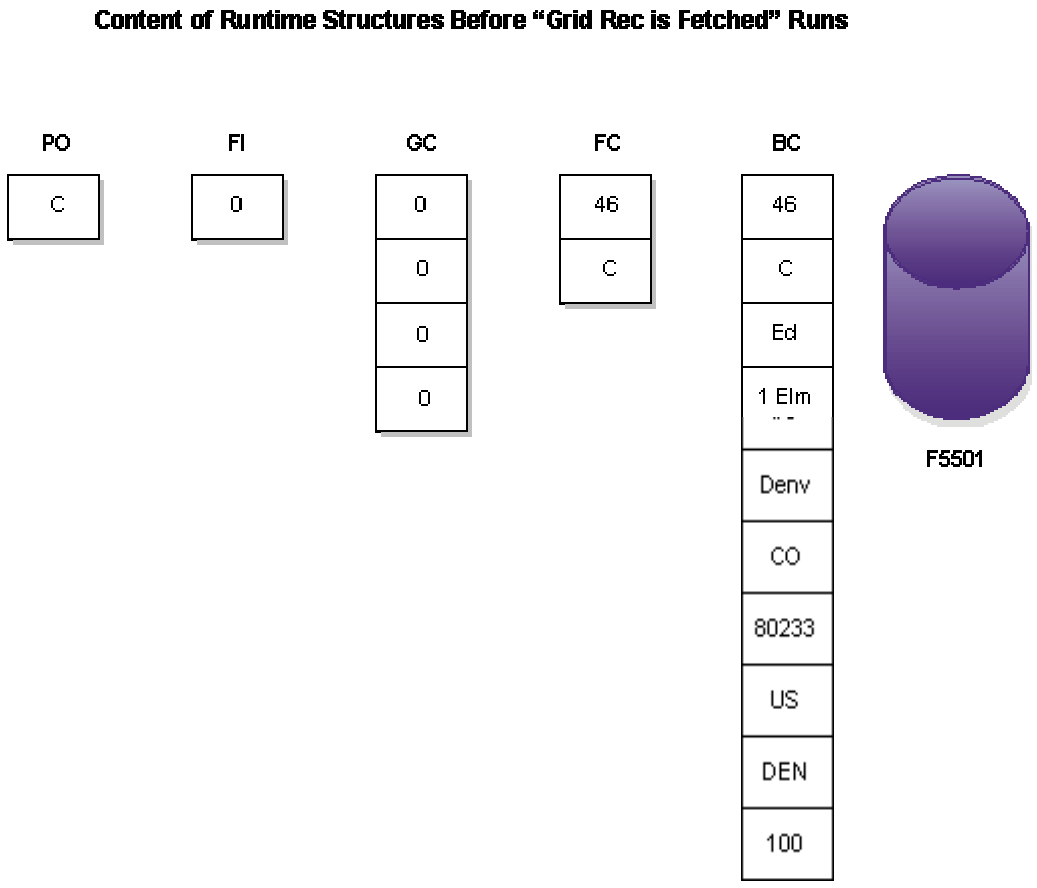
FC = Values from the database (if the fields are database fields)

GC = 0

FI = Values passed from a calling form (if any)

PO = Values passed from processing options

The following illustration represents the information in the runtime structures just before the system runs *Grid Rec Is Fetched*:

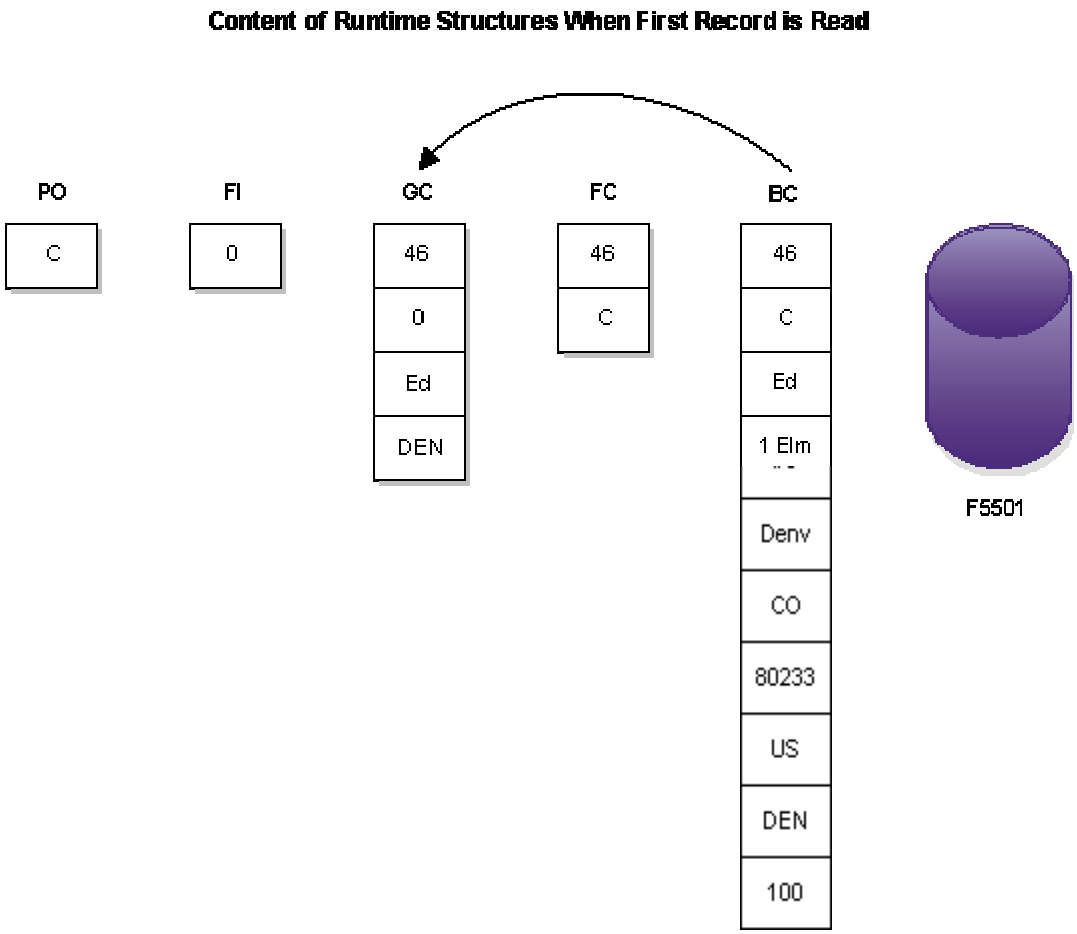


The *Grid Rec Is Fetched* event is commonly used to perform the following actions:

- Calculate a value for a work field in the grid.
- Suppress a row from being written to the grid.

After the *Grid Rec Is Fetched* event (when the first record in the WHILE loop is fetched), the BC values are copied into the GC runtime structure.

The following illustration represents the information in the runtime structures when the system reads the first record in a `WHILE` loop.



Write Grid Line Before

The engine pauses again for the event to be processed. You can add logic to be processed when the system runs *Write Grid Line Before*. When the engine pauses, the runtime structures have the following values:

BC = Values from the database (from the record just read)

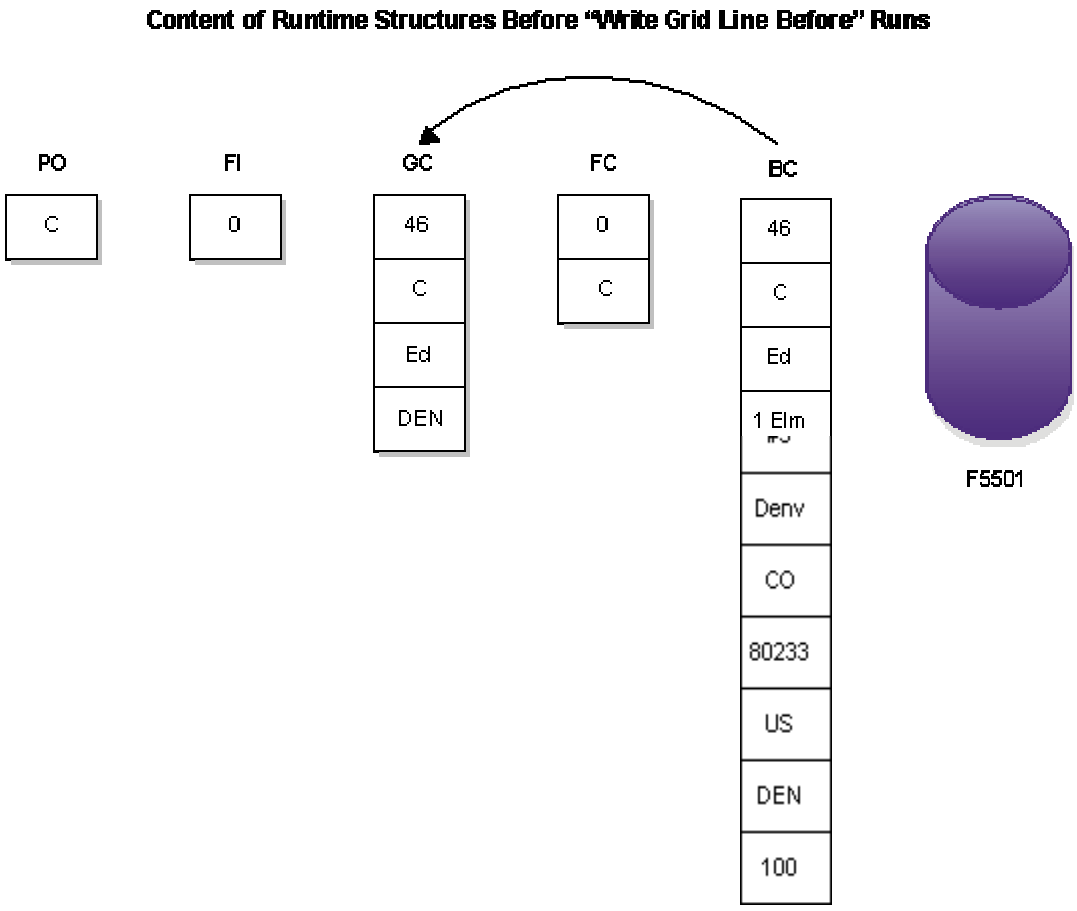
FC = Values from the database (if the fields are database fields)

GC = Values from the database (from the previous read)

FI = Values passed from a calling form (if any)

PO = Values passed from processing options

The following illustration represents the information in the runtime structures just before the system runs *Write Grid Line Before*:

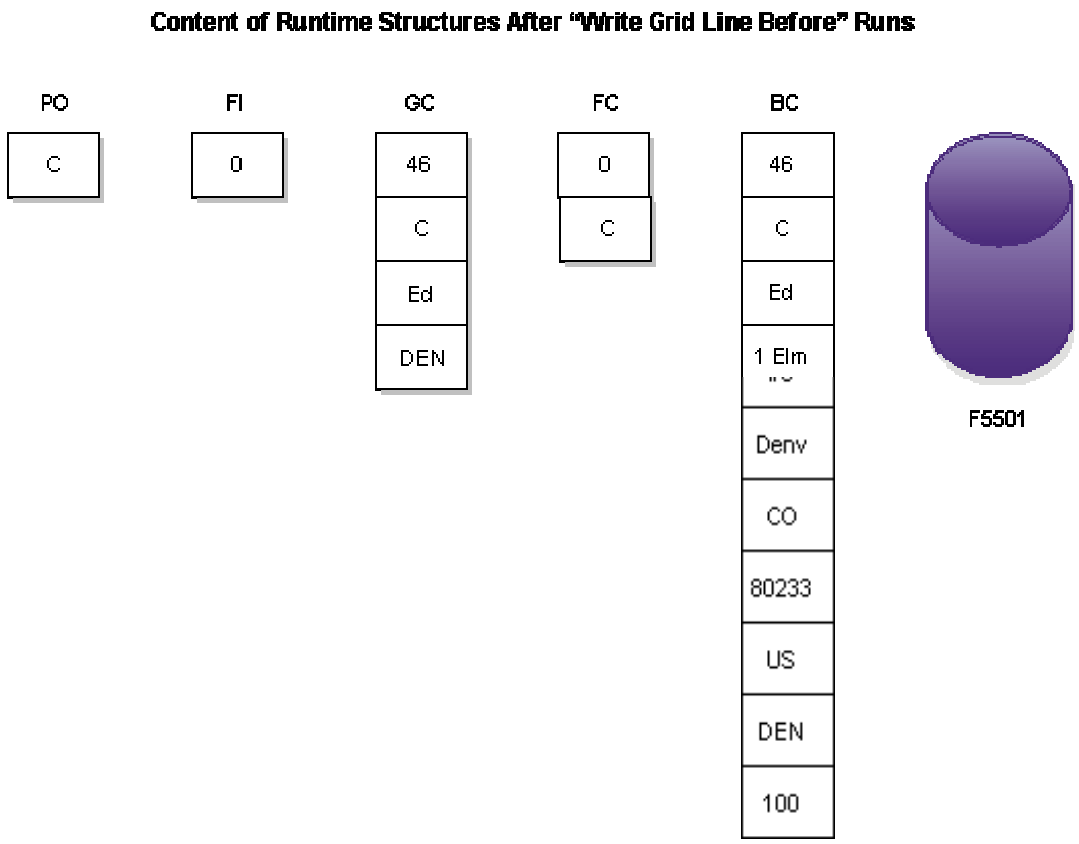


The *Write Grid Line Before* event is commonly used to do the following:

- Suppress a grid row from being written.
- Add logic before the user sees a row on the form.
- Change formatting of a grid column.
- Convert any grid value, such as unit of measure.
- Retrieve additional information for the grid row, such as a description, from tables that are not in the business view.

After the system processes *Write Grid Line Before*, the GC elements, which now include the database values for the first record, are copied to the grid cells on the form.

The following illustration represents the information that appears in the runtime structures now:



Write Grid Line After

The engine pauses again for the event to be processed. You can add logic to be processed when the system runs *Write Grid Line After*. When the engine pauses, the runtime structures have the following values:

BC = Values from the database (from the first record read)

FC = Values from database (if the field is a database field)

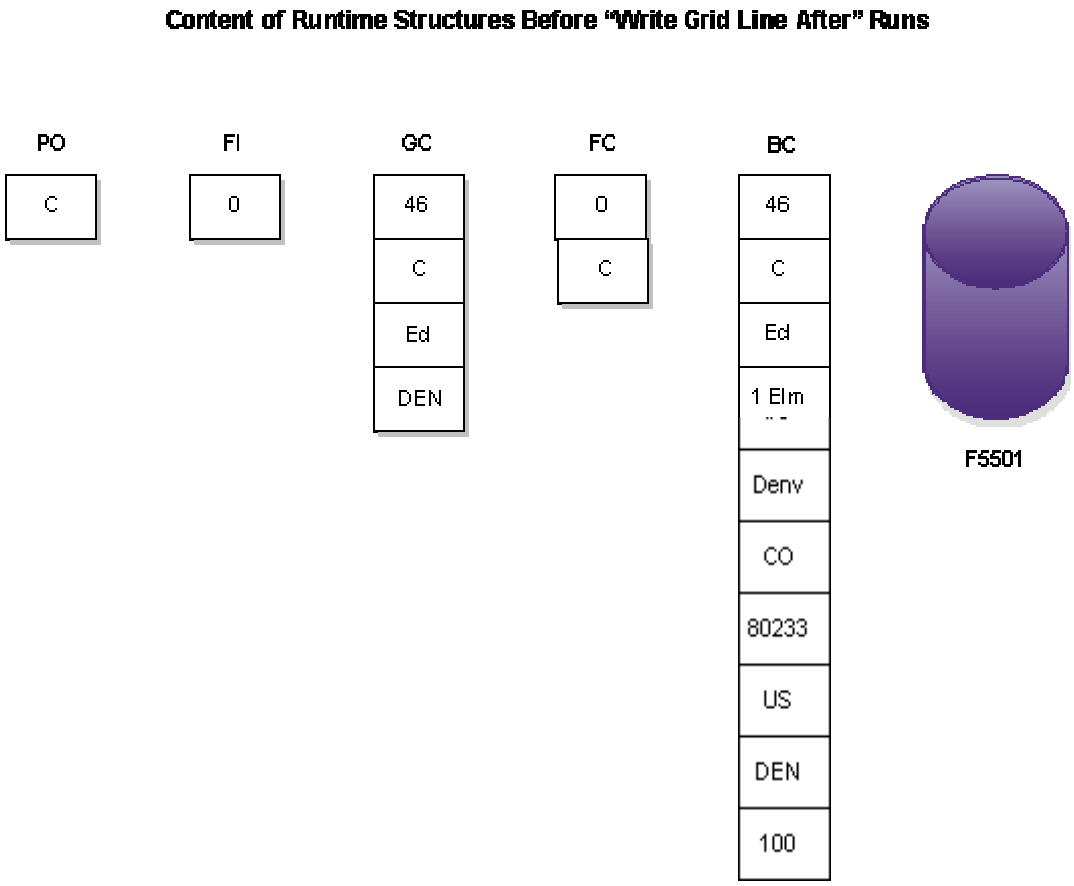
GC = Values from the database (from the first record read)

FI = Values passed from a calling form (if any)

PO = Values passed from processing options

The system displays the current record in the grid cells.

The following illustration represents the information in the runtime structures just before the system runs *Write Grid Line After:*



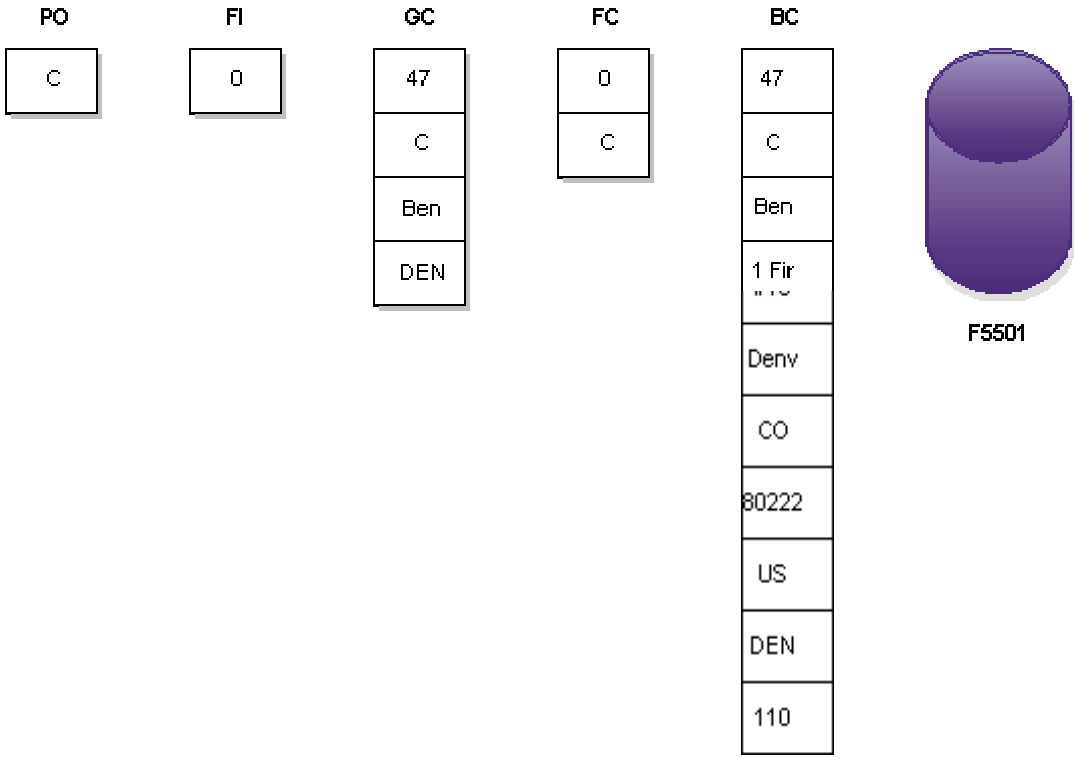
You typically use the *Write Grid Line After* event to add logic after the user sees a row on the form.

The system reads records in the database one at a time and performs the same processing steps. When the system reads the next record, it performs the following processing steps:

- Performs an SQL Fetch of next record that matches criteria
- Assigns BC values from the database
- Processes *Grid Rec is Fetched*
- Assigns BC values to GC
- Processes *Write Grid Line Before*
- Displays values in the grid row on the form
- Processes *Write Grid Line After*

The following illustration represents the information in the runtime structures after the system processes the *Write Grid Line After* event for the second record:

Content of Runtime Structures After "Write Grid Line After" Runs



If the system locates grid records and the user clicks the arrow keys to fetch all records that meet the selection criteria, the SQL FETCH finally fails. If the grid is full and the user never clicks the down arrow key, FETCH might not fail because the system might not have read some of the matching records. When FETCH fails, the system processes *Last Grid Rec Has Been Read*.

Last Grid Rec Has Been Read

The engine pauses again for the event to be processed. You can add logic to be processed when the system runs *Last Grid Rec Has Been Read*. When the engine pauses, the runtime structures contain the following values:

BC = Values from the database (from the last record read)

FC = Values from the database (if the field is a database field)

GC = Values from the database (from the last record read)

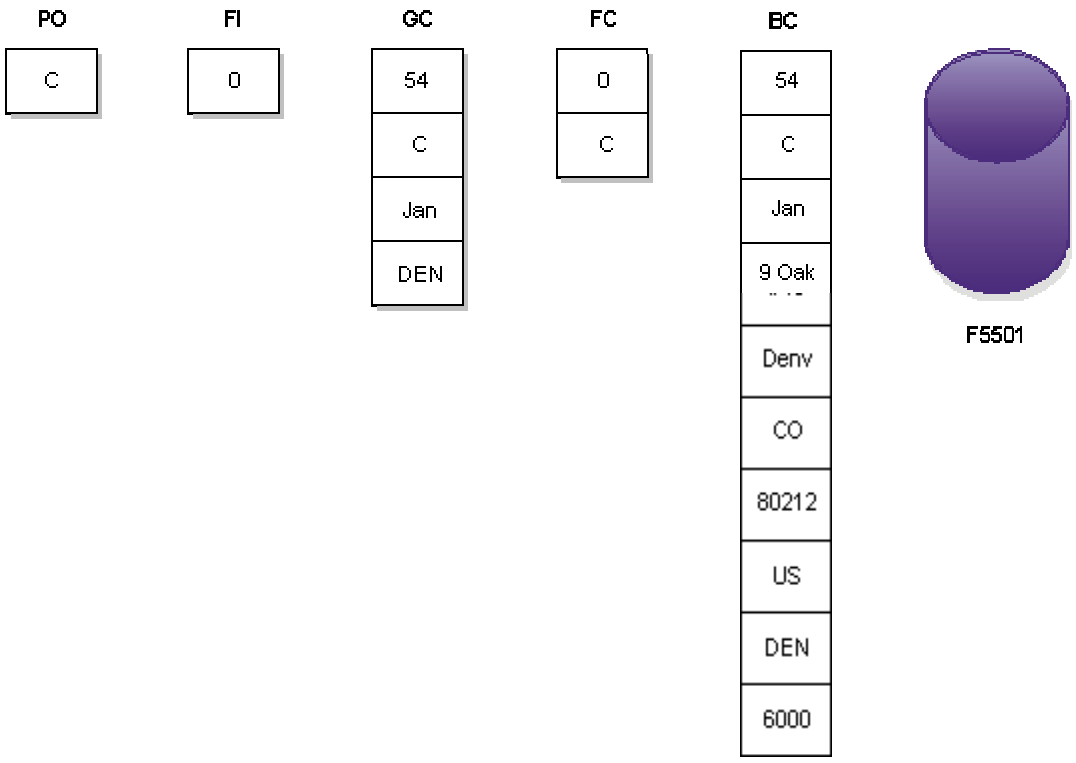
FI = Values passed from a calling form (if any)

PO = Values passed from processing options

The GC values appear on the form.

The following illustration represents the information in the runtime structures just before the system runs *Last Grid Rec Has Been Read*:

Content of Runtime Structures Before "Last Grid Rec Has Been Read" Runs



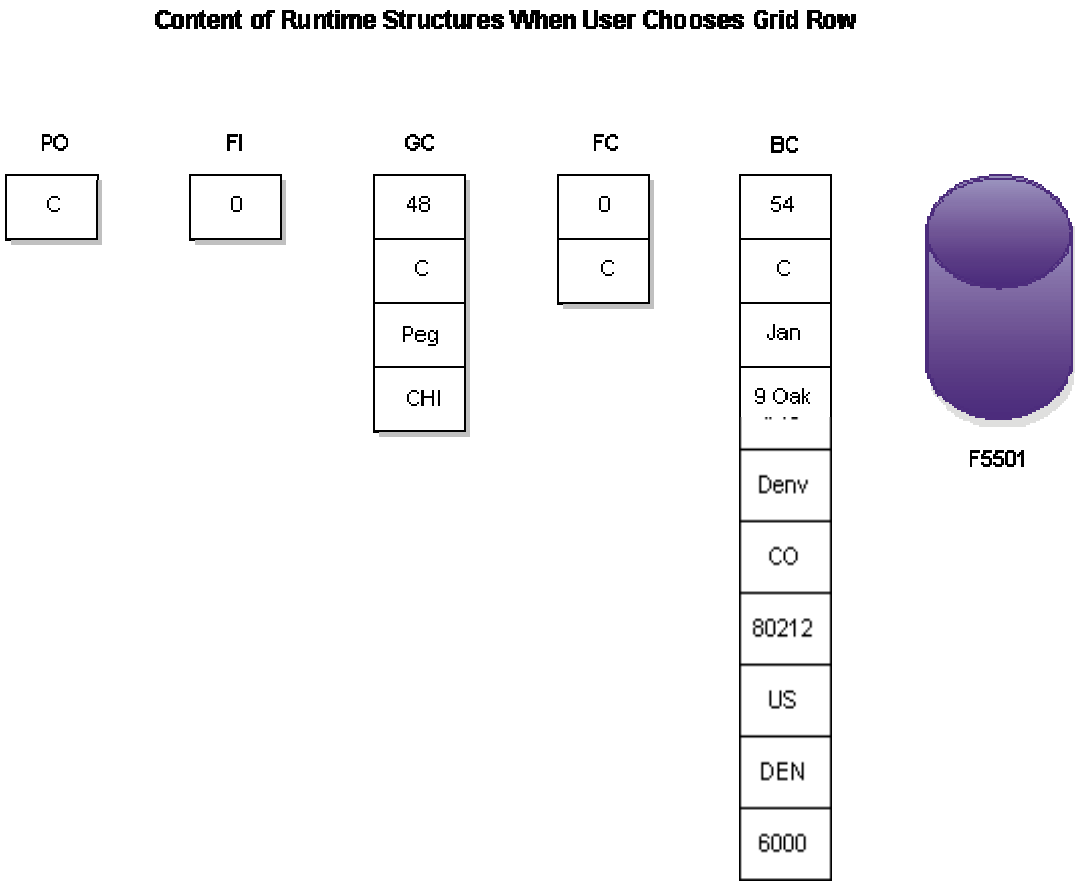
The *Last Grid Rec Has Been Read* event is commonly used to do the following:

- Write total lines to the grid.
- Display totals that are based on grid values.

Select Button Processing

When a user chooses a grid row and clicks the Select button, the system copies form values back into the GC structure. The BC structure stays the same, and the system does not update the database just because the user clicked a row. Therefore, you should select GC as the value to pass during an interconnection.

The following illustration represents the information in the runtime structures when the user chooses a grid row. Note that the BC and GC structures do not contain the same values.



Button Clicked

The engine pauses for the event to be processed. You can add logic to be processed when the system runs *Button Clicked*. When the engine pauses, the runtime structures have the following values:

BC = Values from the database (from the last record read)

FC = Values from the database (if the field is a database field)

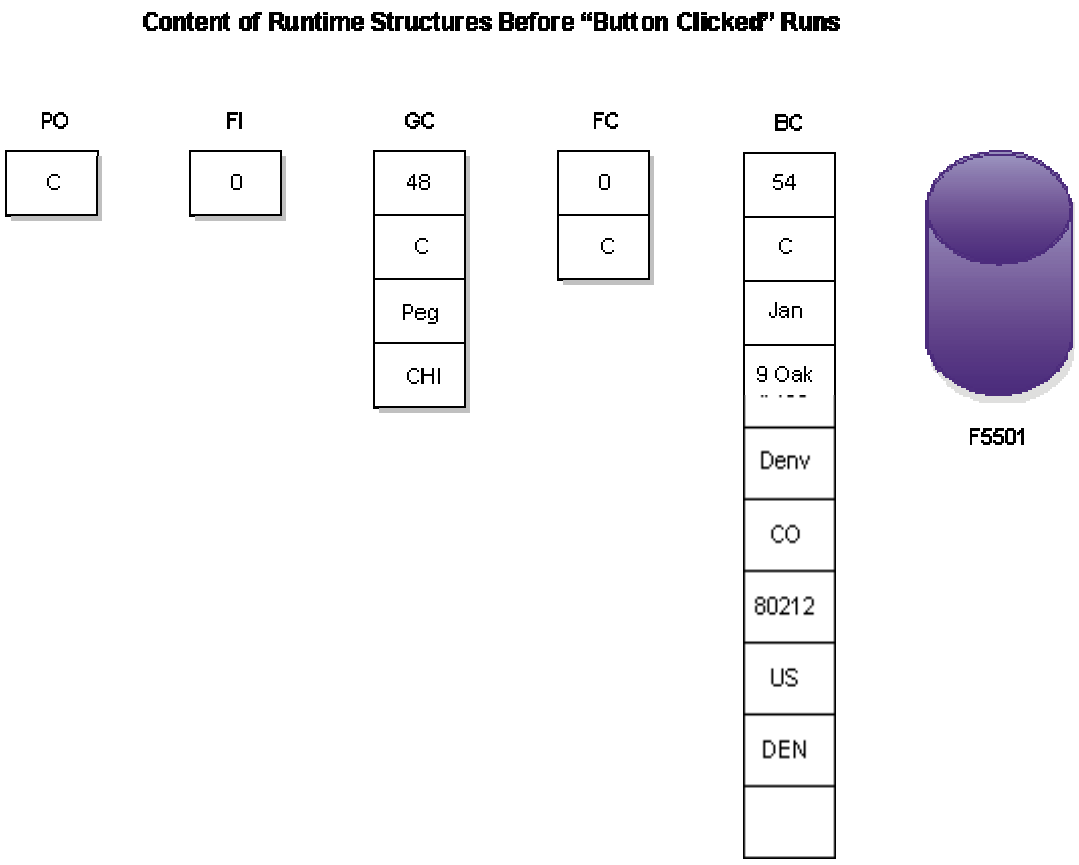
GC = Values from the selected grid row

FI = Values passed from a calling form (if any)

PO = Values passed from processing options

The form grid cells display the current record.

The following illustration represents the information in the runtime structures just before the system runs *Button Clicked*:



The *Select Button Clicked* event is commonly used to do the following:

- Connect to another form.
- Pass GC values from the form into the FI structure of a receiving form.
- Use *Repeat Business Rules for Grid* to repeat event rules when multiple rows are selected (you must also enable the form property *Multiple Select* for the multiselect feature to work).

Note

Activate *Repeat Business Rules for Grid* if you want to allow the user to choose multiple grid rows.

Add Button Processing

After the user chooses a grid row, the GC runtime structure is assigned the values that appear in the grid record on the form. Normally, the user does not choose a row before an add action, but if a row is highlighted, the system copies form values to the GC runtime

structure. If the user does not choose a record, the GC runtime structure contains the values from the last grid record that the system read, if any. The system does not update the database just because the user clicks the row.

The engine pauses for the *Button Clicked* event to be processed. You can add logic to be processed when the system runs *Button Clicked*. When the engine pauses, the runtime structures have the following values:

BC = Values from the database (from the last record read)

FC = Values from the database (if the field is a database field)

GC = Values from the selected grid row

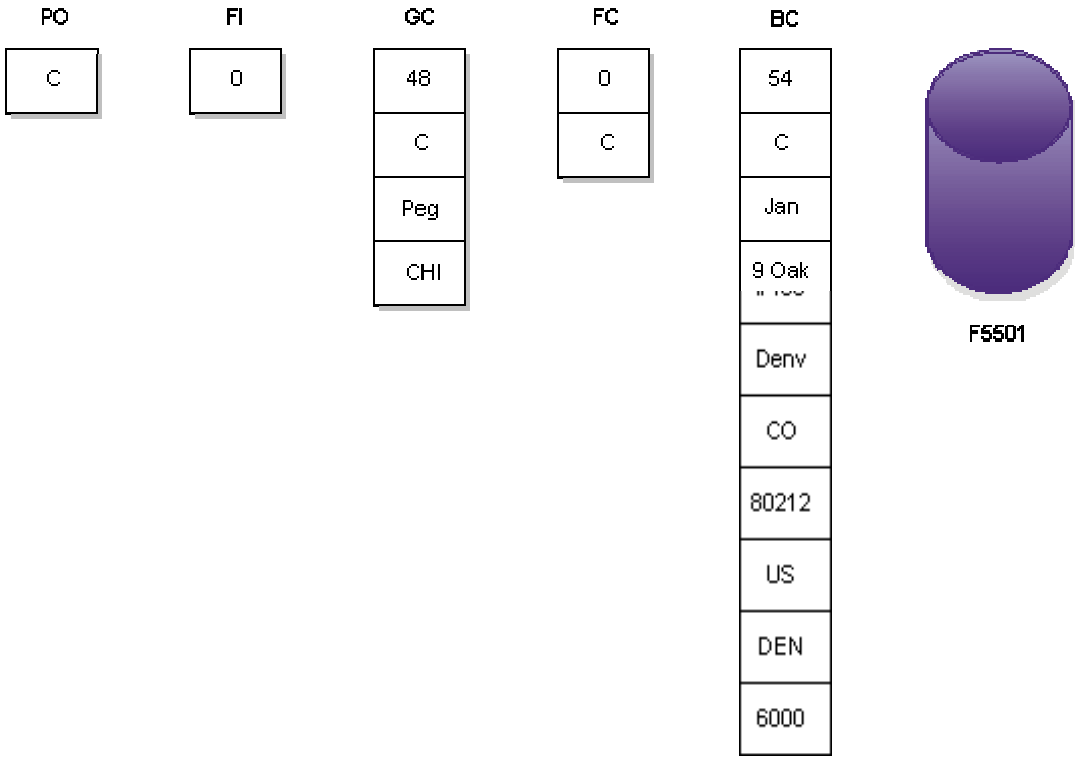
FI = Values passed from a calling form (if any)

PO = Values passed from processing options

Because this is an add action, the content of GC is irrelevant at this point. BC and GC do not contain the same values.

The following illustration represents the information that is in the runtime structures just before the system runs *Add Button Clicked*:

Content of Runtime Structures Before "Add Button Clicked" Runs



You typically use the *Add Button Clicked* event to interconnect to another form, such as a fix/inspect or headerless detail form on which the system actually performs the add action.

Because you are adding a new record, you generally do not pass GC values to the FI structure of the receiving form here.

Delete Button Processing

When the user chooses a grid row, the GC runtime structure is assigned the values that appear in the grid record on the form. BC is still the same, and the system does not update the database.

The engine pauses for the *Button Clicked* event to be processed. You can add logic to be processed when the system runs *Button Clicked*. When the engine pauses, the runtime structures have the following values:

BC = Values from the database (from the last record read)

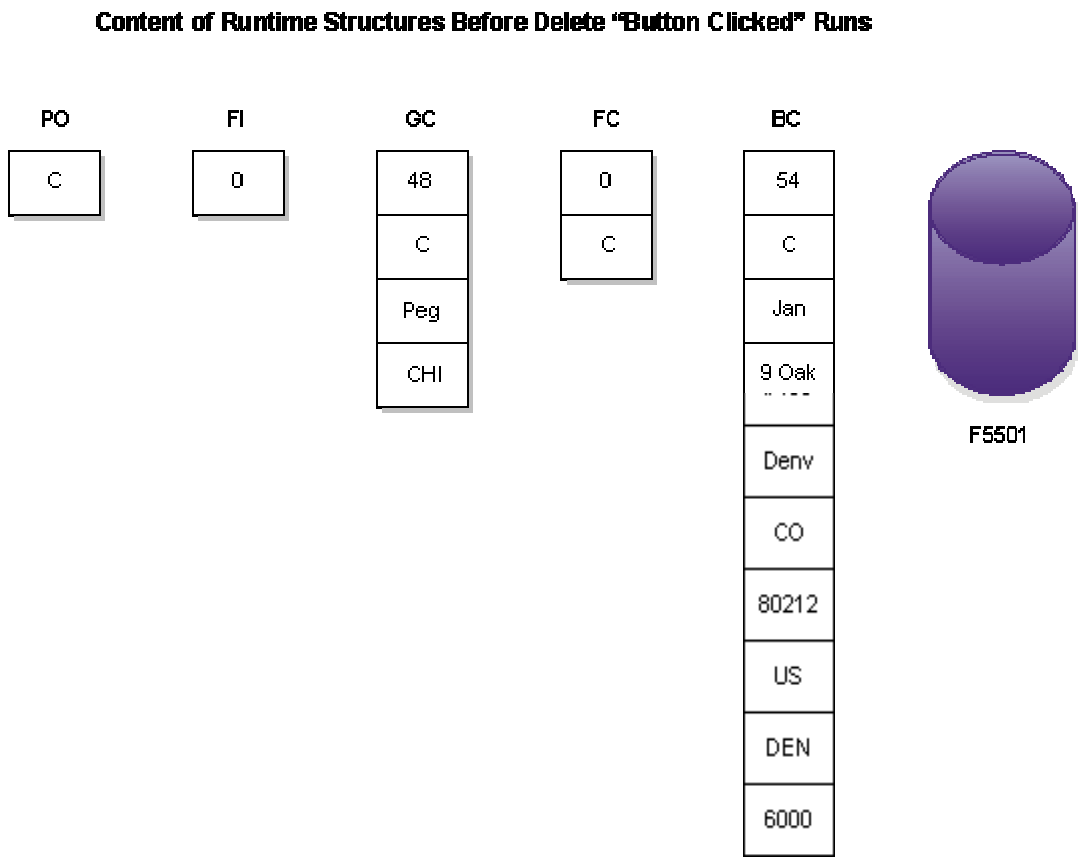
FC = Values from the database (if the field is a database field)

GC = Values from the selected grid row

FI = Values passed from a calling form (if any)

PO = Values passed from processing options

The following illustration represents the information in the runtime structures just before the system runs *Button Clicked*:

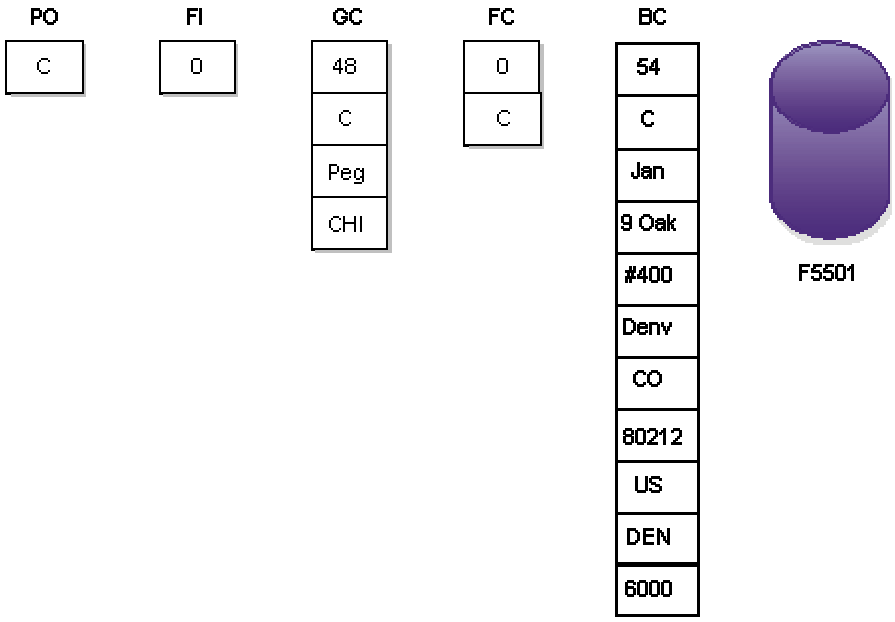


Next, the *Delete Grid Rec Verify Before* event occurs.

Delete Grid Rec Verify Before

The engine pauses for the *Delete Grid Rec Verify Before* event to be processed. You can add logic to be processed when the system runs *Delete Grid Rec Verify Before*. The system processes the logic that is attached to this event after the user clicks Delete, but before the pop-up Verify confirmation form appears.

Content of Runtime Structure When "Delete Grid Rec Verify Before" Runs



Next, the *Delete Grid Rec Verify After* event occurs.

Delete Grid Rec Verify After

The engine pauses for the *Delete Grid Rec Verify After* event to be processed. You can add logic to be processed when the system runs *Delete Grid Rec Verify After*.

You might want to perform editing to verify that the delete is valid. For example, other tables might contain dependant records that that prevent this record from being deleted as long as they exist.

The system processes the logic that is attached to this event after the user clicks OK in the Verify confirmation form. If the user clicks Cancel in the Verify confirmation form, the logic attached to this event does not occur.

Next, the *Delete Grid Rec From DB Before* event occurs.

Delete Grid Rec From DB Before

The engine pauses again for the *Delete Grid Rec From DB Before* event to be processed. You can add logic to be processed when the system runs *Delete Grid Rec From DB Before*. When the engine pauses, the runtime structure FC is blank.

The system processes the logic that is attached to the *Delete Grid Rec From DB Before* event after the user clicks OK to delete a record and after it processes the Verify window, but before it actually deletes the record.

You can use the *Suppress Delete* system function with the *Delete Grid Rec From DB Before* event to turn off the automatic tool delete and perform the delete yourself. For example, you can use a business function to perform the delete.

After the system processes the *Delete Grid Rec From DB Before* event, it builds an SQL DELETE statement. The engine pauses again so that you can add logic to process. FC is blank. The SQL DELETE occurs at this point, and the system deletes the current record from the database. When you choose multiple records, one delete call can delete all of the records.

Delete Grid Rec From DB After

The engine pauses again for the *Delete Grid Rec From DB After* event to be processed. You can add logic to be processed when the system runs the *Delete Grid Rec From DB After*. This logic runs after the system physically deletes the record from the database. You might use this event to call a business function to delete information from related tables that are not in the business view.

The system processes the logic that is attached to the *Delete Grid Rec From DB After* event after the user clicks OK to delete the record and after the system processes the Verify confirmation form and deletes the record.

All Grid Recs Deleted From DB

The engine pauses again for the *All Grid Recs Deleted* from *DB* event to be processed. You can add logic to be processed when the system runs *All Grid Recs Deleted from DB*. At this point, FC is blank.

You can also add logic after the system physically deletes the record from the database. The system processes logic that is attached to the *All Grid Recs Deleted from DB* event after it deletes multiple grid lines and the corresponding database records. Rules that are attached to this event are not apparent on the form and cannot manipulate the grid lines or records.

Working with Event Rules Design

You can use Event Rules Design to create event rule logic for controls on a form. For example, assume that you want to pass data for a selected record on a find/browse form to a fix/inspect form to revise that record. To accomplish this task, you would create a form interconnect event rule and attach it to the Select toolbar option for the Button Clicked event.

Before you create an event rule, consider the control (form, button, field, grid, and so on) and the event upon which the event rule should process. Answering the following questions will determine upon which of the events logic should occur:

- Is the user initializing the form?
- Is the user clicking a button?
- Is the user exiting from a field?
- Is the user changing or exiting from a row?

See Also

- *Understanding the HTML Client* in the *Development Tools Guide* for information about turning on and turning off HTML post (refresh) for an event

Creating and Saving Event Rules

After you place controls on a form, you must create event rule logic to cause processing to occur within your application at runtime. Remember that a form is also a control, and you can create logic that the system automatically processes whenever a form is initialized.

You create event rules by clicking the buttons on the toolbar in Event Rules Design. Depending on the button that you click, a different work area appears for creating and manipulating the event rule line-by-line. Specific buttons within Event Rules Design allow you to:

- Attach a business function.
- Attach a system function.
- Create an If/While statement.
- Assign a value or expression.
- Create a form interconnection.
- Create a report interconnection.
- Insert an Else clause in an If statement.
- Create a variable.
- Perform table I/O.

► To create and save an event rule

1. On Form Design, choose a control on the form.
2. From the Edit menu, choose Event Rules.
3. Choose an event from the Events list box (for example, *Control Is Entered*).
4. Click one of the following Event Rules buttons to add logic for the control:
   - Assignment/Expression
   - If/While
   - Business Function
   - System Function
   - Method Invocation
   - Variables
   - Else
   - Table I/O
   - Report Interconnect (UBE)
   - Form Interconnect
5. Click the following buttons to add a note, enable or disable a specific line within the event rule, or delete a specific line within the event rule:
   - Comment
   - Enable/Disable
   - Delete

   The Enable/Disable button affects only a specific line within the event rule. To disable the entire event, select the Disable Event option from the Options menu.

   You can disable a specific line within an event rule when you want to test your event rule logic. When you are confident that a line is no longer needed, you can delete it from the event rule.

To enable, disable, or delete multiple consecutive lines, press the shift key and choose all event rules that you want to enable, disable, or delete. After you have chosen the desired lines, click the Enable/Disable or Delete button.

6. Click Save to save the event rule.
7. Click OK to return to Form Design.

Saving the event rule saves it with the application. If you delete the application, or if you cancel the application before you save it, the event rule is deleted also.

Finding Event Rules

If the logic for an event rule becomes unwieldy, you can use the Find feature to locate specific strings within the event rule.

► To find a string of text in an event rule

1. From Event Rules Design, choose Find from the Edit menu.
2. Click the appropriate option to Indicate the direction in which you want to search.
3. Enter the string of text that you want to find and click the Find Next button.

Cutting, Copying, and Pasting Event Rules

You can cut or copy event rules and paste them in the same event, form, or application or in a different event, form, or application.

You can also paste event rules into other applications, such as word processing documents. This feature is useful for documenting your project.

You can use any of the following buttons:

- Cut
- Copy
- Paste
- Paste Options

When you cut event rules, the system deletes the selected lines from the source and stores them on the clipboard.

► To cut event rules

1. On Event Rules Design, choose the lines of event rules that you want to cut.
2. Click the Cut button.

► To copy event rules

1. On Event Rules Design, choose lines of event rules that you want to copy.
2. Click the Copy button.

When you copy event rules, the system copies the selected lines of event rules and stores them on the clipboard.

► To paste event rules

When you paste event rules, the system resolves objects from the source as you past them. If an object is partially resolved, the system pastes the closest matching object from the destination event rules. A comment line appears above the partially-resolved line of event rules and in the status bar to indicate that the object is partially resolved.

1. On Event Rules Design, choose the line after which you want to insert your lines of event rules.
2. Click the Paste button.

Some objects cannot be resolved in the destination event rules. The system disables these lines of event rules and displays a comment. For example, an EndIf statement is commented out if its associated If statement is missing.

For criteria statements, the paste operation adds whatever is necessary to maintain a clean, logical structure. For example, if you paste an If statement and no EndIf statement exists, the paste operation adds a matching EndIf statement to make the logic complete.

You can set paste options to display comments before and after a block of pasted event rules.

► To set paste options

1. On Event Rules Design, choose Paste Options from the Edit Menu.
2. On Cut Copy Paste Options, click the Paste Options option.
3. Enter the number of lines for which you want comments to appear.

When you paste information, comments indicate where your pasted selection begins and ends.

Adding Comment Lines to Event Rules

You can add a comment line to document event rule code.

► To add a comment line to an event rule

1. On Event Rules Design, position the cursor where you want to add a comment.
2. Click the Comment button.
3. Type a comment and then click OK.

   The system automatically formats the comment in Visual C++ notation so that you do not have to type the symbols (//) to indicate that the inserted text is a comment.

Printing Event Rule Logic

You can print the code for event rules. This is especially useful when many lines of code make up an event rule. You can print event rule code for any of the following:

- An entire application
- A form
- A control

- A single event

► To print event rule code

1. On Form Design Aid, click the control for which you want to print event rule code.
2. From the Edit menu, choose Event Rules.
3. On Event Rules Design, choose an event from the Events list box.

   The event rule appears in the work area.
4. From the File menu, choose Print.
5. On Event Rules Printing, click one of the following destinations:
   - Printer
   - File
6. Choose one of the following print scopes:
   - Application
   - Form
   - Control
   - Event
7. Choose one of the following page break options:
   - Application
   - Form
   - Control
   - Event
8. Choose one or more of the following print ER options:
   - Expand Arguments
   - Date/Time Stamp
   - Show Line Numbers
   - Show Comments
9. Click OK.

Validating Event Rules

You validate event rules to help you locate errors, such as a variable or business function that no longer exists or an incorrect business view column. You can validate event rules as you are working or when you save an application.

The system validates event rules either when you click Save or when you choose Exit from the File menu and save before exiting. You can exit Form Design Aid or leave it open if the system locates errors during validation upon exit.

You can also choose the menu option entitled Validate Event Rules. When you do so, the system immediately validates event rules. Validate Event Rules checks for errors at two levels. The first level occurs in Business Function event rules or Table event rules, in which the system converts the event rule code from the event rule scripting language to C code and

then to compiled code. The second level occurs in the application, in which the system reviews the event rules for errors such as data type mismatches, data structure errors, and missing variables and controls. The Generator does not check logic errors or syntax.

The error log that the system creates is stored in a file, such as `b9\`*`prod`*`\log\p1234.log` (where *prod* is your environment). If no errors exist, the system does not generate a log.

▶ To validate event rules

On Form Design Aid, from the File Menu, choose Validate Event Rules.

The Validate Event Rules form displays messages as it processes. When the validation successfully completes, a Validation Successful message appears.

Working with If and While Statements

If and While statements are conditional instructions for an event rule. They evaluate conditions and dictate the flow of logic when the event rule is activated.

If Statements

An If statement executes conditional event rule logic. That is, the logic executes only *if* the condition is true. The system evaluates an If statement only once when it processes the event rule.

If statements are typically formatted as follows:

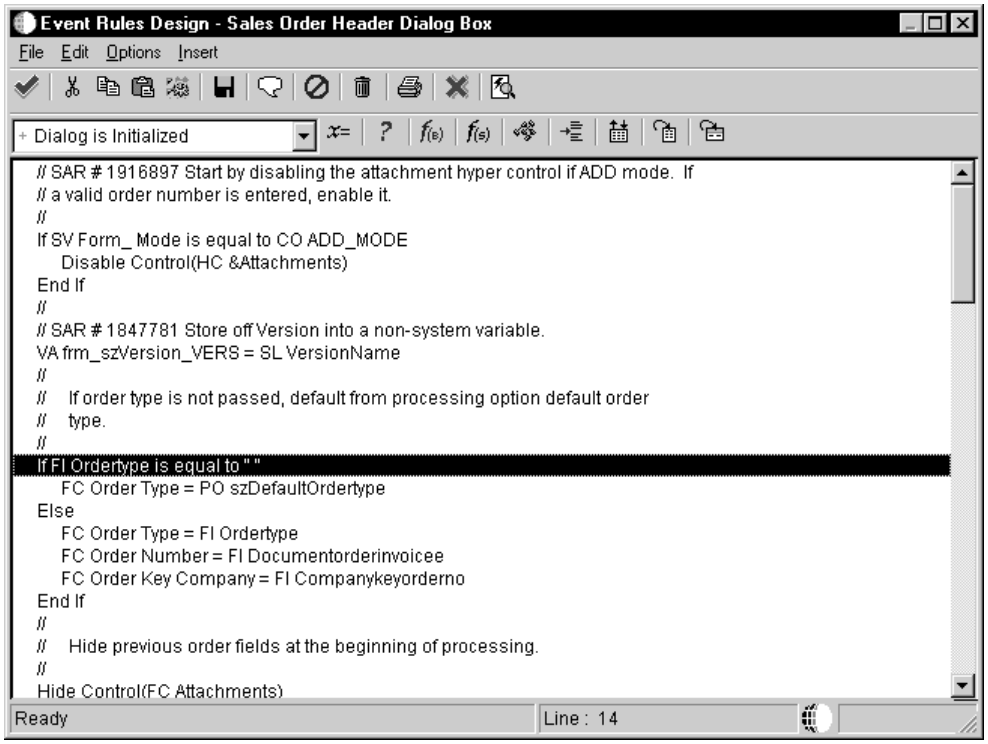
```
IF condition X is true

    Do Y

ELSE

    Do Z

ENDIF
```

The system evaluates an If statement as follows:

> If condition X is true, then do Y and do not evaluate the Else statement. If condition X is not true, then proceed to the Else clause and do Z.

The Else clause is optional. When no Else clause is necessary, the system proceeds to the next statement and evaluates it.

The following is an example of an If statement from Sales Order Entry:



While Statements

A While statement repeats conditional event rule logic. That is, the logic continuously executes as long as a condition is true. A While statement controls the execution of a *loop*, or repetitive test.

A While statement is typically formatted as follows:

```
WHILE condition X is true

    Do Y

ENDWHILE
```

The system evaluates a While statement in the following manner:

> Evaluate condition X. If it is true, then do Y. Repeat evaluation of condition X until it becomes false, and then exit the loop.

Creating If and While Statements

You use the If/While button to build conditional logic into an event. When you create an If statement, the system also automatically inserts an Else clause. However, you can use the Delete button to delete the Else clause and then reinsert it using the Insert Else button. When you delete an If or While statement, the system also deletes the associated Else and Endif or Endwhile clauses, but not the rules inside of those statements.

You can drag and drop statements line-by-line to change their sequence. Resequencing event rules can result in improper syntax. When you click the Save button or the OK button, the system verifies the syntax. If it detects syntax errors, you can either disable the event rule and continue or edit the event rule to eliminate the errors.

The only valid logical operators when you use range and list values are Is Equal To and Is Not Equal To. The criteria design tool prevents you from using the range and list literals incorrectly by ensuring that the comparison is either equal to or not equal to. If you choose Range or List and your comparison field does not contain an Is Equal To or Is Not Equal To comparison, then the cell is cleared.

To change a statement, click the cell to select the cell or value that you want to change. You can then change the value of that cell. The system checks the syntax when you click OK. To change the sequence of a line, choose the entire row by clicking the row header. Then use the up and down arrows on the toolbar to move that line. You cannot move the If/While line.

To delete a statement, choose the line of the statement, and then click Delete. You cannot delete the top-most clause of the statement (If or While) in If/While design; you can only delete it from the Event Rules Design window.

► To create an If or a While statement

1. On Event Rules Design, choose an event in the Event Rules Design window and click the If/While button.

   Each cell in the Criteria Design grid represents a component of the criteria. When you choose a cell by clicking on it or using the Tab key to move into it, a list of valid options appears. To choose an option, either double-click it or select it, and press Enter or Tab. You can choose an option by using the mouse or by typing the option that you want.

   Criteria Design has a type-ahead feature that allows you to type the first few characters of an item in a field to automatically display a list of available items that begin with those letters.

2. Choose one of the following operators:
   - If
   - While
3. Choose a left operand from the list of available data items.

   You can right-click to sort the available data items by name or object type. If only one type exists, the sort options are not available.

   You can group the available data items by the following object types:

BC A column in the business view for this form

GC A column in the grid for this form

FI A value passed through form interconnection to this form

FC A control on this form, such as a push button

PO A value from processing options of the application

HC A hypercontrol

SV A system variable

SL A system value

VA A variable

4. Choose a comparisons from the following list of logical operators:
   - is equal to
   - is not equal to
   - is less than
   - is less than or equal to
   - is greater than
   - is greater than or equal to
5. Choose a right operand from the object list.
6. To assign a literal, select <Literal>.

   The Literal dialog depends on the data item.

7. Click Save to save the criterion statement and return to the Event Rules Design window.

   If the criteria are incomplete (for example, if the right operand is missing), you must fix the criteria or delete it.

To create complex If statements, you can select the And option or the Or option, and continue your logic.

Defining Literal Values in Event Rule Logic

You can define literal values in event rules.

► To define literal values

1. On Criteria Design, from the Right operand list, double-click <Literal>.
2. Click one of the following tabs:
   - Single value

- Range of values
- List of values

3. Complete the appropriate fields on the tab that you chose.
4. Click OK.

Working with Event Rule Variables

An event rule variable is associated with a data dictionary item, but it does not reside in the data dictionary. After you create it, you can use it only in a specific interactive application, batch application, or business function event rule.

The system automatically initializes the event rule variable at runtime because you define how the event rule variable is used when you create it.

Use event rule variables instead of hidden fields. Event rule variables use fewer system resources at runtime.

The scope of an event rule variable determines how you can use it. Different scope options are available for interactive and batch applications. For example, you can do the following:

- Reference a report variable anywhere in the report.
- Reference an event variable only within the event in which it was created.

Interactive Event Rule Variables

Interactive event rule variables are available at the following levels:

- Form level
- Grid level
- Event level

Form-Level

Form-level variables are available at all events for all controls within the form. They are initialized when the form is initialized, and they retain values until the form is closed.

Grid-Level

Grid-level variables are subtypes of form variables, and they are available on any form that includes a grid. They are available from all events on the form. They apply to the current row. Every new row added to the grid has the same set of variables. These variables are reinitialized each time a new row is added to the grid. You can use these variables as temporary work fields for the grid. For better system performance, you should use variables instead of hidden work fields whenever possible. Using variables instead of hidden work fields enhances the performance of J.D. Edwards forms during initialization and saves time because variables are not formatted. Although grid variables are available in all event-rule line types, you should use them only with events that are associated with grid rows.

Event-Level

An event-level variable is available only within the event for the form control for which it was added. The variable is reinitialized each time that the event is processed for the form control.

Batch Application Event Rule Variables

Batch event rule variables are available at the following levels:

- Report
- Section
- Event

Creating an Event Rule Variable

After you create an event rule variable, it appears in the available objects list in Event Rules Design where you added it. Use the event rule variable in event rules just as you would use any available object in the list. If you create an event level variable and do not use it in event rules, Form Design Aid automatically deletes it.

After you add an event rule variable, you cannot be modify it. Instead, you must delete it and create another one.

The system automatically assigns to each variable one of the following prefixes, based on the specified scope:

- frm_ (Form)
- evt_ (Event)
- grd_ (Grid)
- rpt_ (Report)
- sec_ (Section)

▶ To create an event rule variable

1. On Event Rules Design, click the Variables button.

   The Variables form displays different scope options, depending on whether you are working with an interactive application, batch application, or business function event rule.

2. Complete the variable naming field that is located under the Add button.

   Note
   Event Rule variables are named similar to C variables and should be formatted as follows: *xxx_yyzzzzzz_AAAA*,

   where:

   xxx = A prefix that J.D. Edwards software automatically assigns, depending on the scope. Examples include:

   frm_ (form scope)

   evt_ (event scope)

   y = Hungarian Notation for the following C variables:

   c - Character

h - Handle request

mn - Math numeric

sz - String

jd - Julian date

id - Pointer

zzzzzz = A variable name that you assign; capitalize each word

AAAA = A data dictionary alias (all upper case)

Do not include any spaces in the event rule variable.

For example, a branch/plant event rule variable would be `evt_szBranchPlant_MCU`.

---

3. Click one of the following Scope options, depending on the purpose for which you created the variable:
   - Form
   - Event
4. Click the Grid option if you select Form Scope and you want to use a grid variable.
5. Click the data dictionary visual assist to browse data dictionary items.
6. Click the Show All button to display the variable list.
7. Choose the data item to which the variable is associated and click Add.

   The system automatically assigns a prefix to the variable, based on the type of scope that you choose.

8. Click OK to return to the design mode for interactive, batch, or business function event rules.

   You can now use the new variable.

Creating Event Rules for Automatic Line Numbering

You can create an event rule to automatically number lines.

▶ To create event rules for automatic line numbering

1. Create a variable to hold the value of the line number. Use the data dictionary item LNID.

   ```
   VA frm_LineNumberCounter_LNID
   ```

2. Initialize the variable on the Post Dialog is Initialized event.

   ```
   VA frm_LineNumberCounter_LNID = 0
   ```

3. On the Grid Record is Fetched event, number the lines as each line is pulled from the database.

```
If BCLineNumber > VA frm_LineNUmber_LNID

VA frm_LineNumberCounter_LNID = BC LineNumber

End If
```

4. On the Add Last Entry Row to Grid event, increment the LineNumber and assign the new value to the next available line.

```
VA frm_LineNumberCounter_LNID = VA
frm_LineNumberCounter_LNID + 1

GC LineNumber = VA frm_LineNumberCounter_LNID
```

Attaching a System Function to an Event

You can use the System Function button to attach predefined J.D. Edwards system functions to events. For example, you can attach system functions to an event that can do the following:

- Hide or display a control.
- Insert dates.
- Display media objects.

► To attach a system function

1. On Event Rules Design, choose an event.
2. Click the *f*(S) button.
3. Choose a category in the System Functions box.
4. Choose the system function that you want to attach.
5. In the Available Objects list, choose objects to pass to the system function.
6. Click OK to add the system function to the event rule.

Common System Functions

Following are some available system functions and descriptions of their use.

Control System Functions

The following table describes various control system functions:

Clear Edit Control Error	Use this function to clear errors that have been set for a specific control. This is important because the runtime engine automatically sets and clears errors on specific events, but does not clear errors on other events. For example, if you use Set Edit Control Error on *Dialog is Initialized,* that event cannot run again to reset the error and then re-edit the control. In this situation, you can use Clear Edit Control Error to clear the error on another event.
Disable Control	Use this system function to dynamically enable or disable a control; otherwise, use the control property. You can use this system function to disable certain fields that you do not want a user to change, such as the exchange rate on a transaction.
Enable Control	Use this system function to enable a control. For example, you can use this function when you want only a manager to have the authority to change something.
Hide Control	Use this system function to dynamically hide and show a control. You can hide a field until the user specifically requests the information it holds. For example, when you add a record in Address Book, you can display the previously-added record.
Set Edit Control Error	Use this system function to set an error on a specific control and turn the field red.
Set Status Bar Text	Use this system function to display text in the status bar. This text might describe why an error has occurred and to clear the status bar after an error has been corrected. You can also use this system function when a process is running in the background or takes some time to complete. In this case, you might want to display a "Please Wait ..." message.
Was Value Entered	Use this system function to verify that data has been changed, such as when an error occurs and the information changes. One of the options for this system function is an All Controls value that determines whether any of the controls have changed. This function is useful in transaction-type programs.

Note

J.D. Edwards strongly recommends against using the following control system functions:

- Set Edit Control Color
- Set Edit Control Font

Set Edit Control Color makes mandatory fields a specific color. If you use this system function, be aware that some users might be colorblind. Set Edit Control Font draws attention to a field, such as a negative number, but nonstandard fonts might confuse the user or detract from the appearance of your form.

See Also

- *Messaging* in the *Development Tools Guide* for more information about how the runtime engine sets and clears errors

Message System Functions

Mail Send Message Use this function to return a message ID (serial number) that is the identifier for the message that you created. This is the key parameter for the other messaging functions, and the application uses this ID to perform the other system functions. You might use this function to generate a message to a manager that requests approval for a client to exceed an authorized credit limit.

Forward Message Use this function to forward a message. You can choose to leave the original message intact when you forward it.

Mail Delete Message Use this function to delete a mail message.

Update Message Use this function to modify a message with new text. You can then use the Forward Message function to send the new message.

General System Functions

Copy Currency Information Use this function to ensure that, when you change currency information, the system copies the change to all of the applications that use it. This function is useful if you are developing software in a country in which the decimal place changes frequently. You can also use it when a company changes from the base of one currency to another.

Press Button Use this function to reuse event rules from event to event without having to write and maintain the code in all of the places in which you use these event rules. To do this step, create a push button on a form, and put all of the reusable event rules on the button clicked event. Then use this system function to “press” the button and run the ER from all of the other events in which you want to run the ER.

Set Control Focus Use this function to set focus on a specific spot. For example, you might set focus on the detail part of the grid when a user enters a form. You can also use this function to override the default cursor position, particularly if the focus differs between an *add* and a *change*.

Stop Processing Use this function to stop processing, such as when an error occurs.

Suppress Add Use this function to control the normal flow of the form for I/O purposes. For example, in transaction entry programs that use master business functions, the master business function performs all of the I/O, including adds.

Suppress Delete Use this function to control the normal flow of the form for I/O purposes. For example, many J.D. Edwards transactions, such as accounts receivable and sales order transactions, use master business functions to insure referential integrity. You might use this function to prevent a user from deleting a customer's address book record that appears on existing invoices.

Suppress Find Use this function to suppress a find. For example, on updateable grid forms that can use filter and find buttons, you would probably suppress the find button if the user has not finished updating the current record. For those forms that perform inquiries, you can verify that the user has provided information that matches an index.

Suppress Update Use this function to suppress an update. This function can control the normal flow of the form for I/O purposes.

form for I/O purposes.

Was Form Record Fetched Use this function to ensure that a record was actually fetched.

Grid System Functions

The following table describes the grid system functions for an event:

Clear Grid Buffer Use this function to clear the buffer. Because the grid buffer is a temporary location in which to manipulate grid rows, use this system function to clear all columns in the buffer. For example, you can use the grid buffer to hold temporary values for a calculation, and then use Clear Grid Buffer to clear the buffer after the system completes the calculation.

Clear Grid Cell Error Use this function in the same way that you use Clear Grid Buffer.

Clear QBE Column This function is similar to Clear Grid Buffer. For example, you might use this function when the QBE column had a value forced into it, such as the current date on a purchase order Find/Browse form. Then, after the user performs a Find, you could clear the QBE column in case you want to use another date.

Copy Grid Row to Grid Buffer Use this function after Clear Grid Buffer was issued and you needed to manipulate just a few of the grid columns. You can use this system function to move all of the GC fields to GB without copying each individual column.

Delete Grid Row Use this function if you (and *not* the runtime engine) are manipulating the grid row. For example, use this function when you are using the Delete Doc routine from the master business function.

Disable Grid Use this function to disable the entire grid from input. Use this function when you need to complete more information in the header before you can add individual rows, or when you want to use information in the header as default information in the grid.

Enable Grid Use this function to enable the grid.

Get Grid Row Use this function to specifically read a grid row, such as when you need to reprocess the grid through a While loop.

Get Max Grid Rows Use this function to determine how many rows the system must process if you need to reprocess all of the individual grid rows through a While loop. Use this function immediately before the While loop.

Get Selected Grid Row Count Use this function to get the row number for a selected row. Typically, you use this function only when you need to save the row as a variable for future processing.

Hide Grid Column Use this function for dynamic processing.

Hide Grid Row Use this function to hide an entire row from appearing on the form. For example, if you create a form with a grid and you want to summarize rows, add together several rows to determine a total and show the total row. If you use this system function, you might include a check box for the detail information and then unhide the row instead of

repopulating the grid.

Insert Grid Buffer Row	Use this function to manipulate the buffer space. If you use this system function, GC becomes GB.
Insert Grid Row	Use this function to insert a row in the grid. Usually, such rows are custom (nondatabase) rows, such as a totaling row.
Set Grid Cell Error	Use this function in the same way that you use Set Edit Control Error.
Set Grid Color	Use this function in the same way that you use Set Edit Control Color.
Set Grid Font	Use this function in the same way that you use Set Edit Control Fonts.
Set Grid Row Bitmap	Use this function to manipulate the bitmap that appears outside of the grid. This function sets a specific bitmap on a specified row header.
Set QBE Column Compare Style	Use this function to assign comparisons to the QBE line. For example, if you want to set up a date column's QBE field to be > January 1, 2005, you would use QC WorkDate = "010105" and Set QBE Column Compare Style(FC Grid, GC WorkDate, <Greater Than>).
Show Grid Column	Use this function in the same way that you use Show Edit Control.
Suppress Grid Line	Use this function to prevent a row from becoming part of the grid. For example, use this system function on the *Write Grid Line Before* event to prevent the line from being written to the grid.
Update Grid Buffer Row	After the grid buffer is assigned, use this system function to make GC=GB.

Telephony System Functions

You can use telephony system functions to integrate telephone communications with your applications. The telephony system functions allow you to send requests to the Microsoft Windows Telephony Application Programming Interface (TAPI). For example, you might use this capability in a customer service organization that customers call for support. When a customer calls, you can use your application to identify who is calling and automatically retrieve information about the caller. For example, you can use TAPI to do the following:

- Answer an incoming call either from a direct line, PBX, or Voice Response Unit (VRU).

  To answer an incoming call, you add event rules at the point in which the phone rings, but before the user picks up the receiver, and again immediately after the user picks up the receiver.

- Transfer a call.

  To transfer a call, determine whether the user has requested a transfer, and then add event rules immediately before the request to transfer the call and immediately after the application receives notice that the call has been transferred.

- Put a call on hold.

To put a call on hold, you add event rules immediately after the application has received notice that the call has been put on hold and immediately after the user has picked up the call that was on hold. The user must be able to see information about all calls that are on hold.

- Place an outgoing call.

  To place an outgoing call, you must pass the phone number being called to the J.D. Edwards telephony system function, which then uses TAPI to complete the steps necessary to make the call. You add event rules immediately before the call is placed, after the call is answered, and immediately after the call has ended.

- End a call.

  Calls can end in several ways, including when the service representative or the caller hangs up, the representative transfers the call, or the system disconnects the call because of bad phone connections. To properly close the call, you add event rules at the point in which the application receives a message that the call has ended.

See Also

- *System Functions* in the online *Tools API Reference* for more information about different system functions

Attaching a Business Function to an Event

You can attach an existing business function to an event. Business functions include:

- C code that you generate manually (source language C)
- Code that J.D. Edwards software generates when you use Business Function Event Rule Design (source language NER)

You typically use business functions for the following purposes:

- Referential integrity, such as deleting secondary records when a master record is deleted, and for editing routines
- Large and complex calculations that might otherwise overload the runtime engine

► To attach a business function

1. On Event Rules Design, choose an event.
2. Click the *f*(B) button.

   You can view a description for a business function by choosing Attachments from the Row menu.

3. Choose a business function and click Select.
4. In the Available Objects list, choose objects to pass to the business function.
5. To assign a literal to the business function, choose <Literal> in the Available Objects list.
6. Enter a single value and click OK.

   Range and List are not valid literals to use with business functions.

7. Indicate the direction of data flow between Value and Data Items, and click OK.

As you click the direction arrow, it toggles through the following four options:

- ! Data flows from the source to the target
- z Data flows from the target to the source
- $ Data flows from the source to the target, and upon exiting the target, data flows back to the source
- No data flow

If the direction of the items is hard-coded in the data structure for a business function (such as when the parameters are predetermined to be input, output, or bidirectional), then this predetermined direction appears here. If the direction of items is not critical, it can be omitted or set by the user. You must complete the required items that appear in red. The status bar indicates the state of the flow to the target.

8. Click the Include in Transaction option to include this business function for transaction processing.

   This option appears only if you are calling from a Fix/Inspect, Header Detail, or Headerless Detail form

9. Click the Asynchronously option to enable asynchronous processing.

   This option appears for the Post Button Clicked event, or for any Cancel or OK button on a Fix/Inspect form, Header Detail form, or Headerless Detail form.

10. Click one of the following buttons to add notes.
    - Business Function Notes
    - Structure Notes
    - Parameter Notes
11. Click OK.

J.D. Edwards Design Standards

Always use the directional arrows to attach business functions. If you do not use a parameter, then use the ↵ symbol. This symbol also does the following:

- Identifies when a parameter has been forgotten or needs to be added, such as when a business view changes or a work field is deleted
- Serves as documentation to other readers of the code
- Prevents memory from being reserved when it is not needed

Because they are internationally acceptable, use numeric values for any event rule flags that are passed back from the business functions. For example, to assign true/false values, use 1 for true and 0 for false, instead of T and F or Y and N.

See Also

- *Business Functions* in the *Development Tools Guide* for more information about business functions

Creating Form Interconnections

Use form interconnections to automatically pass data from a source form to a target form.

Before You Begin

- Define the data structure of the receiving form to include any field for which you are passing values.

Creating a Modal Form Interconnection

Most form interconnections are modal. This situation means that after a form interconnects to another form, the user must close the second form before interacting with the first form again.

► To create a modal form interconnection

1. On Event Rules Design, choose an event.
2. Click the Interconnect button.
3. On Work with Applications, choose the application to which you are connecting.

   Work with Forms displays available forms for the chosen application.
4. Choose the appropriate form to which you want to connect (the target).
5. Choose the appropriate version of the form to which you want to connect.

   The Data Item column displays data items in the data structure of the target form. The keys in the primary unique index for the primary table of the business view are automatically set up as the data structure.
6. In the Available Objects column, choose the object that you want to pass.
7. Use the > button to move it to the Data Structure-Value Column.

   Indicate the direction of data flow between Value and Data Items.

   If you do not want data to pass between forms, set all Direction values to null, and then click OK to save the Form Interconnection and exit.

   As you click the direction arrow, it toggles through the following five options:

   - Data flows from the source to the target
   - Data flows from the target to the source
   - Data flows from the source to the target and, upon exiting the target, data flows back to the source.
   - Upon exiting the target, data flows back to the source
   - No data flows either way
8. Click the Include in Transaction option to include this interconnection for transaction processing.

   This option appears only if you are calling from a fix/inspect, header detail, or headerless detail form.
9. Click one of the following buttons to add notes:
   - Structure Notes
   - Parameter Notes
10. After the data structure is defined, click OK.

Event Rules Design displays the Form Interconnection with the following statement:

Call (Application <name> Form <name>)

J.D. Edwards Design Standards

The following standards apply to all form types:

- Accept the default placement of primary unique key fields at the top of the data structure.
- Change the data item name and description to describe the item that is passed between forms.

Creating a Modeless Form Interconnection

You can create a modeless form interconnection between a find/browse form and one or more fix/inspect forms, or between a find/browse form and transaction forms (header and headerless detail forms).

Modeless processing allows the user to interact with two or more forms simultaneously instead of having to close one form to return to the other. When you update the transaction form, you do not need to reinquire on the database before the update appears on the find/browse form. After accessing the initial find/browse, you can access any form type, including another find/browse.

Each time that the system calls a modeless form interconnection, it passes the values in the form data structure. When you click Cancel in the calling form, the system destroys the called form and does not pass any values. When you click OK in the called form, the system passes values back to the calling form through the form data structure. The called form still appears.

The *Dialog is Initialized* event occurs only the first time that the system calls it. If you want event rules to run each time a form appears, attach them to *Post Dialog is Initialized.*

If a form in update mode fails to fetch a record from the database, the form mode changes to Add mode. If the *Close Form On Add* option is turned on, the form closes when you click OK.

When you close a Find/Browse form, it closes all of the modeless interconnect records before it closes.

Event rules that follow a modeless form interconnection execute immediately instead of waiting for the called form to return.

You run applications with modeless processing from the menu. If you run an application from Object Librarian, modeless processing does not work.

► To create a modeless form interconnection

1. On Event Rules Design for the find/browse form that you want to use (the source), choose an event.
2. Click the Form Interconnection button.
3. On Work with Applications, choose the application to which you are connecting.

   Work with Forms displays available forms for the chosen application.
4. Choose the appropriate fix/inspect form to which you want to connect (the target).

The Form Interconnect - Values to Pass window displays the data structure for the target form.

5. Choose the appropriate versions of the fix/inspect form to which you want to connect.

   The Data Item column displays data items in the data structure of the target form. The keys in the primary unique index, for the primary table of the business view, are automatically set up as the data structure.

6. Click the Modeless option.
7. In the Available Objects column, choose objects that you want to pass. Use the > button to move objects to the Data Structure-Value Column.
8. Indicate the direction of data flow between Value and Data Items.

   If you do not want data to pass between forms, set all values to ↵ and click OK to save the Form Interconnection and exit.

   As you click the direction arrow, it toggles through the following four options:

   - Data flows from the source to the target
   - Data flows from the target to the source
   - Data flows from the source to the target and, upon exiting the target, data flows back to the source
   - No data flow

9. Click one of the following buttons to add notes:
   - Structure Notes
   - Parameter Notes
10. After you define the data structure, click OK.

    The Event Rules Design displays the Form Interconnection with the following statement:

    Call (Application <*name*> Form <*name*>).

Before You Begin

- ❑ Set up the data structure of the receiving form to include any field for which you are passing values.

Creating Report Interconnections

Use report interconnections to automatically run a report. The current event rules might continue processing or wait for the completion of the report, based upon whether asynchronous processing is enabled. If you use a synchronous report interconnect, your initiating process starts a second process and waits until the second process has completed before it continues running. If you use asynchronous processing, the initiating process starts another process and continues to run. The two processes run separately.

► To create a report interconnection

1. On Event Rules Design, choose an event.
2. Click the Report Interconnection button.

3. On Work with Applications, choose the report to which you are connecting.

   Work with Versions displays versions for the selected report.

4. Choose the appropriate version of the report to which you want to connect.
5. In the Available Objects column, choose the object that you want to pass. Use the > button to move it to the Data Structure-Value Column.
6. Indicate the direction of data flow between Value and Data Items.

   If you do not want data to pass between reports, set all Direction values to ↵ and click OK to save the Report Interconnection and exit.

   As you click the direction arrow, it toggles through the following four options:

   - Data flows from the source to the target
   - Data flows from the target to the source
   - Upon exiting the target, data flows back to the source
   - No data flow
7. To run the report as a separate process, click the following option:
   - Asynchronously

   You must turn on this option if you want to pass data into the report.

8. To include the report interconnect for transaction processing, click the following option:
   - Include in Transaction
9. Click one of the following buttons to add notes:
   - Structure Notes
   - Parameter Notes
10. After the data structure is defined, click OK.

    Event Rules Design displays the Report Interconnection with the following statement:

    - Call (UBE <*name*> Version <*name*>)

Creating Assignments

Use an assignment to define a field as a fixed value or a mathematical expression. For example, you can create an assignment that inserts a default value when the user leaves the field. You can also use an assignment to calculate a value, rather than creating a business function to calculate the value.

When you create an assignment, you can do the following:

- Assign a fixed value.
- Create and assign a mathematical expression.

When you create an expression, calculate only the data items that are of the exact same numerical scale or data type. For example, do not calculate different currencies or decimal figures that represent different decimal values because the result of these calculations might compromise data integrity.

► To assign a value

1. On Event Rules Design, choose an event.
2. Click the Assignment/Expression button.
3. On Assignment, choose the To Object that you want to receive your assigned value.
4. Use one of the following methods to determine the From/Object Literal value:
   - Choose a From Object in the right-hand column to create a simple statement: [left-hand column] = [right-hand column].
   - Type a literal expression (number, text, and so on) in the text entry box to assign a literal statement: [left-hand column] = [literal].
   - Press the *f(X)* button to create a complex expression or advanced mathematical function using the Expression Manager.
5. Click OK.

   The Event Rules Design form displays the assignment in text format.

► To create an expression for an assignment

1. From the Assignment form, click the *f*(X) button.
2. On Expression Manager, create the expression in the edit field.

   Either type the expression or use the object list, calculator pad, and functions list. You can use the following buttons to edit your expression:

Clear Clears all data from the Assignment Display

Bksp Deletes the previous expression or character

Undo Reverses your previous editing action (other than inserting objects or functions from the lists)

3. Click OK when you finish editing your expression.

   The Assignment Display checks for and highlights any spelling or syntax errors. If it detects no errors, the system returns the expression to Event Rules Design.

Expression Manager

Expression Manager has several different sections with which you can work, as described in the following topics.

Assignment Display

The first section of the Expression Manager form displays the current status of the assignment expression. To Object displays the object to which the expression will be assigned. From Expression displays either a blank entry or the expression currently being edited.

Expression Editing Field

You create and edit expressions in the editing field. You can enter text by typing characters from the keyboard, using the editing keypad, or using the mouse to point and click to various expression components, including the following:

- Objects
- Numbers and mathematical symbols
- Advanced functions

The editing field accepts any expression, in any order. If syntax errors occur, the system highlights the error and displays it in the status bar.

Available Information

The Available Information list contains all of the objects that are available for creating and editing expressions. When you choose an object in the list box, the system displays its data type in the status bar.

Editing Keypad

You can use the editing keypad to enter data into an expression instead of using the keyboard. The Undo button is enabled only when the system can undo the last editing operation that you performed. The system cannot undo inserts from either the Available Information list or the Advanced Functions list.

Advanced Functions

The Advanced Functions list contains functions that are available to create or edit an expression. You can display information about functions in the status bar. The first box displays a short description of the function, and the second box displays the syntax for the function. Advanced functions include:

- Date functions
- General functions
- Trigonometry functions
- Text functions

Date Functions

Function	Description
add_days(date, days)	Adds a specified number of days to the date
add_months(date, months)	Adds a specified number of months to the date
days_between(date1, date2)	Returns the number of days between date1 and date2
months_between(date1, date2)	Returns the number of months between date1 and date2
date_day(date)	Returns the day for the specified date
date_month(date)	Returns the month of the year for the specified date (1=January, 2=February,...)
date_today( )	Returns the current date
date_year(date)	Returns the year for the specified date (in 19xx format)
last_day(date)	Returns the last day of the month of the specified date (not day of

	the week)
next_day(date, day_of_week)	Returns the next date that occurs on the day of the week after a given date

General Functions

Function	Description
abs	Returns the absolute value of the specified number
cell	Rounds the specified number up to the next whole number
exp	Calculates the exponential e to the specified number
floor	Rounds the specified number down to the next whole number
mod	Returns the remainder of numeric1/numeric2
pow10	Calculates 10 to the power of the specified number
pow	Calculates numeric1 to the power of numeric2
round	Rounds numeric1 to the power of numeric2
sign	Returns the sign of the specified number (If the sign is negative, the system returns a -1; otherwise, it returns 0.)
sqrt	Calculates the positive square root of the specified number

Trigonometry Functions

Function	Description
acos	Calculates the arc cosine of the specified number
asin	Calculates the arc sine of the specified number
atan2	Calculates the arc tangent of numeric1/numeric2
cos	Calculates the cosine of the specified number
cosh	Calculates the hyperbolic cosine of the specified number
log	Calculates the natural logarithm of the specified number
log10	Calculates the base 10 logarithm of the specified number
sin	Calculates the sine of the specified number
sinh	Calculates the hyperbolic sine of the specified number

tan	Calculates the tangent of the specified number
tanh	Calculates the hyperbolic tangent of the specified number

Text Functions

Function	Description	Example
concat	Appends string2 to string1	
indent	Indents string a given length of characters	indent("abcde",'5',5)="+++++abcde"
length	Returns the length of a string	length("axcvbnm") = 7
lower	Converts specified string to lowercase	lower("AbCdEfG") = "abcdefg"
lpad	Inserts the character into the front (left side) of the string until the string is length long	lpad("qwerty",' ',12) = "..... qwerty"
ltrim	Removes leading occurrences of the character from the string	ltrim("aaaaaabcdef" , 'a') = "bcdef"
rpad	Inserts the character into the back (right side) of the string until the string is length long	rpad("qwerty" , '.', 10) = "qwerty...."
rtrim	Removes trailing occurrences of the character from the string	rtrim("abcdef ",' ') = "abcdef"
substring	Extracts a portion of string beginning at position for length number of characters **Note** The beginning position of the string is considered position zero; to substring beginning with the 10th character, use 9 as the beginning position in the command.	substring ("SUNMONTUEWEDTHUFRISAT", 9,3) = "WED"
upper	Converts specified string to uppercase	upper("qweRTY") = "QWERTY"

Table I/O

Use the Table I/O button in Event Rules Design to create instructions that perform table input and output (I/O) so that you do not need to manually code a business function in C code. Table I/O allows you to access a table through event rules. You can use table I/O to do the following:

- Validate data.
- Retrieve records.

- Update or delete records across files.
- Add records.

For example, you can use table I/O to display information in a table that your application does not use.

You can use Log Viewer to view your table I/O SQL statements in the jdedebug.log. To do so, your jde.ini file must have debugging set to File.

Available Operations

Table I/O is an event rule that replaces writing low-level business functions that perform I/O by calling to the JDB API set. Using table I/O, you can perform the following operations:

FetchSingle Combines Select and Fetch in a basic operation. Indexed columns are used for the Select; and non-indexed columns are used for the Fetch. The operation opens a table for I/O but does not close it. All tables that do not use handles close automatically when the form that uses them closes.

Insert Inserts a new row.

Update Updates an existing row. Only those columns mapped (presently in tables with or without handles) are updated. You can do partial key updates with tables and handles to tables. If you do not specify all the keys, then several records might be updated.

Delete Deletes one or more rows in a table or business view.

Open Opens a table or business view.

Close Closes a table or business view.

Select Selects one or more rows for a subsequent FetchNext operation.

SelectAll Selects all rows for a subsequent fetch next operation.

FetchNext Fetches rows that you specify. You can fetch multiple records with multiple FetchNext operations or with a FetchNext operation in a loop.

Valid Mapping Operators

You can use the following operators for mapping specific table I/O operations:

Table I/O Operation	Mapping Operators
FetchSingle	Index Fields: =, <, <=, >, >=, !=, Like Non-Index Fields: Copy Target
Insert	All Fields: Copy Source
Update	Index Fields: = Non-Index Fields: Copy Source

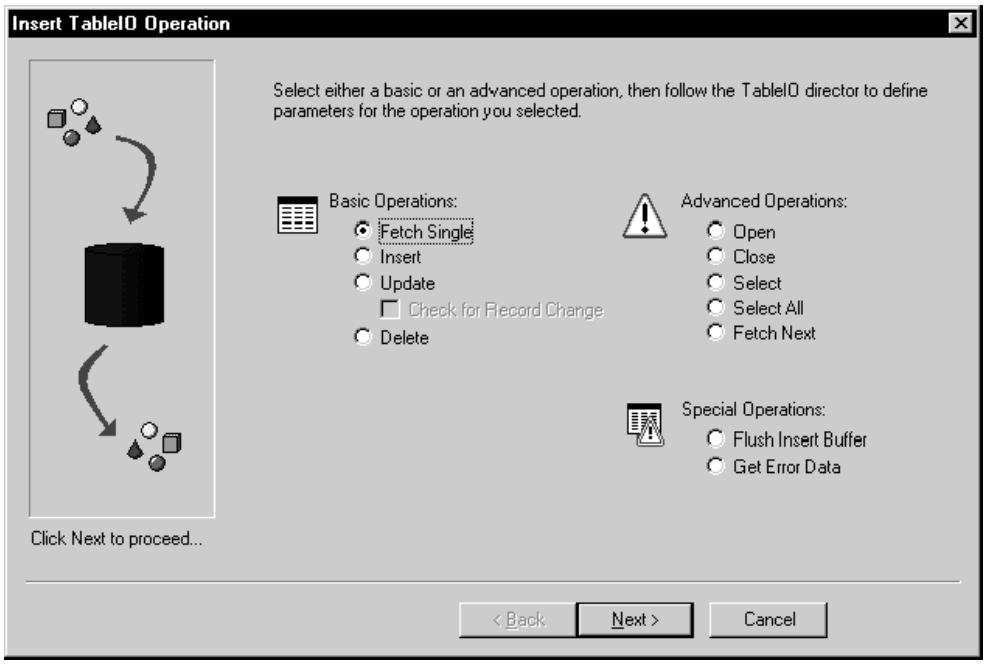
Delete	All Fields: =
Open	N/A
Close	N/A
Select	All Fields: =, <, <=, >, >=, !=, Like
SelectAll	N/A

Creating a Table I/O Event Rule

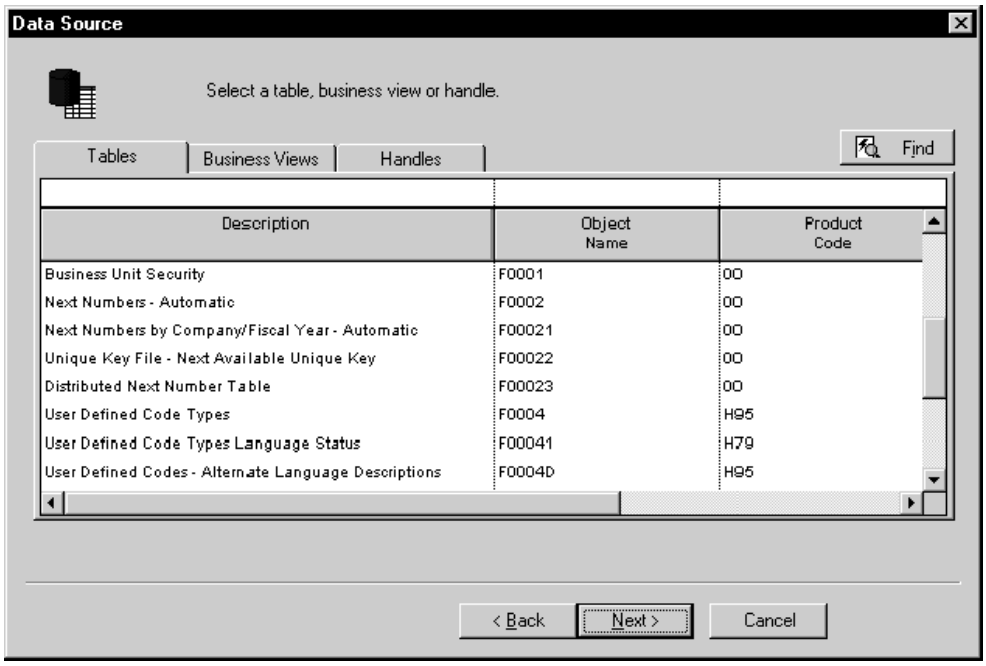
Table I/O event rules allow event rule support for database access. You need event rule support to perform table input and output, data validations, and record retrieval.

▶ To create a table I/O event rule

1. On Event Rules Design, click the Table I/O button.



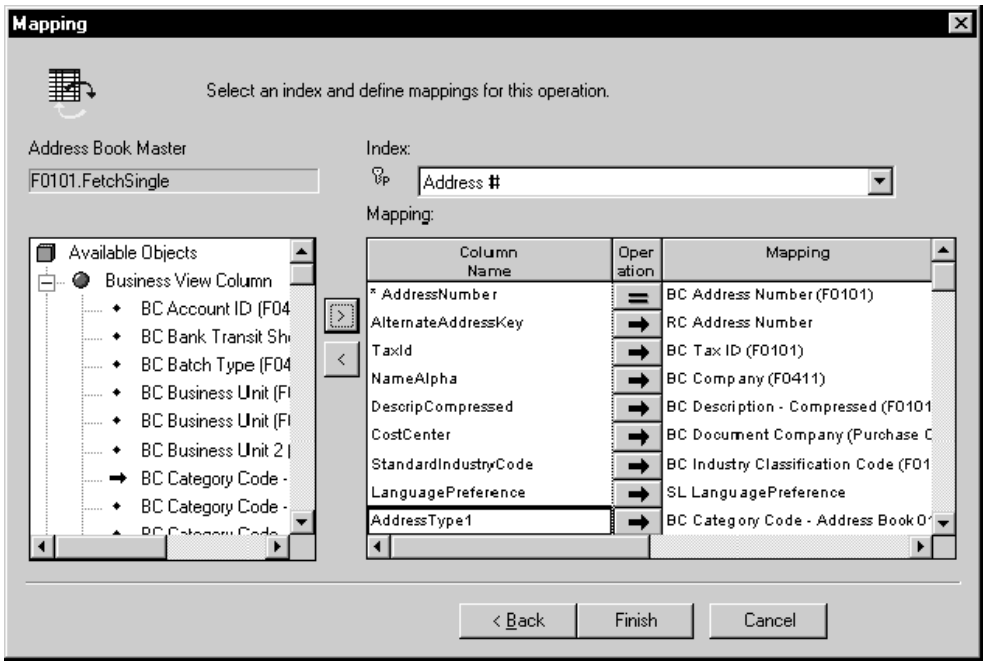
2. On Insert TableIO Operation, choose an operation and click Next.



3. On Data Source, choose the table, business view, or handle for which you want to perform I/O, and then click Next.

   The Mapping form displays available objects that you can map to selected table columns. The available objects are used to build a WHERE clause on SELECT statements. For FETCH statements, the system maps values into available objects in the variable column. For example, if you want to FETCH a single record from a table, map columns to create the WHERE clause of a SELECT statement.

   Key columns have an asterisk next to them.



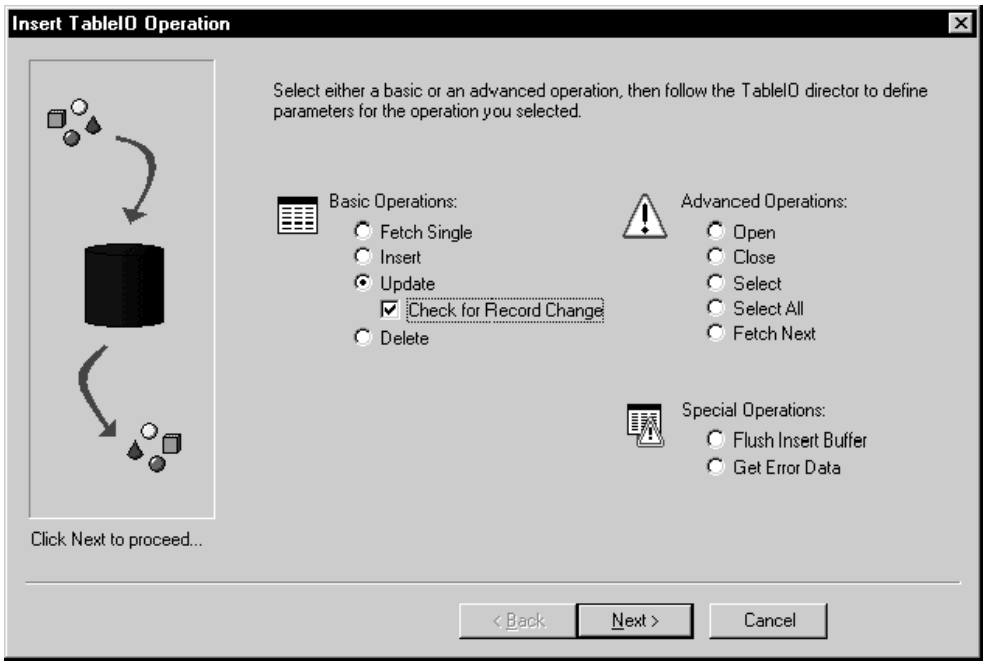
4. Choose the column that you want to use, and then double-click the available objects that you want to map to that column.
5. Click the Operator button until you locate the operation that you want.

   The following selection operations are available. The default is equal.

   - Equal
   - Not Equal
   - Less Than
   - Less Than or Equal To
   - Greater Than
   - Greater Than or Equal
   - Like
6. Click Finish to save the operation and return to Event Rules Design.

Understanding Record Change

If you choose the Update option, you can also enable Check for Record Change. The Check for Record Change option indicates whether the record has been changed between the time that it was fetched and the time that it was updated.



Understanding Buffered Inserts

You can use buffered inserts to improve performance when you insert many records (hundreds or thousands) into a single database table, and you do not need immediate user feedback if an insertion failure occurs. You can use buffered inserts with table conversion, table I/O, batch processes, and business functions. They are not available for interactive applications. Buffered inserts are available only with Oracle (V8 and above), DB2/400, and SQL Server. Buffered inserts are not available with Access, post-insert triggers, or multiple-table views. The JDEbase database middleware delivers records to the database management system one bufferload at a time.

When you request buffering, the database records are inserted individually and the buffer is automatically flushed when it fills; that is, the JDEbase database middleware delivers the buffer to the database management system. The buffer can also be explicitly flushed. For example, the buffer flushes automatically when you commit a transaction or when you close a table or view. The business function, table conversion engine, or table I/O can explicitly request that the buffer be flushed as well.

Understanding Buffered Insert Error Messaging

Because the system provides no immediate feedback if an insertion fails, you should use caution when you decide to use buffered inserts. If an insertion fails, the error appears in the JDE log. Consequently, buffered inserts are used primarily with batch applications.

Unless you are using the Table Conversion application, you must request more detailed information from the middleware to get detailed error messages. In Table Conversion, the table conversion engine automatically performs this task. You can enabl tracing to receive more detailed error messages. Otherwise, you get an error message that the insert failed. You should clear the output tables so that you do not receive duplicate error logging.

► To use buffered inserts in table I/O

1. On Event Rules Design, click the table I/O button.
2. On Insert TableIO Operation, choose the Open option in Advanced operations.
3. Click Next.
4. On Data Source, choose the table that you want to use, and then click Advanced Options.
5. On Advanced Options, choose Buffered Inserts, and then click OK.

Using Special Operations for Buffered Inserts

After you set up buffered inserts, you can use Special Operations to flush the buffers or get error messages.

► To use special operations for buffered inserts

1. In Event Rules, at the point at which you want to perform either a Flush Insert Buffer or Get Error Data operation, click one of the following options:

   - Flush Insert Buffer

     To maintain data integrity, you should flush the insert buffer before you perform any operations other than an insert. If you fail to do so, the results of recent inserts might not be reflected in other operations, and the operations might not work properly.

     When you use the flush insert buffer option for a specific table, you must flush the buffer before you close the table so that you still have access to error information. You can use the Get Error Data option for each insert to ensure that you can access this information.

   - Get Error Data

     The Get Error Data option retrieves errors for records that the system did not insert properly. Depending on when your buffers are flushed, or when you begin another insert, you might overwrite the error information for a specific insert. If error information is critical, retrieve the information before the next insert begins.

     If you need to perform special error handling, you should set it up after each table I/O insert and each Flush Insert Buffer option. Always retrieve the error information before you begin the next table operation.

     Note Concerning `CO_ERROR_DETAILS_AVAILABLE` for *SV_File_IO_Status* for Reports
     You set this error for reports during an Insert or Flush Insert Buffer operation when the insert fails in Table I/O. You can use the return code to determine if the system provides information about why this insert failed. If the return code from the insert is `CO_ERROR_DETAILS_AVAILABLE`, then you can call the Get Error Data Table I/O Operation. The Get Error Data operation returns the values used in the insert for all the requested columns. The following example illustrates how you can use `CO_ERROR_DETAILS_AVAILABLE.`

```
F0101.Insert  //Attempt an insert
        SL AgingDaysAP1 -> TK Address Number
        RC Page - -> TK Tax ID
        SL TargetEnvironment -> TK Description - Compressed
If SV File_IO_Status is equal to CO ERROR_DETAILS_AVAILABLE
    F0101.Get Error Data  //Failed with errors so get errors
                                  //Map values used in insert to
the
                                  //specified fields.
           SL AgingDaysAP1 <- TK Address Number
           RC TESTT <- TK Tax ID
           SL ReportName <- TK Description – Compressed
End If
```

Understanding Handles

In J.D. Edwards software, the table I/O term handle refers to a type of file pointer. This file pointer connects the application or UBE with the middleware that communicates with the database manager. Handles point to a database table, and they are references to an address within the middleware. Unlike regular file pointers, handles allow you some control over when and how they are used. Handles allow you to perform the following operations, which you cannot perform using nonhandle table I/O operations:

- You can use handles to concurrently open multiple instances of a single table or business view.
- You can use handles to open a table or business view in an environment other than the environment that you signed on to. This feature is particularly helpful when you receive an upgrade to J.D. Edwards software or when you need to convert data from another system into J.D. Edwards software.
- You can pass handles into a form, named event rule, or business function so that you do not need to open a table or business view more than once.

Note

You cannot use handles in transaction processing.

If you pass a handle to a form or a named event rule, the data structure for the form or named event rule must contain a member that is a handle data item. In the form interconnect or business function call, you must assign a handle value from your event rules to the handle data structure member. You can use this handle in the form or named event rule that is receiving the handle in the same way that you use any other handle.

You must explicitly open and close handles, unlike other table I/O operations in which you can use implicit open and close statements. You must open a handle before you can use it

for any other operations. All of the operations except Open work the same for handles as they do for tables or business views. When you are finished using a handle, you must explicitly close it. You close the handle in the same way in which you close a table or business view, except that you choose a handle instead of a table or business view.

Using a Handle

To use a handle, you must do the following:

- Define the handle in the data dictionary.
- Create a handle variable in event rules.
- Open the handle explicitly.

After you create a handle data item, you must create a handle variable. You create a handle variable the same way in which you create other variables. You can use any scope that is necessary to create the handle variable.

After you create a handle variable, you must explicitly open the handle. Then, after performing the required table I/O, you must explicitly close it.

► To use a handle

Use a Class type of handle and a data type of 7. You should name the alias for the handle the same as its table.

1. On Data Item Specifications, to complete the handle data item, click the Edit Rule tab, type the table or business view name for the handle, and then save the data dictionary item.

   The data item name can be a maximum of eight characters and should be formatted as follows:

   HFxxxxxx
   where

   HF = Designates a table I/O data item

   xxxxxx = Represents the system code and group type used in the table name

   For example, the table I/O data item name for table F4211 is HF4211.

   You can also create a handle data item in a data structure.

2. On Event Rules Design, click the Table I/O button.
3. From Advanced Operations, click Open.
4. Click Next.
5. On Data Source, click the Handles tab.
6. Choose the handle that you want to open, and then click Next.
7. Choose a variable that contains the name of the environment in which you want to open the table.

   If you want to open the table in the login environment, choose the system value SL LoginEnvironment. System values also exist for the source and target environment in Table Conversion if you use Table I/O in Table Conversion.

8. Click Finish.
9. On Data Source, click the Handles tab.
10. Choose the handle that you want to close, and then click Finish.

See Also

- *Data Dictionary* in the *Development Tools Guide* for more information about data items

Table Event Rules

You use table event rules (TER) to attach database triggers (or programs) that automatically run whenever an action occurs against the table. An action against a table is called an event. When you create a J.D. Edwards database trigger, you must first determine which event activates the J.D. Edwards database trigger. Then, use Event Rules Design to create the database trigger.

Table event rules provide embedded logic at the table level. Table event rules have their own location, events, and system functions. When you use table event rules, neither the calling application nor the user is notified of changes or events to the table. No form or report interconnection is available with table event rules.

You can use table event rules for data integrity. For example, when you delete a record in address book, you might want to delete all associated records, such as phone and category codes. You can also use table event rules for currency. The Currency Conversion is On event rule handles currency information in table event rules.

The following is a list of the events to which you can attach event rules on a table-by-table basis:

- After Record is Deleted
- After Record is Fetched
- After Record is Inserted
- After Record is Updated
- Before Record is Deleted
- Before Record is Fetched
- Before Record is Inserted
- Before Record is Updated
- Currency Conversion is On

See Also

- *Currency* in the *Development Tools Guide* for more information about currency conversion
- *ERP 8.0 Tools APIs Reference* on the *J.D. Edwards Knowledge Garden* for more information about APIs, including typical use and processing sequence

Creating Table Event Rules

To create a table event rule, you must perform the following:

- Create the database trigger in Event Rules Design.
- Generate the J.D. Edwards database trigger as C code.

► To create table event rules

1. On Object Management Workbench, check out the table to which you want to attach event rules, and then click Design.
2. On Table Design, click the Design Tools tab, and then click Start Table Trigger Design Aid.

   This starts Event Rules Design, which you can use to attach event rules to any of the events for the table.

3. From the Events list, choose an event.
4. Click one of the following event rule buttons:

Business Function	Attaches an existing business function.
System Function	Attaches an existing J.D. Edwards system function.
If/While	Creates an IF/WHILE conditional statement.
Assign	Creates an assignment or a complex expression.
Else	Inserts an ELSE clause, which is only valid within the bounds of IF and ENDIF.
Variables	Creates a programmer-defined field, which has data dictionary characteristics for application-specific purposes, but does not reside in the data dictionary.
Table I/O	Allows event rule support for database access. Performs table input and output, data validations, and record retrieval.

   You do not need to create and associate data structures to the table event rule (TER) functions. The table itself is the data structure that is passed to the table event rule function.

5. On Event Rules Design, click Save to save your event rule specifications, then click Close to return to Table Design.
6. If you are creating a new table, in Table Design, click the Table Operations tab, and then click Generate Table.

   Caution
   Never perform this step on an existing table because it clears all data. Only perform step this for New Tables.

7. On Generate Table, complete the following fields, and then click OK:
   - Data Source
   - Password
8. On Table Design, click the Design Tools tab, and then click Build Table Triggers.

The Build Triggers option performs the following steps:

- Converts the ER to C source code. This creates the files OBNM.c and OBNM.hxx (OBNM = Object Name). The source file will contain one function per table event rule event.
- Creates a make file to compile the generated code.
- Runs the make file to compile the new functions and to add them into JDBTRIG.DLL. This consolidated DLL contains table event rule functions.

9. To review a log of the build, click Generate Header File, and then open the file that is created by the system.

The creation of the table event rule is complete. The newly created or modified table event rule functions can now be called from the database APIs whenever the corresponding event occurs against the table.

Creating Dynamic Overrides

Some applications have generic form controls or grid columns in which the control properties (such as row or grid description, visual assist, and edit rules) are unknown until the user enters specific information or until specific data is loaded. In these cases, the system must dynamically override control properties at runtime. For example, an application might need to display the ending date for a field instead of static text, or you might want to change the visual assist search form when a user clicks on the visual assist button.

You can use system functions to override data dictionary properties at runtime. You can use the Set Data Dictionary Item system function to do the following:

- Override form controls and grid columns that are data dictionary items
- Change the data dictionary item completely so that all data dictionary properties are changed
- Create a new data item that is not the same type as the old item

  You can use a data item name that is a string variable or a hard-coded string.

You can use the Set Data Dictionary Overrides system function for the following:

- All form controls and grid columns
- Changes to a specific data dictionary property
- Data dictionary items that are not changed

You can use the following system functions to override text at runtime:

- Set Control Text
- Set Grid Column Heading
- Set Form Title

  These system functions are commonly used with text variables. You can also use the grid column system functions for Parent/Child forms. The grid column overrides work for all grid rows, and existing functionality remains intact.

You can use the following events to override a visual assist:

- Visual Assist Button Clicked

- Post Visual Assist Button Clicked

You can use also use the Suppress Default Visual Assist system function to override a visual assist and affect the next visual assist form. After you suppress the default visual assist form, you can use form interconnections to call another form instead of the Search and Select form.

Working with Asynchronous Processing

A *thread* is a path of execution that is separate from the main path of execution. The act of creating a thread is similar to calling a function, except that the main program also continues running. This means that two points of execution progress through the code. The different threads share the same memory space, and the operating system assigns processor time to them.

Threads allow you to process selected J.D. Edwards software events or business functions in the background while the user continues to interact with the application.

Thread processing provides several performance benefits, including the following:

- Improves processing for grid and edit controls
- Processes certain events in the background so that the user does not have to wait for the system to finish
- Provides greater flexibility for event processing
- Allows multiple-task processing
- Allows the user to continue with interactive tasks, such as data entry
- Allows faster cursor movement

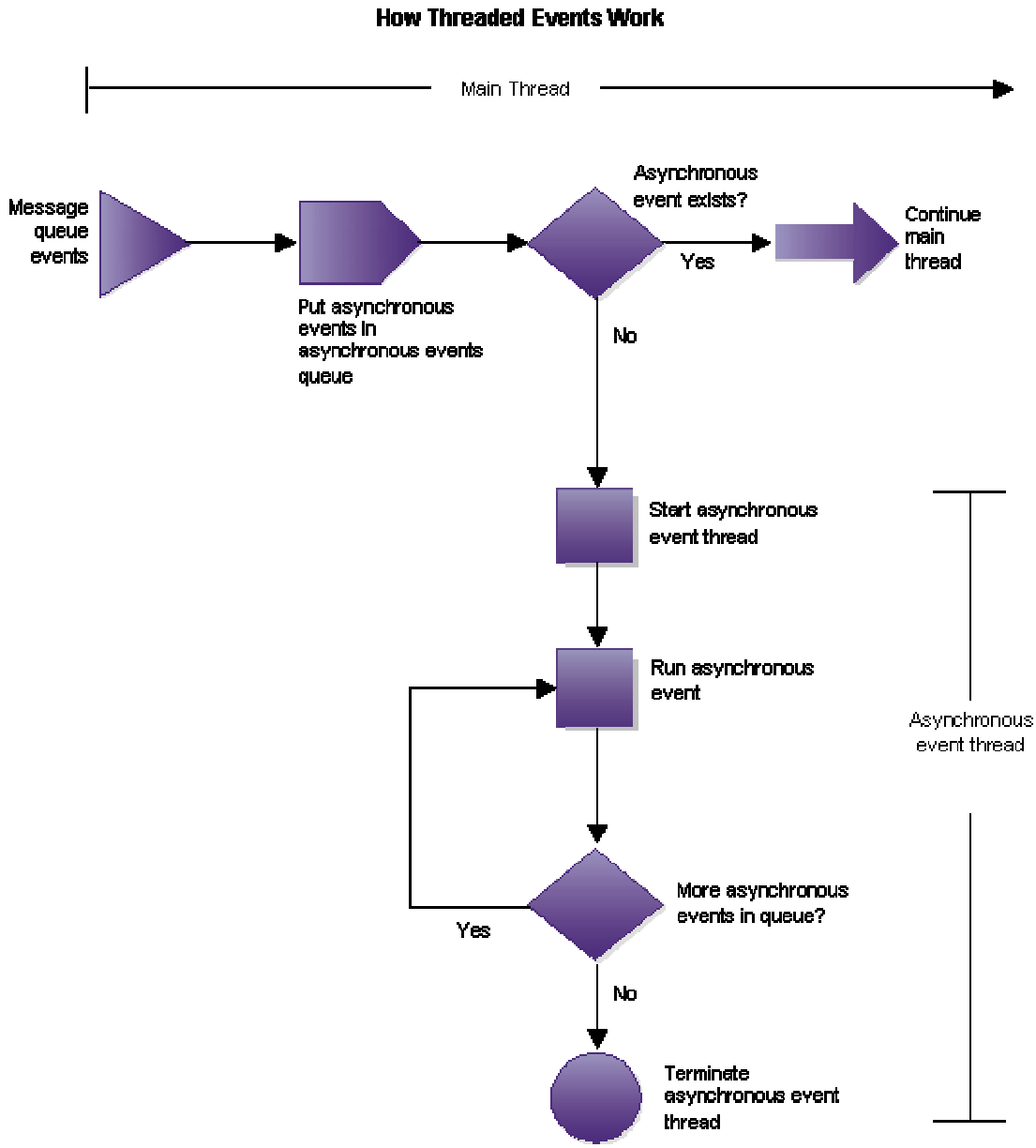
Though threads can significantly improve performance by using idle time to accomplish background processing, they also introduce a number of possible problems that are not present in single-threaded applications.

Events processed in the main path of execution and events processed in a thread can execute at the same time. Unpredictable results can occur when two events try to access the same data at the same time.

Asynchronous processing does not support form interconnections. You use asynchronous processes for background operations, and users should not directly interact with an asynchronous thread. For example, if you have an asynchronous process (such as Row is Exited and Changed - Asynch), you should not open a form on that worker thread because doing so requires the user to interact with a process that should be processing in the background.

Asynchronous Events

The following diagram illustrates how threaded events work.



Only one asynchronous event is processed at a time. Multiple instances of a unique asynchronous event might be waiting to process. The main thread continues, regardless of the presence or absence of asynchronous events in the queue. In the diagram, *Asynchronous event exists* determines whether the secondary thread starts; it does not alter the main thread.

All asynchronous events must complete their processing before OK or Cancel can be processed.

The following events can execute on a thread:

- Control is Exited and Changed - Asynch
- Row is Exited and Changed - Asynch
- Column is Exited and Changed - Asynch

Control is Exited and Changed - Asynch

As a control is exited, these three events process in the following sequence:

- Control is Exited
- Control is Exited and Changed - Inline
- Control is Exited and Changed - Asynch

The first two events are processed before the user can continue. The Control is Exited and Changed - Asynch event runs on a thread, which means that the user can continue entering data while the event runs.

Row is Exited and Changed - Asynch

As a grid row is exited, these three events process in the following sequence:

- Row is Exited
- Row is Exited and Changed - Inline
- Row is Exited and Changed - Asynch

The Row is Exited event is available on all grids. The other two events are available only on update grids (header and headerless detail forms).

The first two events are processed before the user can continue. The Row is Exited and Changed - Asynch event runs on a thread which means that the user can continue entering data while the event runs. An hourglass appears in the row header to indicate that this event is processing for a specific row.

Column is Exited and Changed - Asynch

As a grid column is exited, these three events process in the following sequence:

- Column is Exited
- Column is Exited and Changed - Inline
- Column is Exited and Changed - Asynch

These events are valid for update grids only (header and headerless detail forms).

The first two events are processed before the user can continue. The Column is Exited and Changed - Async events runs on a thread, which means the user can continue entering data while the event processes.

Asynchronous Business Functions

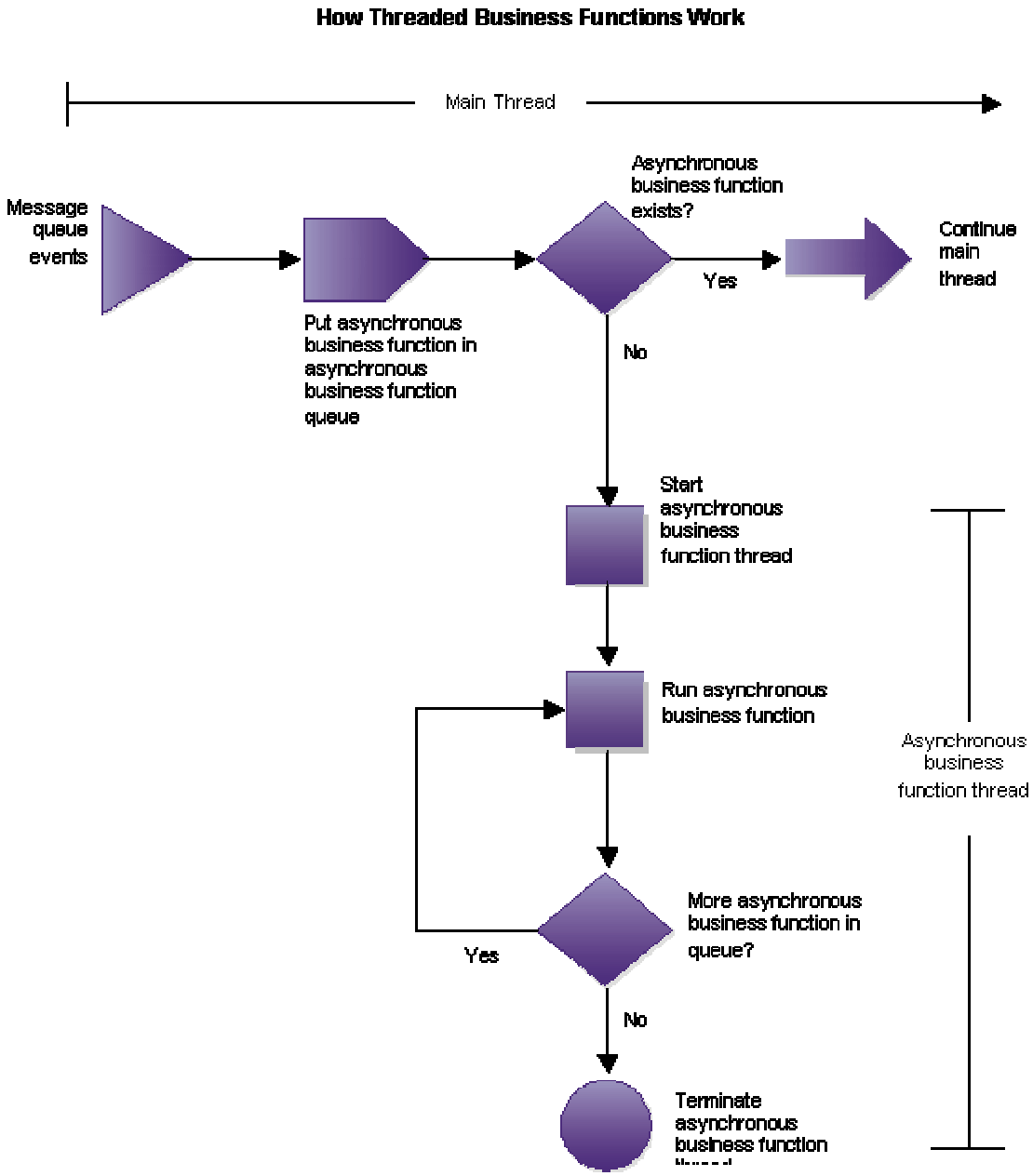
Business functions that run on OK and Cancel processing often negatively affect performance. When possible, run these business functions on a thread. Event Rules Design has an asynchronous option on the form on which business function parameters are

selected. The asynchronous option is disabled for all events except OK *Post Button Clicked,* Cancel *Post Button Clicked,* and Close *Post Button Clicked.* When the option is turned on, the business function processes on a thread. When the option is turned on, parameters can be passed in, or not passed at all. You cannot pass parameters out of the business function because the form might have reached the *End Dialog* event and therefore not open.

Attempts to set errors during asynchronous business functions are ignored. The asynchronous business function has no connection to the form, so errors cannot be set. The runtime engine can, however, use the return code from jdeCallObject to determine if an asynchronous business function fails. A message box appears if a failure occurs. The message box allows you to quit processing when a failure occurs. You can review the logs for more information about the failure.

Asynchronous business functions are useful for forms that make many database calls as the form is closing. For example, a good candidate for threaded business functions is a form that uses jdeCache calls or workfiles to store records temporarily and then writes the temporary records to the actual files when the OK button is clicked.

The following diagram illustrates how threaded business functions work:



Only one asynchronous business function processes at a time. The main thread continues regardless of the presence or absence of asynchronous events in the queue. In the diagram, *Asynchronous business function thread exists* determines whether the secondary thread starts, it does not affect the main thread.

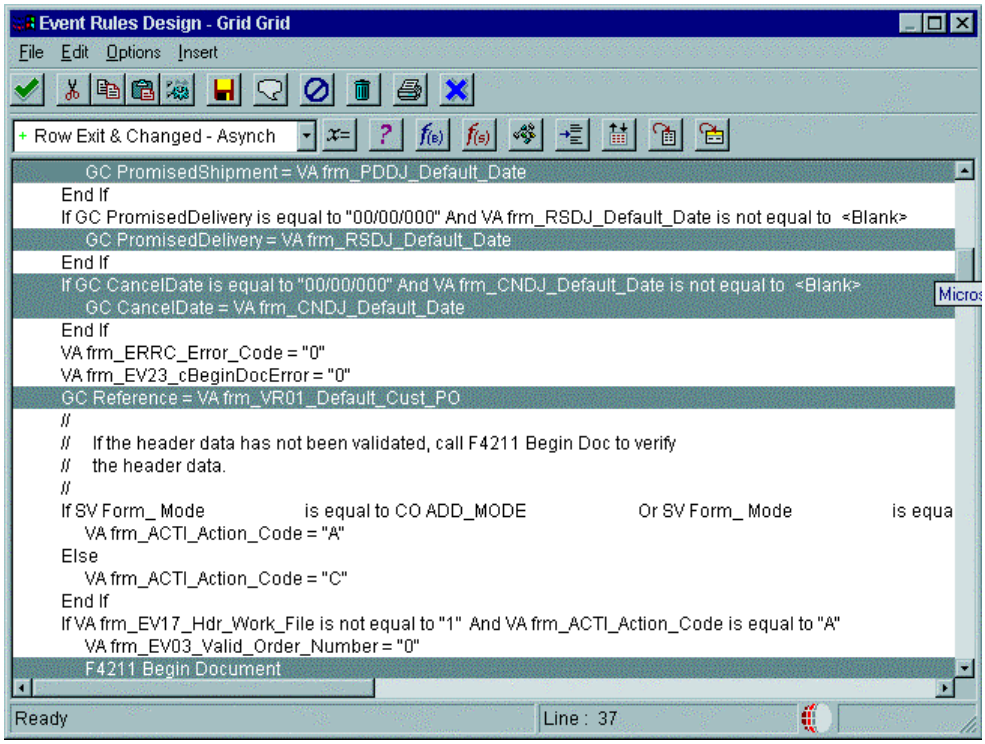
Asynchronous business functions must complete their processing before J.D. Edwards Explorer can be closed. If asynchronous business functions are still running, a message appears, and J.D. Edwards Explorer cannot close.

Example: Asynchronous Event Processing

The following is an example of functions that are attached to the Row is exited and Changed - Asynch event.

The Row is exited and Changed - Asynch event behind the grid in the Sales Order Detail form (P4210) has logic attached to it as follows.

For the first five highlighted lines, the system enters default information in certain table columns for the database update. For the last highlighted line, the F4211Begin Document (Master Business Function) is called.



BrowsER

You can use BrowsER to view event rules and design layout for interactive and batch applications. You can enable or disable one or more event rules without extensive work in the design tools. You use this feature to debug specific event rules.

BrowsER displays the structure of forms within an interactive application, or sections within a batch application. The forms or sections appear in a hierarchical structure, with events and event rules for each section.

Working with BrowsER

You can use BrowsER to disable or enable event rules, and then observe the effect of your actions on your application.

► To work with BrowsER

1. On Object Management Workbench, select a project and then click Design.
2. On Interactive Design, click the Design Tools tab, and then click Browse Event Rules.
3. On the Browsing form, click the plus (+) and minus (-) buttons to expand or collapse the hierarchical view of events for interactive forms or batch report sections.

   Each event rule appears beneath the event with which it is associated and beside a control that contains event rule logic. If it does not appear beside a control, then no event rule logic exists on that control.

4. To disable an event rule for debugging, double-click the event rule.
5. Double-click a disabled event rule to enable it.

   You cannot print or modify any event rule from any BrowsER forms.

Working with BrowsER Options

You can choose one of the following BrowsER options to easily view or search for code:

- Expand Tree
- Expand Node
- Show Object IDs
- Hide Objects with no ER
- Filter ER Records
- Search

► To work with BrowsER options

On the Browsing form, right-click and choose an option from the menu that appears.

Expand Node

Expand Node allows you to expand a highlighted node to show each line of code for the node.

Show Object IDs

You use Show Object IDs for C coding. This option displays a unique ID for each object, which is useful for identifying objects that produce errors during the code generation process.

Filter ER Records

Filter ER Records allows you to search event rule records for certain types of code, including the following:

- Assignments
- Business functions
- Criterion
- Comments
- Form interconnects
- Options

- System functions

Search

Search allows you to search for a particular line of code. You can use this feature to find occurrences of particular strings or variables.

Using Visual ER Compare

Visual ER Compare is a program that lets you compare ER on your local workstation to ER in the central objects data source of any defined pathcode, TAM specifications, or ESU backup. For example, if you change the ER for an application and then want to compare your changes to the ER in the server application, you can use Visual ER Compare.

Visual ER Compare provides a line-by-line, on-screen comparison. You can change the target ER (your local version) within the utility by moving lines directly from the source ER. You can also remove or disable lines. In addition to providing an on-screen comparison, you can also print a report that lists the changes.

Launching Visual ER Compare

Apply the following task only to objects with attachable ER (applications, UBEs, tables, and business functions).

► To launch Visual ER Compare

From the Cross Application Development Tools menu (GH902), choose Object Management Workbench.

1. On Object Management Workbench, check out an object.
2. Select the object that you checked out, and then click the Design button in the center column.
3. On the Design form, click the Design Tools tab.
4. Click Visual ER Merge.
5. On Select the Location of Source Specifications, click one of the following options:
   - Central Objects Path Code
   - Remote Specifications Location
   - Software Update Backup

Understanding the Visual ER Compare Interface

When you launch Visual ER Compare, the Visual ER Compare form appears. A tree-structured menu of the ER appears on the left. The rest of the form displays the source ER (in the middle panel) and the target ER (in the right panel). The target ER is your local ER.

In the ER menu, the system uses fonts of different colors to show the rules that exist in both source and target but that are different, and the rules that exist in one location but not the other. The system indicates a change in the parent node if one or more of its children changed. In the ER panes, the system highlights the lines that differ. If lines have been added to or deleted from one side, blank lines appear on the other side. An exclamation point indicates that a line is disabled. The system uses fonts of different colors to show the rules

that have changed in content or that have been added or deleted. You can change the display colors by choosing User Options from the View menu, and then choosing Set Colors.

Visual ER Compare uses an algorithm to compare lines to determine if a change has occurred. If a certain percentage of the target line is different from the source line, then the system marks the line as being different. You can change the sensitivity of the comparison by choosing User Options from the View menu and then choosing Comparison Factors. To include disabled ER lines in the comparison, click Disable Partial Matching for Disabled ER. To change the percentage of difference required to indicate that a line is changed, enter a number in the Partial Match Ratio field. The default value of .50 indicates that a minimum of 50% of the target line must vary from the source line to trigger the system to mark it as changed.

You can choose a different source by choosing Open Source from the File menu.

Working with Visual ER Compare

Use the ER menu to identify and display specific ER components that have changed. If a parent node is identified as changed, expand it to see which of its children are different. Double-click an event in the ER menu to display its associated code. You can display more than one event at a time. Use the Tile option in the Window menu to view different ER events simultaneously.

You can also move from change to change by right-clicking in either the source or target pane and choosing either Next ER Difference (to move forward) or Previous ER Difference (to move backward).

You can change your target ER with Visual ER Compare. You can also print the changes. In addition, you can copy all of the changes from the source to the target by using the AutoMerge feature.

Changing Your Target ER

Perform any of the following actions to change your target ER:

Copy selected lines from source to target	Choose the lines to copy, right-click in the source pane, and then choose Copy Right.
Delete selected lines from the target	Choose the lines to delete, right-click in the target pane, and then choose Delete.
Enable or disable selected lines in the target	Choose the lines to enable or disable, right-click in the target pane, and then choose Enable/Disable ER.

Note

Use the shift key to select multiple, contiguous lines and the control key to select multiple, noncontiguous lines.

After making your changes, right-click and choose Save ER. This action saves your changes to a buffer. When you open a new source or exit Visual ER Compare, the system prompts you to save your changes again. If you elect to save your changes at this time, then the system updates the object on your workstation; otherwise, your changes are lost.

Printing a Visual ER Compare Report

You can print a report that compares the source and target ER. You can print the comparison for a particular event or for all of the ER in the object.

To print a report for an event, double-click the event in the ER menu, right-click in either pane, and then choose Print ER.

To print a report for the entire object, choose Print ER from the File menu.

Using AutoMerge

Use AutoMerge when you want the system to change the target ER to match the source ER. You can use AutoMerge to change a particular event or to update all of the ER in the object.

Caution

Before performing an AutoMerge for an entire object, compare the source and the target to be certain that you want to make all of the changes that the system detects.

To use AutoMerge on an event, double-click the event in the ER menu, right-click in either pane, and then choose AutoMerge.

To use AutoMerge on an entire object, choose Advanced Operations from the View menu, and then choose Auto Merge.

Business Functions

The Business Functions topic discusses both C business functions and named event rules. It also includes information about master business functions, Business Function Builder, and business function documentation.

Understanding Business Functions

You can use business functions to enhance J.D. Edwards applications by grouping related business logic. Journal Entry Transactions, Calculating Depreciation, and Sales Order Transactions are examples of business functions.

You can create business functions using one of the following methods:

- The event rules scripting language

  The business functions that you create using the event rules scripting language are referred to as Business Function Event Rules (also called Named Event Rules). You should try to use Business Function Event rules for your business functions, if possible. In some instances, however, C business functions might better suit your needs.

- C programming code

  J.D. Edwards software does not generate the business functions that you create using C. You use C business functions mainly for caching. They can also be used for the following:

  - Batch error level messaging
  - Changes to the OR properties of a Where clause
  - Large functions
  - Complex Select statements

    C business functions work better for large functions. If you have a large function, you can break the code up into smaller individual functions and call them from the larger function.

After you create business functions, you can attach them to J.D. Edwards applications to provide additional power, flexibility, and control.

What are the Components of a Business Function?

The process of creating a business function produces several components. The Object Management Workebench (OMW) is the entry point for the tools that create the components.

The following components are created:

Component	Where Created
Business Function Specifications	Object Management Workbench Business Function Source Librarian and Business Function Design
Data Structure Specifications	Object Management Workbench Business Function Parameter Design
.C file	Generated in Business Function Design Modified with the IDE
.H file	Generated in Business Function Design Modified with the IDE

The DLLs are divided into categories. This distribution provides better separation between the major functional groups such as tools, financials, manufacturing, distribution, and so on. Most business functions are organized into a consolidated DLL based on their system code. For example, a financials business function with system code 01 belongs in CFIN.DLL.

You should follow these guidelines when you add or modify business functions:

- Create a custom parent DLL unless you are adding a J.D. Edwards business function. Assign a parent DLL to the business functions, based on the system code defined in UDC table H92/PL. If no DLL is assigned for the system code in which the business function is created, CCUSTOM is used. You can change the DLL after the business function is created.
- When you write business function code, ensure that all calls to other business functions use the jdeCallObject protocol. Linker errors might occur if you do not use jdeCallObject and you attempt to call a business function in a different DLL. A linker error prevents your function call from working.

The following table lists some of the DLLs for which Business Function Builder manages the builds:

DLL Name	Functional Group
CAEC	Architecture
CALLBSFN	Consolidate BSFN Library
CBUSPART	Business Partner
CCONVERT	Conversion Business Functions
CCORE	Core Business Functions
CCRIN	Cross Industry Application
CDBASE	Tools - Database

CDDICT	Tools - Data Dictionary
CDESIGN	Design Business Functions
CDIST	Distribution
CFIN	Financials
CHRM	Human Resources
CINSTALL	Tools Install
CINV	Inventory
CLOC	Localization
CLOG	Logistics Functions
CMFG	Manufacturing
CMFG1	Manufacturing - Modificated BFs
CMFGBASE	Manufacturing Base Functions
COBJLIB	Tools - Object Librarian
COBLIB	Busbuild Functions
COPBASE	Distribution/Logistic Base Functions
CRES	Resource Scheduling
CRUNTIME	Tools - Run Time
CSALES	Sales Order
CTOOL	Tools - Design Tools
CTRAN	Transportation
CTRANS	Tools - Translations
CWARE	Warehouse
CWRKFLOW	Tools - Workflow
JDBTRG1	Table Trigger Library 1
JDBTRG2	Table Trigger Library 2
JDBTRG3	Table Trigger Library 3

JDBTRG4	Table Trigger Library 4
JDBTRIG	Parent DLL for Database Triggers

Note Concerning Table Triggers and Regular Business Functions
Do not use the table triggers for regular business functions.

How Distributed Business Functions Work

The Object Management Workbench manages the following three main components that make up named event rules or business functions:

- Object Name

  The Object Name is the actual source file.

- Function Name

  The name of the business function or event rule.

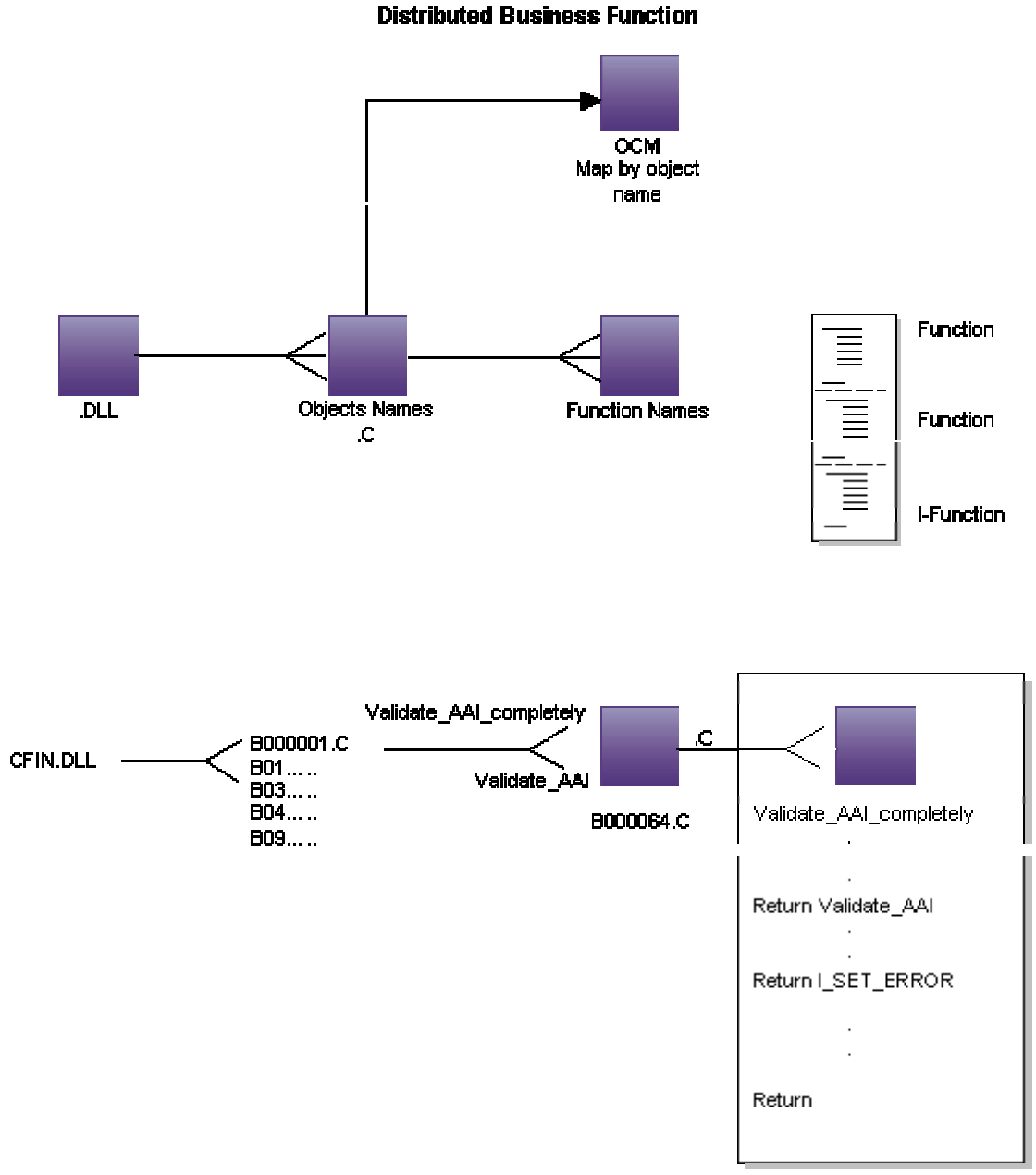
  Note
  Each function must have a data structure.

- DLL Name

  The DLL is a dynamic link library.

When a business function is called, the Object Configuration Manager (OCM) determines where to run the business function. After the system maps a business function to a server, calls from that business function cannot be mapped back to the workstation.

The following graphic illustrates how distributed business functions work:



See Also

- *Object Configuration Manager* in the *Configurable Network Computing Implementation Guide* for more information about Object Configuration Manager

Creating Business Function Event Rules

A business function event rule (BSFN ER) is a business function object for which the source language is event rules, instead of C. You create a business function event rule using the event rules scripting language. This scripting language is platform-independent and is stored in a database as a J.D. Edwards software object. Business function event rules are also called Named Event Rules (NER).

Before You Begin

- Create a data structure. See *Data Structures* in the *Development Tools Guide* for more information about creating data structures.

► To design a business function event rule

1. On Object Management Workbench, create a business function.

   For Function Location, you typically choose Client/Server Function. Use the Client Only and Server Only function locations only if absolutely necessary.

2. On Business Function Design, click the Design Tools tab, and then choose Start Business Function Design Aid.
3. Complete the Parent DLL field.
4. Complete the Business Function Location (C/S) field to specify the business function location in which you want this business function to reside.
5. Choose Parameters from the Row menu.
6. On Business Function Parameters, choose Select from the Form menu.
7. Click Find to locate the data structure to which the business function should be attached.

   You might need to create a new data structure if an existing one does not meet your needs.

8. To create a new data structure, click Add and complete the steps for creating data structures.

If the business function already has a data structure, the system identifies the business structure. You can choose another data structure or edit the one that you want to use.

► To create or edit event rules for a business function event rule

1. On Business Function Design, choose Edit from the Form menu to create or edit the event rules that comprise the function.

   When you create a new BSFN event rule, ensure that you choose NER as the Source Language.

2. From the File menu, choose Exit.
3. On Business Function Event Rules Design, construct the business function event rule.
4. Click the Save button or the OK button to save the event rules source code and return to Business Function Design.

5. On Business Function Design, click OK to save the functions and return to Business Function Source Librarian.
6. On the Design Tools tab, choose Build Business Function to create the .c and .h files, create a make file, and build the business function.

   Because the source language is NER, Business Function Source Librarian creates an objname.c and objname.h file for the business function event rule. The business function event rule resides in the parent DLL that is associated with the business function.

7. To attach the newly created business function event rule to an event, click the *f*(B) button on Event Rules Design.

   Ensure that the source language is NER when you browse available business function objects.

Example: Named Event Rule

Named event rules are modular. That is, they can be reused in multiple places by multiple programs. This modularity reduces rework and allows you to reuse code.

Not all chunks of code should be packaged in a business function module. For example, when code is so specific that it applies only to a particular program, and it is not reused by any other programs, you should leave it in one place instead of packaging it in a business function. You can attach all the logic on a hidden control (*Button Clicked* event) and use a system function to process the logic as needed.

An example of a named event rule is N3201030. This business function creates generic text and Work Order detail records (F4802) for a configured work order. Based on the structure of the sales order in F3296, the configured segments for the item on the passed work order and all lower level segments are included in the generic text.

The following example illustrates the function as it appears in Event Rules Design:

```
//
// Convert the related sales order number into a math numeric.  If that
fails,
// exit the function.
//
String, Convert String To Numeric
If VA evt_cErrorCode is equal to "1"
  //
  // Validate that the work order item is a configured item.
  //
  F4102 Get Item Manufacturing Information
  If VA evt_cStockingType is not equal to "C"And BF
cSuppressErrorMessages is not equal to "1"
  BF szErrorMessageID = "3743"
  Else
  BF szErrorMessageID = ""
  //
  // Delete all existing "A" records from F4802 for this work order.
  //
  VA evt_cWODetailRecordType = "A"
  F4802.Delete
  F4802.Close
  //
  // Get the segment delimiter from configurator constants.
  //
  F3293 Get Configurator Constant Row
  If VA evt_cSegmentDelimiter is less than or equal to  <Blank>
  VA evt_cSegmentDelimiter = "/"
End If
//
F3296.Open
F3296.Select
If SV File_IO_Status                  is equal to CO SUCCESS

F3296.FetchNext
//
// Retrieve the F3296 record of the work order item, and determine its
key
// sequence by parsing ATSQ looking for the last occurrence of '1'.  The
substring
// of ATSQ to this point becomes the key for finding the lower level
configured
// strings.
//
If VA evt_mnCurrentSOLine is equal to BF mnRelatedSalesOrderLineNumber
// Get the corresponding record from F32943.  Process the results of
that fetch
// through B3200600 to add the parent work order configuration to the
work order
// generic text.
```

```
F32943.FetchSingle
If SV File_IO_Status                  is equal to CO SUCCESS

  VA evt_szConfiguredString = concat([VA evt_ConfiguredStringSegment01],
  [VA evt_ConfiguredStringSegment02])
  Confg String Format Segments Cache
End If
//
// Find the last level in ATSQ that is not "00".  Note that the first three
// characters represent the SO Line Number to the left of the decimal.
Example:
// SO line 13.001 will have ATSQ characters "013".  Each configured item can
have
// 99 lower-level P-Rule items and a total of ten levels.  Therefore every
pair
// thereafter is tested.
//
VA evt_mnSequencePosition = "1"
While VA evt_mnSequencePosition is less than "23"
And VA evt_szCharacterPair is not equal to "00"
VA evt_mnSequencePosition = [VA evt_mnSequencePosition] + 2
VA evt_szCharacterPair = substr([VA evt_szTempATSQ],[VA
evt_mnSequencePosition],2)
End While
VA evt_szParentATSQ = substr([VA evt_szTempATSQ],0,[VA
evt_mnSequencePosition])
//
// For each record in F3296 for the related sales order, find those with the
same
// key substring of ATSQ.  Retrieve the associated record from F32943 if
// available and pass the configured string to N3200600 for addition to the
work
// order generic text.
//
F3296.FetchNext
While SV File_IO_Status                    is equal to CO SUCCESS

VA evt_szChildATSQ = substr([VA evt_szTempATSQ],0,[VA
evt_mnSequencePosition])
If VA evt_szChildATSQ is equal to VA evt_szParentATSQ
F32943.FetchSingle
If SV File_IO_Status                  is equal to CO SUCCESS

VA evt_szConfiguredString = concat([VA evt_ConfiguredStringSegment01],
[VA evt_ConfiguredStringSegment02])
Confg String Format Segments Cache
End If
End If
F3296.FetchNext
End While
F32943.Close
//
// Unload segments cache into the work order generic text. B3200600 Mode 6
Confg String Format Segments Cache
//
End If
End If
F3296.Close
//
End If
Else
// The related sales order number is invalid. Return an error.
If BF cSuppressErrorMessages is not equal to "1"
Set NER Error("0002", BF szRelatedSalesOrderNumber)
End If
```

```
End If
End If
```

Understanding C Business Functions

J.D. Edwards software contains two types of business functions: Named Event Rules (NER) and C business functions. C business functions are written in C programming language and are used to perform functions that are not available in NER. C business functions include both a header file (.h) and a source file (.c).

Understanding Header File Sections

The following table describes the major sections of a business function header file:

Section	What It Includes	Description and Guidelines
Header File Comment	• Header file name • Description • History • Programmer • Software action request (SAR) number • Copyright information	Comments that the input process of the Business Function Source Librarian builds. The programmer name and SAR number are manually updated by the programmer.
Table Header Inclusions	Include statements for header files associated with tables that are directly accessed by this business function	Table header files include definitions for the fields in a table and the ID of the table itself.
External Business Function Header Inclusions	Include statements for headers associated with externally defined business functions that are directly accessed by this business function	External function calls with jdeCallObject are included to use the predefined data structures.
Global Definitions	Global constants used by the business function	Symbolic names that you enter in uppercase; words are separated by an underscore character. Use global definitions sparingly.
Structure Type Definitions	Data structure definitions for internal processing	To prevent naming conflicts, define this structure using structure names that are prefixed by the source file name.
DS Template Type Definition	• Data structure type definitions generated by Business Function Design • Symbolic constants for the data structure generated by Business Function Design	This structure must be modified through the Object Management Workbench.
Source Preprocessor	• Undefines JDEBFRTN if it is already defined • Checks for how to define JDEBFRTN • Defines JDEBFRTN	Ensures that the business function declaration and prototype are properly defined for the environment and source file, including this header.
Business Function Prototype	Prototypes for all business functions in the source file	Defines the business functions in the source file, the parameters that are passed to them,

		and the type of value that they return.
Internal Function Prototype	Prototypes for all internal functions that are required to support business functions within this source file	Defines the internal functions that are associated with the business functions in the source file, the parameters that are passed to each internal function, and the type of value that they return.

Business Function Header File Example

Assume that Business Function Design created the following header file. This file contains only the required components in a business function header file.

```
/**************************************************************************
 *    Header File:  B98SA001.h
 *
 *    Description:  Check for In Add Mode Header File
 *
 *        History:
 *          Date        Programmer  SAR# - Description
 *          ----------  ----------  ------------------------------------------
 *   Author 03/07/1995   Hotchkiss  Unknown  - Created
 *
 *
 * Copyright (c) 1994  J.D. Edwards & Company
 *
 * This unpublished material is proprietary to J.D. Edwards & Company.
 * All rights reserved.  The methods and techniques described herein are
 * considered trade secrets and/or confidential.  Reproduction or
 * distribution, in whole or in part, is forbidden except by express
 * written permission of J.D. Edwards & Company.
 **************************************************************************/


#ifndef __B98SA001_H
#define __B98SA001_H
/**************************************************************************
 * Table Header Inclusions
 **************************************************************************/


/**************************************************************************
```

```
 * External Business Function Header Inclusions
 ****************************************************************************/


/****************************************************************************
 * Global Definitions
 ****************************************************************************/


/****************************************************************************
 * Structure Definitions
 ****************************************************************************/


/****************************************************************************
 * DS Template Type Definitions
 ****************************************************************************/
/***************************************
 * TYPEDEF for Data Structure
 *    Template Name: Check for In Add Mode
 *    Template ID:   104438
 *    Generated:     Tue Mar 07 09:33:47 1995
 *
 * DO NOT EDIT THE FOLLOWING TYPEDEF
 *    To make modifications, use the OneWorld Data Structure
 *    Tool to Generate a revised version, and paste from
 *    the clipboard.
 *
 ***************************************/


#ifndef DATASTRUCTURE_104438
#define DATASTRUCTURE_104438


typedef struct tagDS104438
{
  char              cEverestEventPoint01;                  /* OneWorld Event Point 01
*/
} DS104438, FAR *LPDS104438;


#define IDERRcEverestEventPoint01_1              1L
```

```
#endif


/******************************************************************************
 * Source Preprocessor Definitions
 *****************************************************************************/
#if defined (JDEBFRTN)
    #undef JDEBFRTN
#endif

#if defined (WIN32)
    #if defined (b98sa001_c)
        #define JDEBFRTN(r) __declspec(dllexport) r
    #else
        #define JDEBFRTN(r) __declspec(dllimport) r
    #endif
#else
    #define JDEBFRTN(r) r
#endif


/******************************************************************************
 * Business Function Prototypes
 *****************************************************************************/
JDEBFRTN(ID) JDEBFWINAPI CheckForInAddMode
   (LPBHVRCOM lpBhvrCom, LPVOID lpVoid, LPDS104438 lpDS);


/******************************************************************************
 * Internal Function Prototypes
 *****************************************************************************/


#endif    /* __B98SA001_H */
```

The following table describes the contents of the various lines in the header file :

	Header File Line	Where Input	Description
1.	Header File	Object Management Workbench	Verify the name of the business function header file.
2.	Description	Object Management Workbench	Verify the description.
3.	History	IDE (Integrated Development Environment)	Manually update the modification log with the programmer name and the appropriate SAR number.
4.	#ifndef	Business Function Design	Symbolic constant prevents the contents from being included multiple times.
5.	Table Header Inclusion	Business Function Design	When business functions access tables, related tables are input and Business Function Design generates an include statement for the table header file.
6.	External Business Function Header Inclusions	Business Function Design	No external business functions for this application.
7.	Global Definitions	IDE (Integrated Development Environment)	Constants and definitions for the business function. J.D. Edwards does not recommend using this block. Global variables are not recommended. Global definitions go in .c not .h.
8.	Structure Definitions	IDE (Integrated Development Environment)	Data structures for passing information between business functions, internal functions, and database APIs.
9.	TYPEDEF for Data Structure	Business Function Design	Data structure type definition. Used to pass information between an application or report and a business function. The programmer places it on the Clipboard and pastes it in the header file. Its components include: Comment Block, which describes the data structure. Preprocessor Directives, which ensure that the data type is defined only once. Typedef, which defines the new data type. #define, which contains the ID to be used in processing if the related data structure element is in error. #endif, which ends the definition of the data structure type definition and its related information.
10.	Source Preprocessor Definitions	Business Function Design	All business function header files contain this section to ensure that the business function is prototyped and declared based on where this header is included.

	Header File Line	Where Input	Description
11.	Business Function Prototype	Business Function Design	Used for prototypes of the business function.
12.	JDEBFRTN(ID) JDEBFWINAPI CheckForInAddMode	Business Function Design	Business Function Standard All business functions share the same return type and parameter data types. Only the function name and the data structure number vary between business functions. Parameters include: LPBHVRCOM: Pointer to a data structure used for communicating with business functions. Values include an environment handle. LPVOID: Pointer to a void data structure. Currently used for error processing; will be used for security in the future. LPDS#####: Pointer to a data structure containing information that is passed between the business function and the application or report that invoked it. This number is generated through Object Librarian. Parameter names (lpBhvrCom, lpVoid, and lpDS) will be the same for all business functions. JDEBFRTN(ID)JDEBFWINAPI: All business functions will be declared with this return type. It ensures that they are exported and imported properly.
13.	Internal Function Prototypes	Business Function Design	Internal function prototypes required to support the business functions in this source file

Understanding the Structure of a Business Function Source File

The Object Management Workbench builds a template for the business function source file. The business function source file consists of several major sections, as described in the following table:

Section	What It Includes	Description
Source File Comment Block	• Source file name • Description • History • Programmer • Date • SAR Number • Description • Copyright information	Built from the information in the Business Function Source Librarian. The programmer manually updates the programmer name and SAR number.
Notes Comment Block	Any additional relevant notes concerning the business function source	Document complex algorithms used, how the business functions in the source relate to each other, and so on.

Business Function Comment Block	• Business function name • Description • Description list of the parameters	
Business Function Source Code	Source code for the business function	
Internal Function Comment Block	• Function name • Notes • Returns • Parameters	Copy these blocks and place the values in the specified sections to describe the internal function. Follow the comment block with internal function source code.
Internal Function Source Code	Source code for the internal function described in the comment block	The business function developer enters this code as needed. A populated internal function comment block must precede this code.

Example: Business Function Source File

Assume that Business Function Design created the following source file called *Check for In Add Mode*. It contains the minimum components that are required in a business function source file. The source code in the Main Processing section is manually entered and varies from business function to business function. All other components are completely generated by Business Function Design.

```
#include <jde.h>

#define b98sa001_c


/**************************************************************************
 *    Source File:  B98SA001.c
 *
 *    Description:  Check for In Add Mode Source File
 *
 *        History:
 *          Date        Programmer  SAR# - Description
 *          ----------  ----------  ----------------------------------------
 *   Author 03/07/1995  Hotchkiss   Unknown - Created
 *
 * Copyright (c) 1994  J.D. Edwards & Company
 *
 * This unpublished material is proprietary to J.D. Edwards & Company.
 * All rights reserved.  The methods and techniques described herein are
 * considered trade secrets and/or confidential.  Reproduction or
```

```
 * distribution, in whole or in part, is forbidden except by express
 * written permission of J.D. Edwards & Company.
 ***************************************************************************/
/***************************************************************************
 * Notes:
 *
 ***************************************************************************/

#include <B98SA001.h>

/***************************************************************************
 *  Business Function:  CheckForInAddMode
 *
 *        Description:  Check for In Add Mode
 *
 *         Parameters:
 *           LPBHVRCOM       lpBhvrCom    Business Function Communications
 *           LPVOID          lpVoid       Void Parameter - DO NOT USE!
 *           LPDS104438      lpDS         Parameter Data Structure Pointer
 *
 ***************************************************************************/

JDEBFRTN(ID) JDEBFWINAPI CheckForInAddMode (LPBHVRCOM lpBhvrCom, LPVOID lpVoid,
LPDS104438 lpDS)
{
   /***************************************************************************
    *  Variable declarations
    ***************************************************************************/

   /***************************************************************************
    * Declare structures
    ***************************************************************************/

   /***************************************************************************
    * Declare pointers
    ***************************************************************************/
```

```
   /*************************************************************************
    * Check for NULL pointers
    *************************************************************************/
   if ((lpBhvrCom == NULL) ||
       (lpVoid    == NULL) ||
       (lpDS      == NULL))
   {
      jdeErrorSet (lpBhvrCom, lpVoid, (ID) 0, "4363", 0);
      return ER_ERROR;
   }


   /*************************************************************************
    * Set pointers
    *************************************************************************/


   /*************************************************************************
    * Main Processing
    *************************************************************************/


   /*************************************************************************
    * Function Clean Up
    *************************************************************************/


   return (ER_SUCCESS);
}


/* Internal function comment block */
/*************************************************************************
 *   Function:  Ixxxxxxx_a   // Replace "xxxxxxx" with a source file number
                             // and "a" with the function name
 *
 *      Notes:
 *
 *    Returns:
 *
 * Parameters:
```

```
**************************************************************************/
```

The following table describes the various lines that appear in the source file:

	Source File Line	Where Input	Description and Guidelines
1.	#include <jde.h>	Business Function Design	Includes all base J.D. Edwards definitions.
2.	#define b98sa001_c	Business Function Design	Ensures that related header file definitions are properly created for this source file.
3.	Source File	Object Management Workbench	Verify the information in the file comment section. Enter the programmer's name, SAR number, and description.
4.	#include <B98SA001.h>	Object Management Workbench	Includes the header file for this application.
5.	Business Function	Business Function Design	Verify the name and description in the business function comment block.
6.	JDEBFRTN(ID) JDEBFWINAPI CheckForInAdd Mode (LPBHVRCOM lpBhvrCom, LPVOID lpVoid, LPDS104438 lpDS)	Business Function Design	Includes the header of a business function declaration.
7.	Variable declarations	IDE	Declare variables that are local to the business function.
8.	Declare structures	IDE	Declare local data structures to communicate between business functions, internal functions, and the database.
9.	Declare pointers	IDE	Declare pointers.
10.	Check for NULL pointers	Business Function Design	Business Function Standard Verifies that all communication structures between an application and the business function are valid.

	Source File Line	Where Input	Description and Guidelines
11.	jdeErrorSet (lpBhvrCom, lpVoid, (ID) 0, ”4363”, 0); return ER_ERROR;	Business Function Design	Sets the standard error to be returned to the calling application when any of the communication data structures are invalid.
12.	Set pointers	IDE	Declare and assign appropriate values to pointers.
13.	Main Processing	IDE	Provide main functionality for a business function.
14.	Function Clean Up	IDE	Free any dynamically allocated memory.
15.	Internal function comment block	IDE	Define internal functions that are required to support the business function. They should follow the same C coding standards. A comment block is required for each internal function and should be in the format shown in the example.

Use the MATH_NUMERIC data type exclusively to represent all numeric values in J.D. Edwards software. The values of all numeric fields on a form or batch process are communicated to business functions in the form of pointers to MATH_NUMERIC data structures. MATH_NUMERIC is used as a data dictionary data type.

Using Application Programming Interfaces (APIs)

Application programming interfaces (APIs) are routines that perform predefined tasks. J.D. Edwards APIs make it easier for third-party applications to interact with J.D. Edwards software. These APIs are functions that you can use to manipulate J.D. Edwards data types, provide common functionality, and access the database. Several categories of APIs exist, including the Common Library Routines and J.D. Edwards Database (JDEBASE) APIs.

Programs using the J.D. Edwards APIs are flexible for the following reasons:

- No code modifications are required as functionality is upgraded.
- When a J.D. Edwards data structure changes, source modifications are minimal to nonexistent.
- Common functionality is provided through the APIs, and they are less prone to error.

When the code in an API changes, business functions typically have only to be recompiled and relinked.

Using Common Library APIs

The Common Library APIs are specific to J.D. Edwards functionality, such as determining whether foreign currency is enabled, manipulating the date format, retrieving link list information, or retrieving math numeric and date information. You can use these APIs to set up data by calling APIs and modifying data after API calls. Some of the more commonly used categories of APIs include MATH_NUMERIC, JDEDATE, and LINKLIST. Other miscellaneous Common Library APIs are also available.

J.D. Edwards provides two main data types that you use when you create business functions. They are:

- MATH_NUMERIC
- JDEDATE

Because these data types might change, you must use the Common Library APIs provided by J.D. Edwards to manipulate the variables of these data types.

MATH_NUMERIC Data Type

The MATH_NUMERIC data type exclusively represents all numeric values in J.D. Edwards software. The values of all numeric fields on a form or batch process are communicated to business functions in the form of pointers to MATH_NUMERIC data structures. MATH_NUMERIC is used as a data dictionary data type.

The data type is defined as follows:

```
struct tagMATH_NUMERIC


{
   char  String [MAXLEN_MATH_NUMERIC + 1];
   char  Sign;
   char  EditCode;
   short nDecimalPosition;
   short nLength;
   WORD  wFlags;
   char  szCurrency [4];
   short nCurrencyDecimals;
   short nPrecision;
};


typedef struct tagMATH_NUMERIC MATH_NUMERIC, FAR *LPMATH_NUMERIC;
```

The following table describes the various elements:

MATH_NUMERIC Element	Description
String	The digits without separators.

Sign	A minus sign indicates the number is negative; otherwise the value is 0x00.
EditCode	The data dictionary edit code that formats the number for display.
nDecimalPosition	The number of digits from the right to place the decimal.
nLength	The number of digits in the string.
wFlags	Processing flags.
szCurrency	The currency code.
nCurrencyDecimals	The number of currency decimals.
nPrecision	The data dictionary size.

JDEDATE Data Type

The JDEDATE data type exclusively represents all dates in J.D. Edwards software. The values of all date fields on a form or batch process are communicated to business functions in the form of pointers to JDEDATE data structures. JDEDATE is used as a data dictionary data type.

The data type is defined as follows:

```
struct tagJDEDATE
{
   short nYear;;
   short nMonth;;
   short nDay;
};


typedef struct tagJDEDATE JDEDATE, FAR *LPJDEDATE;
```

The following table describes the elements in the JDEDATE data type:

JDEDATE Element	Description
nYear	The year (four digits)
nMonth	The month
nDay	The day

Using Database APIs

J.D. Edwards software supports multiple databases. An application can access data from a number of databases. APIs offer the following advantages:

- They provide a standard interface to multiple database management systems.

- They require minimal knowledge of SQL to perform complex database operations.
- They include add, modify, delete, and query operations on database systems.
- They manage memory areas for passing data to and from a database.
- They create and execute SQL statements at runtime.
- They are more flexible than embedded SQL.
- They provide an improved method for developing applications in a client/server environment.
- They provide standard return codes from function calls.

Understanding Standards and Portability

The following standards affect the development of relational databases:

- ANSI (American National Standards Institute) standard
- X/OPEN (European body) standard
- ISO (International Standards Institute) SQL standard

Ideally, industry standards allow users to work identically with different relational database systems. Although each major vendor supports industry standards, it also offers extensions to enhance the functionality of the SQL language. Vendors also periodically release upgrades and new versions of their products.

These extensions and upgrades affect portability. Due to the industry impact of software development, applications need a standard interface to databases that is not affected by differences between database vendors. When a vendor provides a new release, the affect on existing applications should be minimal. To solve many of these portability issues, many organizations use standard database interfaces called open database connectivity (ODBC).

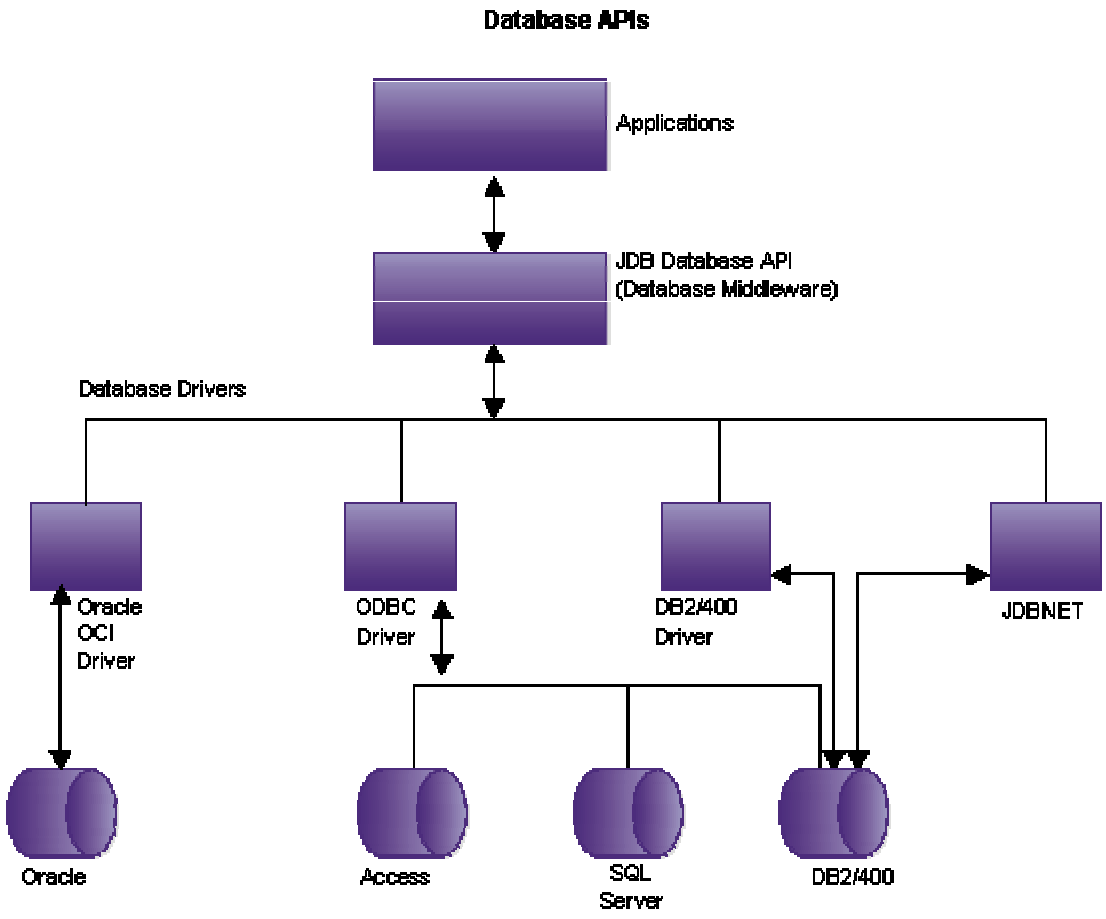
J.D. Edwards Open Database Connectivity (ODBC)

J.D. Edwards ODBC provides a single method to access multiple relational database management systems. ODBC allows you to use one set of functions to interface with different types of databases. You can develop and compile applications without knowing the type of database that each application uses. Database drivers are installed that allow the J.D. Edwards ODBC interface to communicate with a specific database system.

A driver is an application that processes the API request, communicates with the database, and returns the result to the API. The driver also handles the input/output (I/O) buffers to the database. This allows a programmer to write an application to communicate with a generic data source. The database driver is responsible for processing the API request and communicating with the proper data source. The application does not have to be recompiled to work with other databases. If the application needs to perform the same operation with another database, a new driver is loaded.

A driver manager handles all application requests to the J.D. Edwards database function call. The driver manager processes the request or passes it to an appropriate driver.

The following graphic illustrates how J.D. Edwards software uses database APIs:



J.D. Edwards applications access data from heterogeneous databases. J.D. Edwards uses the JDB API to interface between the applications and multiple databases. Applications and business functions use the JDB API to dynamically generate platform-specific SQL statements. JDB also supports additional features, such as replication and cross-data source joins.

Standard JDEBASE API Categories

The following table describes the categories of JDEBASE APIs. You can use control and request level APIs to develop and test business functions.

Category	Description
Control Level	Provides functions for initializing and terminating the database connection.
Request Level	Provides functions for performing database transactions. The request level functions perform the following tasks: • Connect to and disconnect from tables and business views in the database • Perform data manipulation operations of select, insert, update, and delete • Retrieve data with fetch commands

Column Level	Performs and modifies information for columns and tables.
Global Table/Column Specifications	Provides the capability to create and manipulate column specifications.

Connecting to a Database

To perform a request, the driver manager and driver must manage the information for the development environment, each application connection, and the SQL statement. The pointers that return this information to the application are called handles. The APIs must include these handles in each function call. Handles used by the development environment include the following:

Handle	Purpose
HENV	The environment handle contains information related to the current database connection and valid connection handles. Every application connecting to the database must have an environment handle. This handle is required to connect to a data source.
HUSER	The user handle contains information related to a specific connection. Each user handle has an associated environment handle with it. A connection handle is required to connect to a data source. If you are using transaction processing, initializing HUSER indicates the beginning of a transaction.
HREQUEST	The request handle contains information related to a specific request to a data source. An application must have a request handle before executing SQL statements. Each request handle is associated with a user handle.

Understanding Database Communication Steps

You can use several APIs to perform the following steps for database communication:

- Initialize communication with the database.
- Establish a connection to the specific data to access.
- Execute statements on the database.
- Release the connection to the database.
- Terminate communication with the database.

The following table describes some of the API levels, and the communication handles and API names that are associated with them.

API Level	Communication Handles	API Name
Control level (application or test driver)	Environment handle	JDB_InitEnv
Control level (application or test driver)	User handle (created)	JDB_InitUser
Request level (business function)	User handle (retrieved)	JDB_InitBhvr
Request level (business function)	Request handle	JDB_OpenTable

	Request handle	JDB_FetchKeyed()
	Request handle	JDB_CloseTable
	User handle	JDB_FreeBhvr
Control level (application or test driver)	User handle	JDB_FreeUser
Control level (application or test driver)	Environment handle	JDB_FreeEnv

Calling an API from an External Business Function

You can call APIs from external business functions. To call an API from an external business function, you must first determine the function-calling convention of the .dll that you are going to use. It can be either cdecl or stdcall. The code might change slightly depending on the calling convention. This information should be included in the documentation for the .dll. If you do not know the calling convention of the .dll, you can execute the *dumpbin* command to determine the calling convention. Execute the following command from the MSDOS prompt window:

```
dumpbin /EXPORTS ExternalDll.DLL.
```

Dumpbin displays information about the dll. If the output contains function names preceded by _ and followed by an @ sign with additional digits, the dll uses the stdcall calling convention; otherwise, it uses cdecl.

Stdcall Calling Convention

The following code example is standard code for Windows programs. It is not specific to J.D. Edwards software.

```
# ifdef JDENV_PC

HINSTANCE hLibrary = LoadLibrary(_TEXT("YOUR_LIBRARY.DLL")); //
substitute the name of the external dll

if(hLibrary)

{

// create a typedef for the function pointer based on the parameters
and return type of the function to be called. This information can
be obtained

// from the header file of the external dll. The name of the
function to be called in the following code is "StartInstallEngine".
We create a typedef for

// a function pointer named PFNSTARTINSTALLENGINE. Its return type
is BOOL. Its parameters are HUSER, LPCTSTR, LPCTSTR, LPTSTR &
LPTSTR.

// Substitute these with parameter and return types for your
particular API.

typedef BOOL (*PFNSTARTINSTALLENGINE) (HUSER, LPCTSTR, LPCTSTR,
LPTSTR, LPTSTR);
```

```
// Now create a variable for your function pointer of the type you
just created. Then make call to GetProcAddress function with the
first
// parameter as the handle to the library you just loaded. The
second parameter should be the name of the function you want to call
prepended

// with an "_", and appended with an "@" followed by the total
number of bytes for your parameters. In this example, the total
number of bytes in the

// parameters for "StartInstallEngine is 20 ( 4 bytes for each
parameter ). The "GetProcAddress" API will return a pointer to the
function that you need to

// call.

PFNSTARTINSTALLENGINE lpfnStartInstallEngine =
(PFNSTARTINSTALLENGINE) GetProcAddress(hLibrary,
"_StartInstallEngine@20");

if ( lpfnStartInstallEngine )

{

// Now call the API by passing in the requisite parameters.

lpfnStartInstallEngine(hUser, szObjectName, szVersionName,
pszObjectText, szObjectType);

}

#endif
```

Cded Calling Convention

The process for using the cded calling convention is similar to the process for using the std calling convention. The main difference is the second parameter for GetProcAddress. Note the comments that precede that call.

```
# ifdef JDENV_PC

HINSTANCE hLibrary = LoadLibrary(_TEXT("YOUR_LIBRARY.DLL")); //
substitute the name of the external dll

if(hLibrary)

{

// create a typedef for the function pointer based on the parameters
and return type of the function to be called. This information can
be obtained

// from the header file of the external dll. The name of the
function to be called in the following code is "StartInstallEngine".
We create a typedef for

// a function pointer named PFNSTARTINSTALLENGINE. Its return type
is BOOL. Its parameters are HUSER, LPCTSTR, LPCTSTR, LPTSTR &
LPTSTR.

// Substitute these with parameter and return types for your
particular API.
```

```
typedef BOOL (*PFNSTARTINSTALLENGINE) (HUSER, LPCTSTR, LPCTSTR,
LPTSTR, LPTSTR);
// Now create a variable for your function pointer of the type you
just created. Then make call to GetProcAddress function with the
first

// parameter as the handle to the library you just loaded. The
second parameter should be the name of the function you want to
call. In this

// case it will be "StartInstallEngine" only. The "GetProcAddress"
API will return a pointer to the function that you need to call.

PFNSTARTINSTALLENGINE lpfnStartInstallEngine =
(PFNSTARTINSTALLENGINE) GetProcAddress(hLibrary,
"StartInstallEngine");

if ( lpfnStartInstallEngine )

{

// Now call the API by passing in the requisite parameters.

lpfnStartInstallEngine(hUser, szObjectName, szVersionName,
pszObjectText, szObjectType);

}

#endif
```

Note

These calls work only on a Windows *client* machine. LoadLibrary & GetProcAddress are Windows APIs. If the business function is compiled on a *server*, the compile will fail.

Calling a Visual Basic Program from J.D. Edwards software

You can call a Visual Basic program from a J.D. Edwards business function and pass a parameter from the Visual Basic program to the J.D. Edwards business function using the following process:

- Write the Visual Basic program into a Visual Basic .dll that exports the function name of the program and returns a parameter to the J.D. Edwards business function.
- Next, write a business function that loads the Visual Basic .dll using the win32 function LoadLibrary.
- In the business function that you create, call the win32 function GetProcAddress to get the Visual Basic function and call it.

Working with Business Functions

Every business function must follow a defined structure and form. Every line of code must conform to the J.D. Edwards business function programming standards. Following these standards will allow you to take advantage of J.D. Edwards proven software engineering approach for developing applications. Create your business functions as follows:

- Use Object Management Workbench to build business function data structures.
- Use Object Management Workbench to create business function source and header files.
- Create and add type definitions for data structures to the header file.

See Also

- *Creating a Business Function Data Structure* in the *Development Tools Guide* for more information about creating data structures for business functions

Accessing Business Function Design

The following task describes how to access Business Function Design.

► To access Business Function Design

On Object Management Workbench, check out the business function with which you want to work.

1. Ensure that the business function is selected, and then click the Design button in the center column.
2. On Business Function Design, click the Design Tools tab, and then click Start Business Function Design Aid.

Viewing Object Codes

You use object codes to group business functions into categories. You can then use these codes as filtering criteria for searches.

► To view object codes

1. On Business Function Design, from the Row menu, choose Codes.
2. Review the following fields:
   - Source Module
   - Function Name
   - Description
   - Business Function Category
   - Function Use

Adding Related Tables and Functions

You can attach tables and functions to a business function. You must add related tables and functions to the business function object to generate the code for the source and header files.

▶ To add related tables

1. On Business Function Design, from the Form menu, choose Tables.
2. On Related Tables, enter the names of related tables.
3. Click OK.

▶ To add related functions

1. On Business Function Design, choose Functions from the Form menu.
2. On Related Business Functions, enter the names of related business function source objects.
3. Click OK.

The associated record is stored in the Object Librarian - Object Relationships table (F9863).

Debugging Business Functions

Because the source code for business function event rules is generated into C, you use the same procedures for debugging both C and NER business functions.

See Also

- *Debugging* in the *Development Tools Guide* for information about debugging business functions

Changing a Business Function Parent DLL or Location

You might need to change the parent DLL for a business function.

▶ To change a business function parent DLL

1. On Business Function Design, type the new DLL name in Parent DLL, or change the business function location, and then click OK.
2. On Object Management Workbench - [Business Function Design], click OK.
3. On Object Management Workbench, check in the business function.

   You should transfer this business function to all path codes as soon as possible.

Your change becomes available to everyone in the next package.

Creating and Specifying Custom DLLs

Business function DLLs are consolidated. Therefore, you need to build each of your custom business functions into a custom DLL that you create. This process ensures that your custom business functions remain separate from J.D. Edwards business functions. The build program reviews the Object Librarian Master Table (F9860) to verify that your custom DLL exists.

Creating a Custom DLL

Before you can build a custom business function into a custom DLL, that custom DLL must exist in the Object Librarian Master Table (F9860). Therefore, you must create a custom DLL.

▶ To create a custom DLL

1. On Object Management Workbench, click Add.
2. On Add J.D. Edwards Object to the Project, choose the Business Function Library option, and then click OK.
3. On Add Object, complete the following fields and click OK.
   - Object Name
   - Description
   - Product Code
   - Product System Code
   - Object Use

Specifying a Custom DLL for a Custom Business Function

When you create a custom business function, you need to specify one of your custom DLLs; otherwise, the build process builds the custom business function into the J.D. Edwards CCUSTOM.DLL, which is the default.

▶ To specify a custom DLL for a custom business function

After you create a custom DLL, you must specify that custom DLL.

1. Enter the custom DLL name in the Parent DLL field, and click OK.

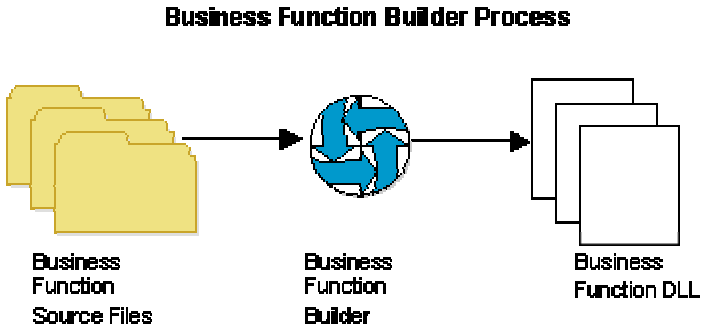
   Note
   You can also change the business function location if necessary.

2. Run the build for the business function.

Working with Business Function Builder

You use Business Function Builder to build business function code into a dynamic link library (DLL). You can build C business functions, Named Event Rules, and table event rules. The process that occurs when you run Business Function Builder to build business functions includes compiling and linking. Compiling involves creating a business function object. Linking makes the object part of a DLL.

The following graphic illustrates the process for building a business function:



Understanding the Business Function Builder Form

The Business Function Builder form consists of three main components, as described below:

- Functions List
- Available Business Functions
- Build Output

In addition to these components, a status window also appears at the bottom of the form. The status window displays the status of builds as they are in progress. You can click the Stop button in the status bar to discontinue a build.

The combo box in the Toolbar should be set to the Optimize mode. If you are debugging, the box should be set to Debug mode.

Functions List

The Functions list displays the consolidated DLLs for J.D. Edwards, including the custom-defined dlls. It lists the functions that you select to link or compile during a build. Any functions that you drag to the Function list builds when you build your Functions list.

Available Business Functions

Available Business Functions displays the functions that you can build. Each Business Function DLL (for example, CCUSTOM or COBLIB) has its own set of available business functions.

Build Output

Build Output displays build results. As your business functions compile and link, Business Function Builder updates Build Output so that you can see the build in progress. This information is useful if you need to diagnose any problems that occur during a build. When the build is complete, Business Function Builder indicates whether the build was successful. Use the scroll bars at any time to view the contents of the form. You can also cut and paste text, or print any text that appears in the form.

Building a Single Business Function

You usually use Business Function Builder to build a single business function. Whenever you create source code changes to a business function, you must build the business function to test it.

▶ To build a single business function

1. On Object Management Workbench, choose the business function that you want to build, and then click the Design button in the center column.
2. On Business Function Design, click the Design Tools tab, and then click Busbuild Standalone.

   The BusBuild form appears and Business Function Builder begins building your business function.

Build Output displays the results of the build. When the build is finished, the message `***Build Finished***` appears at the bottom of Build Output. The text following this line indicates whether the build was successful. If the build was successful, you can test your business function. Otherwise, you must correct any problems and rerun the build process.

To stop the build, click the Stop button in the lower right corner of the form. The DLL reverts back to its original form.

Linking Business Function Objects

When you install on your computer one or more J.D. Edwards applications from Object Management Workbench, the system also installs business function objects and calls Business Function Builder to perform a Link All operation. This operation integrates these business function objects with your local business function DLLs. Linking preserves your local custom modifications instead of replacing the DLLs. The linking process is unnecessary if you do not have custom modifications on your machine.

Note

Link All does not compile any business functions; it only links each DLL.

Setting Build Options

You can use options on the Build menu to control how and when your consolidated business function is built. The following options are available:

Build Generates a makefile, compiles the selected business functions, and links the functions into the current consolidated DLL. Rebuilds only those components that are out-of-date.

Compile Generates a makefile and compiles the selected business functions. The application does *not* link the functions into the current consolidated DLL.

ANSI Check Reviews the selected business function for ANSI compatibility.

Link Generates a makefile for each consolidated DLL. It then builds each consolidated DLL. The application does *not* compile any of the selected business functions.

Link All Generates a makefile for each consolidated DLL. It then builds each consolidated DLL and links it to all business functions that are called. The application does *not* compile any of the selected business functions.

Rebuild Libraries Rebuilds the consolidated DLL and static libraries from the .obj files.

Build All Links and compiles all objects within each DLL.

Stop Build Stops the build from finishing. The existing consolidated DLL remains intact.

Suppress Output Limits the text that appears in Build Output.

Browse Info Generates browse information when compiling business functions. You can turn this option off to expedite the build.

Precompiled Header Creates a precompiled header when compiling a business function. When compiling multiple business functions, the Business Function Builder generally compiles faster if it uses a precompiled header.

Debug Info Generates debug information when compiling. The Visual C++ can debug any function that was built with debug information. You can turn this option off to expedite the build.

Full Bind Resolves all of the external runtime references for each J.D. Edwards consolidated DLL.

Using Utility Programs

The Tool menu contains several utility programs that assist in the build process. These programs include the following:

Synchronize JDEBLC You run the Synchronize JDEBLC program to reorganize J.D. Edwards business functions into new DLL groupings. This program synchronizes DLL field for the local JDEBLC parent specification table with the parent DLL in the Object Management Workbench Master Table (F9860). Use this program with caution. You typically use this program only if you have manually dragged business function DLLs from a recent

package build and you are experiencing failures in the business function load library.

Dumpbin

You run the Dumpbin program to verify whether a particular business function built successfully. This program displays all the business functions that were built into the selected consolidated DLL.

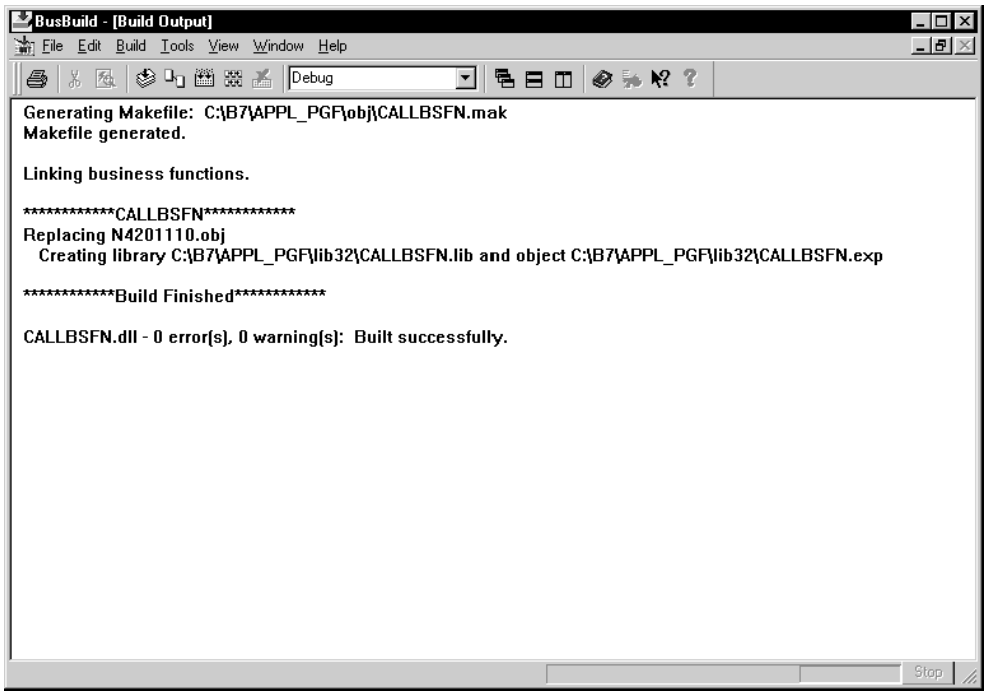
PDB (Program DeBug file) Scan

You receive a CVPACK fatal error when one of the object files that you are trying to link is incorrectly compiled with PDB information. To resolve this problem, you can use the PDB Scan to identify any object fields that were built with PDB information. Recompile any business functions that the PDB Scan reports.

Reading Build Output

Build Output consists of a series of sections that display important information about the status of a build. You can use this information to determine whether your build completed successfully and to troubleshoot problems if errors occurred during your build.

The following graphic is an example of the messages that the system might generate during a build:



Makefile Section

The makefile section indicates where Business Function Builder generated the makefile for a particular build. Business Function Builder generates one makefile for each DLL that it builds. A Generating Makefile statement should always appears for each DLL that you are building. If the makefile statement does not appear, then an error occurred. To resolve the error, you must do the following:

- Verify that the local object directory exists.
- Verify that the permissions for the local object directory and the makefile are correct.

Begin DLL Section

Begin DLL indicates that Business Function Builder is building a particular DLL. For example, assume that the section above this section begins with `*****CDIST*****`. A Begin DLL section appears for each DLL that you are building.

Compile Section

Before it build DLLs, Business Function Builder compiles the business functions in the DLLs first. The system displays a sequential list of each business function that the Business Function Builder attempts to compile. During the compilation process, the following events might occur:

- Compiler Warning

  When a compiler warning occurs, Business Function Builder displays `warning C`*XXXX* (where *XXXX* is a number) and a brief description of the warning. To review information about the warning, search for the `C`*XXXX* value in Visual C++ online help. Warnings usually do not prevent the business function from compiling successfully. However, you can turn on the Warnings As Errors option in the Global Build form so that the business function will not build if any warnings occur.

- Compiler Error

  When a compiler error occurs, Business Function Builder displays `error C`*XXXX* (where *XXXX* is a number) and a brief description of the error. To review extended information about the error, search for the `C`*XXXX* value in Visual C++ online help. Because errors prevent the business function from compiling successfully, you must resolve them.

Link Section

After Business Function Builder has compiled the business functions for a DLL, it links them. This linking process creates the .lib and .dll files for the DLL. During linking, the following actions might occur:

- Linker Warning

  When a linker warning occurs, Business Function Builder displays `warning LNK`*XXXX* (where *XXXX* is a number) and a brief description of the warning. To review information about the warning, search for the `LNK`*XXXX* value in the Visual C++ helps. Warnings usually do not prevent the business function from linking successfully. You can turn on the Warnings As Errors option in the Global Build form so that the DLL will not build if it has any warnings occur.

- Linker Error

  When a linker error occurs, Business Function Builder displays `error LNK`*XXXX* (where *XXXX* is a number) and a brief description of the error. To review extended information about the error, search for the `LNK`*XXXX* value in the Visual C++ helps. If a nonfatal error occurs, Business Function Builder still creates the DLL. However, Business Function Builder notes that the DLL was built with errors. If a fatal error occurs, Business Function Builder does not build the DLL.

Rebase Section

The Rebase Section displays information about rebasing. Rebase fine-tunes the performance of DLLs so that they load faster. Rebase does this by changing the desired load address for the DLL so that the system loader does not have to relocate the image. The system automatically reads the entire DLL and also updates fixes, debug information, checksum information, and time stamp values.

Summary Section

The Summary Section contains the most important information about the build. This section indicates whether the build is successful. The summary section begins with "*****Build Finished*****". Business Function Builder also displays a summary report for each DLL that you attempted to build. This report includes the following:

- The number of warnings
- The number of errors
- Whether the DLL build is successful

Building All Business Functions

You can use Build All to build all business functions. Build All performs the same operations as global link, and it also recompiles all of the objects within each DLL. A system administrator usually runs Build All. Build All processes can take a long time. To run Build All, you must access BusBuild from the J.D. Edwards Explorer menu.

► To build all business functions

1. On Object Management Workbench, choose the business function that you want to build, and then click the Design button in the center column.
2. On Business Function Design, click the Design Tools tab, and then click Busbuild Standalone.

   The BusBuild form appears.
3. On BusBuild, choose Build All from the Build menu.
4. Choose one of the following options for Build Mode:

Debug	A build that includes debug information. After you perform a build, you can debug the built business function using the Visual C debugger.
Optimize	A build that does not include debug information. Optimized builds generally cannot be debugged using the Visual C debugger.
Performance Build	A build that is the same as an optimized build, except that it includes information that helps J.D. Edwards developers measure the performance of business functions. Only J.D. Edwards developers should use this option.

5. Complete the Source Directory field.

   Use this field to specify where your business function source resides. Business function source includes all .c, .h, Named Event Rules, and table event rules. Full packages usually have all business function source.

Click the button to the right of this field to browse for a directory.

You can choose one of the following locations to store your business function source:

Local	All business function source is on the local machine.
Path Code	All business function source is in the path specified by the selected pathcode.
Package	All business function source is in the path specified by the selected package. If a package is built correctly, it typically contains all required business function source. J.D Edwards recommends that you use Package for your location.
Pick Directory	All business function source is stored in another directory on your file server. You specify the directory.

For example, assume that you have a package called PROD_A that physically resides on the file server location \\SERVER\SHARE1\PROD_A. Assume that PROD_A contains the following subdirectories:

Source	Contains all business function .c
Include	Contains all business function .h
Spec	Contains all spec files

For this configuration on the server for PROD_A, click the button, then Package, then PROD_A from the detail area. When Business Function Builder runs, it uses the business function source from this directory.

6. Complete the Foundation Directory field.

   Use this field to specify the foundation to use for this build. The foundation that you choose is the foundation on which you expect these business functions to run.

   Click the button to the right of this field to browse for a location.

   You can specify your foundation from one of the following locations:

Local	The recommended foundation is the local J.D. Edwards foundation.
Foundation	The foundation table lists all registered J.D. Edwards foundations. Choose a foundation from this table.
Pick Directory	The J.D. Edwards foundation exists in a directory on your file server. You specify the directory. J.D. Edwards recommends this location.

   For example, assume that you have a newly built foundation on the server at location `\\SERVER\SHARE1\System\New\Optimize`. This directory contains the following subdirectories:

Lib32	Contains all foundation .lib
Include	Contains all foundation .h
Includev	Contains all vendor .h

7. Complete the Output Destination Directory field.

   Use this field to specify the location for the output of the build. The build output includes the following file types: DLL, .LIB, .OBJ, .LOG.

   Click the button to the right of this field to browse for a location.

   You can select one of the following locations for your output destination directory:

Local	All business function output is stored on the local machine.
Path Code	All business function output is stored in the path specified by the selected pathcode. The pathcode contains the latest business function changes that have been checked in.
Package	All business function output is stored in the selected package. Package is a more stable snapshot of business function source. J.D. Edwards recommends Package for the location of your output destination directory.
Pick Directory	All business function output is stored in a directory on your file server. You specify the directory.

   For example, assume that you have a package called PROD_A that is located on the file server at `\\SERVER\SHARE1\PROD_A`. When the build finishes, you want Business Function Builder to place the build output in the following subdirectories that are subordinate to PROD_A:

Bin32	Contains built .dll files
Lib32	Contains build .lib files
Obj	Contains built .obj files
Work	Contains built .log files

   With the configuration above on the server for PROD_A, click the button, then Package, and then choose PROD_A from the detail area. When Business Function Builder runs, it places the build output files in these subdirectories for PROD_A.

8. Click any of the following options:

Treat Warnings As Errors	If you enable this option, Business Function Builder does not build a business function if it encounters any warnings.
Clear Output Destination Before Build	If you enable this option, Business Function Builder deletes the contents of the bin32, lib32 and obj output directories before it builds all business functions.
Select Which DLLs to Build	If you do not enable this option, Business Function Builder builds all DLLs. If you enable this option, you can click the Select button to choose which business function DLLs you want to build. Use this option if you want to build one or two DLLs. If you build only a subset of all DLLs, then verify that the Clear Output Destination Before Build option is disabled.
Stop Level	You can select the error level at which the build stops. You can ignore errors if you want to continue building despite them. You can specify that the build process stop if a DLL contains errors. You can stop on the first compile error.
Generate "Missing Source" Report	If you enable this option, Business Function Builder generates a report in the work directory of the destination. This report is called NoSource.txt. It contains business function source file names that do not have a .c file but do have a record in the Object Librarian Master Table (F9860). To resolve the information in this report, you can produce the correct .c file for the business function, or you can delete the source file from the F9860 table. J.D. Edwards recommends that you enable this option.
Generate ER Source	If you enable this option, Business Function Builder generates Named Event Rule and table event rule source prior to building business functions.
Verify Check-in	If you enable this option, The system builds only objects checked in to a specified pathcode. A log file, Notchkdn.txt is written to the same directory as Nosource.txt. Objects that are not checked in to the pathcode will be listed in this log and in Buildlog.txt.

You can enable the From RDB option so that you can generate work from any path code. If this option is disabled, the business function builder assumes that the event rules source can be generated from the source directory specification files.

If you are troubleshooting a build initiated by Package Build, then the settings above should already be set to the correct values. In this case, you simply click Build to rebuild the problem DLLs.

Note

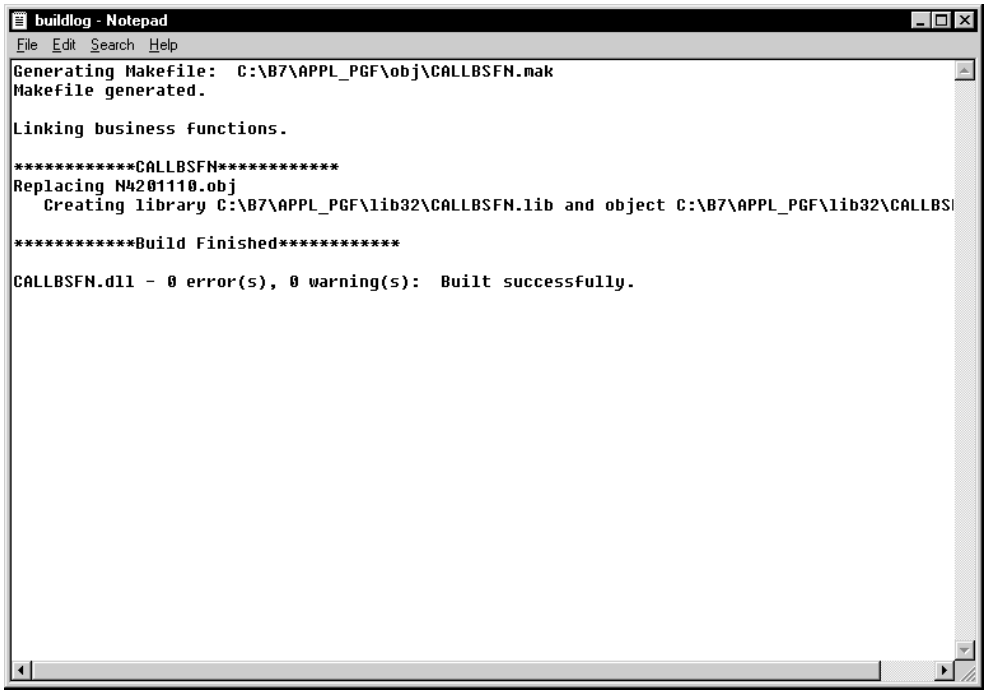
You can also run this build by turning the Build BSFN option on in a package build.

Reviewing Error Output

The system creates a work directory when any object is built. This directory is in the destination directory that you specified, such as C:\b7\appl_pgf\work\buildlog.txt.

This directory contains error and information logs. The Buildlog contains the same information as the Build Output form in Business Function Builder.

The following example is a sample log:



Resolving Errors

You can use Business Function Builder tools to help you resolve errors. If you notice any unresolved external errors during a business function build, your consolidated DLL still builds, and the software should run normally. However, it cannot execute any unresolved business function.

Use the dumpbin tool to verify that a particular business function is present in a consolidated DLL. If a business function is present, its name appears in the dumpbin output, followed by a nonzero number in parentheses.

Use the PDB scan to resolve the CVPACK fatal error. The CVPACK error occurs when the Business Function Builder attempts to link an object file that was built with PDB (Program DeBug file) information. The PDB scan finds the problem object file. You must then recompile the problem object file on your machine with the Business Function Builder.

If a business function is compiled using Visual C++, it will not work properly. You can use PDB scan to identify any business functions that have been built outside of Business Function Builder. Use Business Function Builder to rebuild these functions so that they work properly.

If one of the DLLs is out of synch, you must rebuild it using the Build option. This generates a makefile and then relinks all the business functions within it.

The Synchronize JDEBLC option from the Business Function Builder Tools menu corrects any misplaced or incorrectly-built business functions. This option reviews the server DLLs and determines whether the local workstation specifications match those of the server. If they

do not, then Business Function Builder will rebuild the business functions in the correct DLL on the server and relink them.

The Build Log contains the following sections:

Build Header This section shows the configuration for a specific build, including the source path, foundation path, and destination path.

Build Messages This section displays the compile and link activity. During a compile, a line is output for each business function that was compiled Any compile errors are reported as *error cxxxx*. During the link part, business function builder outputs the text `Creating library ....` This text might be followed by linker warnings or errors.

Build Summary The last section of the build summarizes the build for each DLL. This summary is in the form `x error(s), x warnings (y)`. The summary indicates the status of the build. If you have no warnings and no errors, then the build was successful. If the summary reports an error, search the log for the word *error* to determine the source of the error. Typical build errors are syntax errors and missing files.

Transaction Master Business Functions

Transaction master business functions provide a common set of functions that contain all of the necessary default values and editing for a transaction table in which records depend on each other. Transaction master business functions contain logic that ensures the integrity of the transaction being inserted, updated, or deleted from the database. Event flow breaks up logic. You use cache APIs to store records that are being processed. You should consider using a transaction master business function in the following situations:

- You accept transaction file records from a non-J.D. Edwards source.
- Multiple applications update the same transaction file.

The following transaction tables are examples of candidates for transaction master business functions:

- The Account Ledger table (F0911) accepts updates across application suites, as well as external sources.
- The Employee Transaction Detail File table (F06116) accepts updates from batch, interactive, and external sources.

Master Business Function Naming Convention

The Master Business Function source is named B*xxxxxxxx* (the same as any other business function), unless the object already exists on the AS/400 as a functional server. In this case, the *XTXXXXZ1* naming convention is used. Within this source are external business functions for each of the modules.

The data structure name for each module is D*xxxxxxxx*A, B, C and so on. (Examples include B0400047 - D0400047A [Begin Document], D0400047B [Edit Line], D0400047C [Edit Document], D0400047D [End Document].)

The format for naming individual business functions is *file-name module-name*. Document is shortened to Doc. (An example of a business function name is F0411BeginDoc.)

The functional use code of 192 designates business functions as master business functions.

A cache tracks transaction records. It has the naming convention F*xx*UI*yyy*, where:

xx is the system code

yyy is a unique number

Creating Processing Options for a Master Business Function

A Master Business Function (MBF) can be called from several different applications. Rather than duplicating the processing options for the MBF on each application, you typically create a separate processing option template for these processing options.

► To create processing options for a Master Business Function

1. Create a processing option template.

   The format for the name of the processing option template is T*xxxxxxxx* (replace the B or XT in the MBF name with a T).

2. Create an artificial application for attaching the MBF processing options.

   You can then set up different versions of the MBF processing options through the versions list. The naming convention for this artificial application is P*xxxxxxxx* (replace the B or XT in the MBF name with a P). To generate, this application needs only one form with no fields selected.

You can use interactive versions to set up different versions of the master business function processing options. Various calling programs then pass the version name to the version parameter of BeginDoc.

From within BeginDoc, the business function AllocatePOVersionData can be called to retrieve the processing options by version name. The processing options needed by other modules can be written to the header cache and accessed later, rather than calling AllocatePOVersionData multiple times.

Naming Transaction Master Business Function Modules

Function names follow the standard naming convention F*xxxxx*. If a table has multiple master business functions, include the program name in the function name.

F*xxxxx*Program Name Module

For example:

- F3112SuperBackFlushBegDoc
- F3112WorkOrderRoutingsBegDoc

Components of a Transaction Master Business Function

You typically use the following basic components for a master business function:

Begin Document	Called when all header information has been entered • Creates initial header if it has not already been created • Can also include defaulting, editing, and processing options
Edit Line	Called when all line information has been entered • Creates cache for detail information if it has not already been created
Edit Document	Called when ready to commit the transaction • Processes any remaining document edits and verifies that all records are valid to commit
End Document	Called when you need to commit the transaction • Processes all records in the header and detail cache, performs I/O, and deletes caches
Clear Cache	Called when you are ready to delete all cache records • Deletes header and detail cache records

Begin Document

Function Name

F*xxxxx*BeginDocument

What Does It Do?

The Begin Document component does the following:

- Inserts default information and edits information in the header, including data dictionary defaults and UDC editing.
- Fetches information from the database, if necessary, to ensure that the selected document action can take place.
- Validates and processes information that is common to all records.
- Writes the record to header cache if no errors exist.
- Contains all header cache information that is common to all detail records. This improves performance by eliminating the need to use all the detail records to perform the same validations and table I/O.
- Updates the header cache with the new information when information in the header fields changes and Begin Document has previously been called.

Special Logic or Processing Required

On the initial call, the function assigns the job number. To retrieve the job number, this function calls X0010GetNextNumber with a system code of 00 and an index number of 04. If Begin Document is called again, it passes the job number that was previously assigned; therefore, it does not need to assign another job number.

Hook-Up Tips

- You must call a function at least once before calling Edit Line.
- If errors occur during validation of the header field when the function is called, call the function again to verify that errors have been cleared before calling Edit Line.

- If this function might be called multiple times from different events, include it on a hidden button on an application to reduce duplicate code and ensure consistency. This button might then be called from focus on grid because the user is then adding or deleting detail records, and is finished adding header information. In case of a Copy in which the user does not use the grid, this button might also be called on OK button.
- Calling a button from an asynchronous event breaks the asynchronous flow and forces the button to be processed in synchronous mode (inline).

Common Parameters

Name	Alias	I/O	Description
Job Number	JOBS	I/O	Pass Job Number created in BeginDocument, if previously called; otherwise, pass zeros and assign a job number.
Document Action	ACTN	I	A or 1 = Add C or 2 = Change D = Delete This is the action of the entire Document, not the individual detail lines. For example, you might modify a few detail lines in Edit Line, add a few detail lines in Edit Line, and delete a few detail lines in Edit Line, but the *Document Action* in Begin Document would be Change.
Process Edits	EV01	I	*Optional* 0 = No Edits Any Other = Full Edits **Note** The GUI interface usually uses the partial edit, and the batch interface uses the full edit. If you leave this parameter blank, the default option is full edits.
ErrorConditions	EV02	O	Blank = No Errors 1 = Warning 2 = Error
Version	VERS	I	This field is required if this MBF is using versions.
Header Field One	****	I/O	Pass in all the header fields that are common to the entire document. Begin Document processes all of these fields and validates them, data dictionary edits, UDC editing, default values, and so on. Begin document might also fetch to the table to validate that records matching these header fields exist for Delete and Change, or do not exist for Add.
Header Field Two	****	I/O	
. . .	****	I/O	

Header Field XX	****	I/O	
Work Field / Processing Flag One	****	I	List any work fields that the program needs. These could be flags for processing, dates to validate, and so on. These fields might or might not be used. For example, currency control might be saved in the header cache so that all detail records would either use currency or not.
Work Field / Processing Flag One	****	I	
. . .		I	
Work Field / Processing Flag One		I	

Application-Specific Parameters

- List the fields that are needed to process header level information.
- List any work fields that are needed to perform edits.
- List all processing options that are needed to process header level information.

Edit Line

Function Name

F*xxxxx*EditLine

What Does It Do?

The Edit Line component does the following:

- Validates all user input, performs calculations, and retrieves default information. Edit Line is normally called for every record that is fetched. It performs the edits for that *one* record in the file.
- Reads header cache records for default values.
- On an ADD, enters default information in blank columns, such as address book information. The default values might come from any of the following:
  - Another column in the line
  - A process performed on a column sent in the line
  - A processing option
  - A saved value from the header record that was determined in the Begin Document module
  - A data dictionary default value
- Edits columns for correct information. This includes interdependent editing between columns. Also performs UDC and data dictionary edits.

- Writes record to the detail cache if no errors occurred. If the record already exists in the work file, the line in the work file will be retrieved and updated with the changes. If a record is deleted from the grid in direct mode, and the record does not exist in the database, the record will be removed from the detail cache. If the record exists in the database, the action code for the record will be changed to delete, and the record will be stored in the detail cache until file processing in End Doc.

Special Logic or Processing Required

The following special processing occurs:

- Depending on the type of document being processed, different editing and inserting of default values takes place. An example would be vouchers and invoices processed through the journal entry MBF. The tax calculator is only called for vouchers.
- Depending on the event processing required, the process edit flag determines the editing that occurs. For example, in an interactive program, when the *Grid Record is Fetched* event runs, Partial Edits might be performed to retrieve descriptions, default values, and so on. When the *Row is Exited and Changed* event runs, Full Edits might be performed to validate all user input.

Typical Uses and Hookup

Interactive	Grid Record is Fetched Row is Exited and Changed (Asynch)
Batch	Do section of the group, columnar, or tabular section.

Common Parameters

Name	Alias	I/O	Description
Job Number	JOBS	I	Used as key or to create a unique name for the cache or work file. Retrieved from Begin Document.
Line Number	LNID	I/O	The unique number identifying the transaction line. Can also be used as the line number in the Detail Cache.
Line Action	ACTN	I	A or 1 = Add C or 2 = Change D or 3 = Delete
Process Edits (optional)	EV01	I	0 = No Edits 1 = Full Edits 2 = Partial Edits **Note** GUI interface typically uses the partial edit, and the batch interface typically uses the full edit. If you leave this parameter blank, the default edit is Full.
Error Conditions	ERRC	O	0 = No Errors

			1 = Warning 2 = Error
Update Or Write to Work File	EV02	I	1 = Write or update records to the work file, or do both.
Record Written to Work File	EV03	I/O	1 = A record is written to the work file. This reduces I/O calls to the work file. Blank = No record is written to the work file.
Detail Field One	****	I/O	Pass in all the Detail fields that will be edited. Typically, these are the grid record fields. Edit Line provides validation, data dictionary edits, UDC editing, defaults, and so on.
Detail Field Two	****	I/O	
Detail Field XX	****	I/O	
Work Field / Processing Flag One	****	I	List any work fields that the program needs. These fields could be flags for processing, dates to validate, and so on.
Work Field / Processing Flag One	****	I	
Work Field / Processing Flag One	****	I	

Edit Document

What Does It Do?

The Edit Document component does the following:

- Reads cache records if multiple line editing is required
- Reads header cache record if header information is needed
- Performs cross-dependency edits involving multiple lines in a document. For example, Edit Document processes all records to ensure that percentages total 100 percent, and it ensures that the last record does not contain certain information.

Special Logic or Processing Required

Depending on the type of document that you are processing, different logic is executed. For example, vouchers and invoices are processed through the journal entry edit object, although the balancing is different for these document types.

Hook Up Tips

- Call the function at least once after calling Edit Line and before End Document.
- If errors occur during validation, call the function again to verify that errors have been cleared before calling End Document.
- Call this function on the OK *button clicked* event so that, if errors do occur, they are corrected before the user exits the application.

Common Parameters

Name	Alias	I/O	Description
Job Number	JOBS	I	Retrieved from Begin Document
ErrorConditions	EV01	O	Blank = No Errors 1 = Warning 2 = Error

Application-Specific Parameters

Because all records have been added in Begin Document or Edit Line, and because any information needed to process the entire document is in cache, few parameters are needed in this function.

End Document

Function Name

F*xxxxx*EndDocument

What Does It Do?

The End Document component does the following:

- Assigns a next number to the document. For vouchers, you should do this before calling journal entry edit object, but not before the voucher has been balanced and is ready to be added to the database. By placing this module on the *before add/delete/update* event, the document passes all edits before running this event.
- Reads cache records.
- On an ADD, writes new rows to the table.
- On a CHG, retrieves and updates existing rows.
- On a DEL, deletes rows from the table.
- Adds information and updates associated tables. For example, it adds and updates the following:
    - Manual checks associated with vouchers
    - Address Book vouchered YTD columns in Address Book
    - Address, phones, and who's who information for Address Book
    - Batch header
- Clears the cache for that document and any work fields after all updates are completed successfully.
- Summarizes documents, if designated in a processing option, as it writes to the database. Reads work file through an alternate means and writes the records at a control break.
- Performs currency conversion.

Special Logic or Processing Required

No special logic or processing is required.

Hook-Up Tips

This function is typically called on OK button *Post Button Clicked,* and it is hooked up Asynch. In the C code, after the insert or update to the database is successful, call Clear Cache to clear the cache.

Common Parameters

Name	Alias	I/O	Description
Job Number	JOBS	I	Retrieved from Begin Document
Computer ID	CTID	I	Retrieved from GetAuditInfo(B9800100) in application (optional)
Error Conditions	EV01	O	Blank = No errors 1 = Warning 2 = Error
Program ID	PID	I	Usually hard-coded

Application-Specific Parameters

- List the fields that are needed to process update or writes, such as Time and Date Stamp fields.
- List any work fields that are needed to perform updates or writes.
- List all processing options that are needed to process updates or writes.

Clear Cache

Function Name

F*xxxxx*ClearCache

What Does It Do?

The Clear Cache component removes the records from the header and detail cache

Special Logic or Processing Required

If a unique cache name is selected as the naming convention for the cache (D*xxxxxxxx* [*Job Number*]), then use the cache API jdeCacheTerminateAll to destroy the cache.

Common Parameters

Name	Alias	I/O	Description
Job Number	JOBS	I	Indicates the job number of the transaction that you want to clear. This job number should have been returned from BeginDoc.
Clear Header	EV01	I	Indicates whether the header cache should be cleared. 1 = clear cache
Clear Detail	EV02	I	Indicates whether the detail cache should be cleared 1 = clear cache
Line Number	LNID	I	Indicates where to begin clearing records in the detail cache. If this line is blank,

From (Optional)			the system begins clearing from the first record.
Line Number Thru (Optional)	NLIN	I	Indicates where to stop clearing records in the detail cache. If this line is blank, the system deletes to the end of the cache.

Cancel Document

Function Name

F*xxxxxx*CancelDoc

What Does It Do?

The optional Cancel Document component is used primarily with the Cancel button to close files, clear the cache, and so on. Cancel Document is an application-specific function that provides basic function cleanup.

Special Logic or Processing Required

This function is application-specific.

Common Parameters

Name	Alias	I/O	Description
Job Number	JOBS	I	The job number of the transaction that you want to clear. This number should have been returned from BeginDoc.

Cache Structure

The cache structure stores all lines of the transaction. Transaction lines are written to the cache after they have been edited. The EndDoc module then reads the cache to update the database. The cache structure layout is as follows:

Header

Field Description	Field	Key	Type	Size
Job Number	JOBS	X	Num	
Document Action	ACTN		Char	1
Processing Options				
Currency Flag	CYCR		Char	1
Business View Fields				
Work Fields				

Job Number A unique system-assigned number assigned when the BeginDoc module starts the job. This distinguishes transactions in the cache for each job on the workstation that is using the cache. Use next number 00/4 for the job number. If you are using a unique cache name (D*xxxxxxxxx [job number]*), you do not necessarily need the job number field stored in the cache for a key because you would only be working with one transaction per cache. You can, therefore, use any field as the key to the cache.

Document Action The action for the document. Valid values are:

A or 1 = Add

C or 2 = Change

D = Delete

Processing Options Processing option values were read in using AllocatePOVersionData, and are needed in other modules of the MBF.

Currency Flag A system value that indicates whether currency is on and what method of currency conversion is used (N, Y, or Z).

Business View Fields The fields required for processing the transaction and writing it to the database. All fields in the record format that are not saved in the header cache will be initialized when the record is added to the database using the APIs.

Work Fields Fields that are not part of the business view, but are needed for editing and updating the transaction.

For example, Last Line Number is the last line number written to the detail cache. It will be stored at the header level, and retrieved and incremented by the MBF. The incremented line number will be passed to the header cache and stored for the next transaction.

Detail

Field Description	Field	Key	Type	Size
Job Number	JOBS	X	Char	8
Line Number	(Application-specific)	X	Num	
Line Action	ACTN		Char	1
Business View Fields				
Work Fields				

Job Number

A unique number assigned when the BeginDoc module starts the job. This distinguishes transactions in the cache for each job on the client that is using the cache. If you are using a unique cache name (D*xxxxxxxxx[job number]*), you do not necessarily need to store the job number field in the cache for a key because you work with only one transaction per cache. You can, therefore, use line number only as the key to the cache.

Line Number

The number used to uniquely identify lines in the detail cache. This line number can also eventually be assigned to the transaction when it is written to the database. The transaction lines are written to the detail cache only if they are error-free.

Line Action

The action for the transaction line. Valid values are:

A or 1 = Add

C or 2 = Change

D = Delete

Business View Fields

Fields required for processing the transaction that will be written to the database. All fields in the record format that are not saved in the detail cache will be initialized when the record is added to database using the APIs.

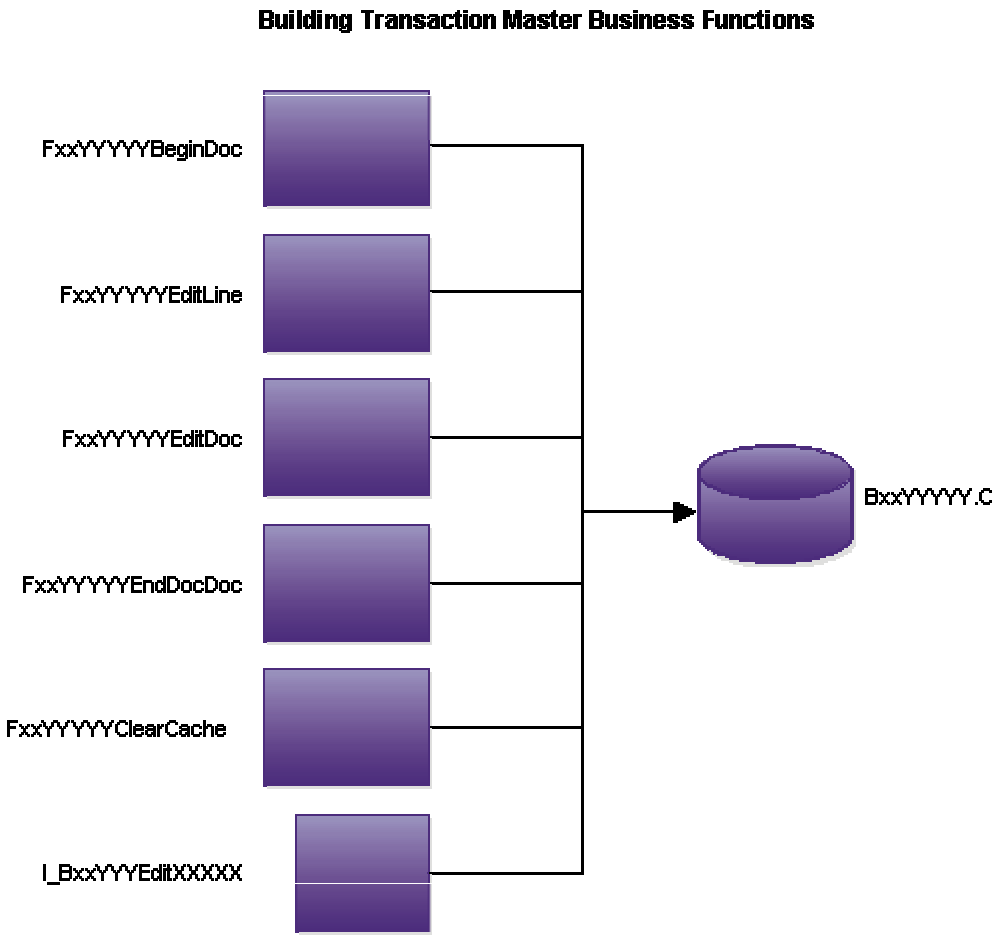
Work Fields

Fields that are not part of the business view, but are needed for editing and updating the transaction line.

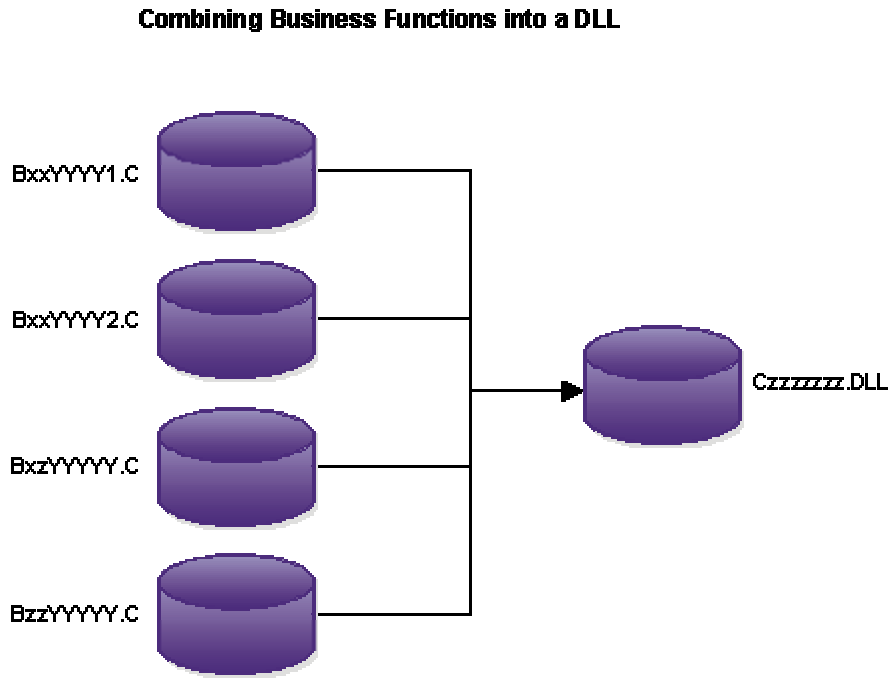
Building Transaction Master Business Functions

The following graphics show how transaction master business functions are built.

First, you create the individual business functions using the components described previously.



Next, you combine the business functions into a DLL.



Implementing Transaction Master Business Functions

You can use single-record processing or document processing to implement transaction master business functions.

Single-Record Processing

Interactive Program Flow Example

5. *Post Dialog is Initialized (optional)*
    - Hook up Begin Document function
6. *Set Focus on Grid*
7. *Row is Exited and Changed* or *Row is Exited and Changed ASYNC*
    - Hook up Edit Line function
8. *Delete Grid Record Verify- After*
    - Hook up Edit Line function to perform delete for one record
    - Hook up Edit Document function to perform deletes on a group of records
9. *OK button pressed event*
    - Call Begin Doc
    - Hook up Edit Document function
10. *Post OK Button Pressed*

- Hook up End Document function

Master Business Functions usually perform all table I/O for the given table. Therefore, the following actions must be disabled in the tool:

- *Add Grid Record to DB - before*
  - Suppress Add
- *Update Grid Record to DB - before*
  - Suppress Update
- *Delete Grid Record to DB - before*
  - Suppress Delete

Batch Program Flow Example

11. *Do Section of Report Header*
    - Hook up Begin Document function
12. *Do Section of the Group Section*
    - Hook up Edit Line function
13. *Do Section of a Conditional Section (optional)*
    - Hook up Edit Document function
14. *Do Section of Report Footer*
    - Hook up End Document function

Document Processing

Program Flow Example

15. *Dialog is Initialized*
    - Hook up Open Batch Edit Object module
16. *Grid is entered* - Finished entering in header
    - Hook up Begin Document Edit Object module
17. *Row is exited*
    - Hook up Edit Line Edit Object module
18. *OK button is pressed*
    - Hook up Edit Document Edit Object module
19. *Before Add/Delete from Database event*
    - Suppress Add/Delete
    - Hook up End Document Edit Object module
20. *Cancel button is pressed*
    - Hook up Close Batch Edit Object module

Master File Master Business Functions

J.D. Edwards provides master business functions (MBFs) to enable calling programs to process certain predefined transactions. An MBF encapsulates the required logic, enforces data integrity, and insulates the calling programs from the database structures.

You can use MBFs for the following reasons:

- To create reusable, application-specific code
- To reduce duplicated code
- To ensure that hookup is consistent
- To support interoperability models
- To allow processing to be distributed through OCM
- To design event-driven architecture

MBFs are typically used for multiline business transactions such as journal entries or purchase orders. However, certain master files also require MBF support due to their complexity, importance, or maintenance requirements from external parties. The requirements for maintaining master files are different from those for multiline business transactions.

Generally, master file MBFs are much simpler than multi-line business transaction MBFs. Transaction MBFs are specific to a program, while master file MBFs access a table multiple times.

For interoperability, master file MBFs can be used instead of table I/O. This allows you to perform updates to related tables using the business function instead of table event rules. Multiple records are not used. Instead, all edits and actions are performed with one call.

In their basic form, master file MBFs have the following characteristics:

Single call Generally, you can make one call to an MBF to edit, add, update, or delete a master file record. An edit-only option is also available.

Single data structure The fields required to make the request and provide all the necessary values are in one data structure. The data fields should correspond directly with columns in the associated master file.

No cache Because each master file record is independent of the others, caching is unnecessary. The information provided with each call and the current condition of the database provides all of the information that the MBF needs to perform the requested function.

Normal error handling As with other MBFs, master file MBFs must be capable of executing both in interactive and batch environment. Therefore, the calling program must determine the delivery mechanism of the errors.

Inquiry feature To allow external systems to be totally insulated from the J.D. Edwards database, an inquiry option is included. This allows an external system to use the same interface to access descriptive information about a master file key as it uses to maintain it.

Effect on applications For J.D. Edwards applications, the effect of implementing a master file MBF should be minimal. Consider and follow several standards before implementing a master file MBF.

Master file applications use the system to process all I/O for the Find/Browse forms. This allows you to use all of the search capabilities of the software.

You should design all master file applications so that all fix/inspect forms are independent of each other. Each fix/inspect form can use the system to fetch the record, and all edits and updates occur using the master file MBF. This independent design has the following two major benefits:

- It organizes the application in a manner that simplifies edits involving dependent fields across multiple forms.
- It allows consistent implementation of modeless processing for all master file applications and all forms within these applications.

Certain circumstances might justify deviation from this simple model. These circumstances are as follows:

- Extremely large file formats

  When the number of columns in the master file plus the required control fields in the call data structure exceed technical limitations for data structures, the MBF can be split. J.D. Edwards recommends that you split the MBF into one MBF that handles base data and performs all adds and deletes, and one or more MBF that allow the calling program to update additional data when the base data has been established. In this case, it is usually logical to split it, regardless of the technical limitation. For example, assuming that the customer master file exceeded the data structure limitation, you would use the following two MBFs to process the file:

  - F0301ProcessMasterData
  - F0301ProcessBillingData

  In this example, the F0301ProcessMasterData function processes the base data, and the F0301ProcessBillingData updates additional data.

- Subordinate detail files

  Information can exist in addition to the primary master file that has been normalized to allow for a one-to-many relationship. Designing the Master File MBF strictly on the basis of how the database is designed translates into three calls. Including at least one occurrence of a detail relationship in the data structure of a Master File MBF is valid. This inclusion allows users to establish reasonably complete master file information using a simple interface to meet simple needs. Street addresses and phone numbers within Address Book are a good example. Customers expect that they can create an address book record by calling a simple address book API with basic identifying information, the street address, and a phone number.

Information Structure

Standard Parameters for Single-Record Master Business Functions

Name	Alias	I/O	Required/Optional	Description
Action Code	ACTN	I	Required	A = Add I = Inquiry C = Change D = Delete S = Same as except (The record is the same except for what the user changes.)

Update Master File	EV01	I	Optional	0 = No update edit only (Default) 1 = Update performed
Process Edits	EV02	I	Optional	1 = All Edits (Default) 2 = Partial Edits (No Data Dictionary)
Suppress Error Messages	SUPPS	I	Optional	1 = Error Messages are Suppressed 0 = Process Errors Normally (Default)
Error Message ID	DTAI	O	Optional	Returns error code
Version	VERS	I	Future	Default to XJDE0001

Application-Specific Control Parameters (Example: Address Book)

Name	Alias	I/O	Required/ Optional	Description
Address Book Number	AN8	I/O	Optional	For additions, AN8 is optional. For all other action codes, this parameter is required.
Same as except	AN8	I	Optional	Required for S = Action Code The record is the same except for what the user changes.

Application Parameters (Example: Address Book)

Name	Alias	I/O	Required/Optional
Alpha Name	ALPH	I/O	Required
Long Address Number	ALKY	I/O	Optional
Search Type	AT1	I	Required
Mailing Name	MLMN	I	Required
Address Line 1	ADD1	I	Optional
City	CTY1	I	Optional
State	ADDS	I	Optional
Postal Code	ADDZ	I	Optional

Naming Convention

- The functional server source is named N*xxxxxxx* for named event rule business functions or B*xxxxxxx* for C business functions, which is the same naming convention as that for any other business function. Within this source is an external business function for each of the modules. The data structure name for each module is *Dxxxxxx*A, B, C and so on (for example, N03000052 - D03000052A F0301ProcessMasterData, D03000052B F0301ProcessBillingData).

- The individual business function is named f*ile name*`ProcessMasterData` (for example, F0301ProcessMasterData). If additional master file functions are needed due to data structure limitations, then the function name is named *file name*`Process`*xxxxxxxxx*, where *xxxxxxxxx* represents a descriptive name for the type of data being processed (for example, F0301ProcessBillingData).
- The functional use code of 192 in the Object Librarian is used to designate business functions as a functional server.

Performance Impact

Performance issues might occur regardless of how you handle large-format tables. Two options for improving performance are:

- Group data in logical groups to allow data structures to be smaller and easier for the user to implement. However, this configuration forces the user to make multiple calls to add or update an entire record in a table.
- Use a data structure that allows 300 fields. This is also cumbersome to implement, and the user can choose not to apply all of the fields.

Through different interfaces, the user can add additional data later. Most processes dictate that part of the data be added immediately, while related data can be added later. For example, the user might define a customer master record, but wait until a later date to define the customer's billing instructions. Therefore, J.D. Edwards recommends that you choose the first option of splitting MBFs so that one MBF handles base data and one MBF handles additional data.

Business Function Documentation

Business function documentation explains what individual business functions do and how they should be used. The documentation for a business function should include information such as the following:

- Purpose
- Parameters (the data structure used)
- Explanation of each individual parameter that indicates required input and output, and an explanation of return values
- Related tables (the table accessed)
- Related business functions (business functions called from within the functions itself)
- Special handling instructions

You use Business Function Design and Data Structure Design to document your business functions.

Creating Business Function Documentation

You can create business function documentation for several levels, including the following:

Business Function Notes	Documentation for the specific business function that you are using
Data Structure Notes	Notes about the data structure for the business function
Parameter Notes	Notes about the actual parameters in the data structure

▶ To create business function documentation

1. On Object Management Workbench, choose the business function that you want to document, and then click the Design button in the center column.
2. On Business Functions Design, click the Attachments tab.
3. Enter your documentation in the Attachments pane.

Business Function Documentation Template

The Business Function documentation template contains the following sections:

Purpose	This section contains a brief summary of what the function does.
Setup Notes and Prerequisites	This section includes any special notes to assist in using the function, including prerequisite functions, special values that need to be initialized, and events that are recommended to run the function. It also indicates whether memory must be cleared separately after the function is used.
Special Logic	This section contains additional details about the business function logic. You typically use it only for complex functions that require more explanation than the purpose summary.
Technical Specification	This section contains the technical specification of the function, written in scripted English. It can be a direct copy from an existing word processing document.

Creating Data Structure Documentation

Use the following process to create data structure documentation.

▶ To create data structure documentation

1. On Object Management Workbench, check out the data structure that you want to document.
2. Ensure that the data structure is highlighted, and then click the Design button in the center column.
3. On Data Structure Design, click the Attachments tab.
4. Enter your documentation in the Attachments pane.

   Alternatively, right-click in the icon bar on the left side of the form, and then select Templates. Select and complete a template.

Data Structure Documentation Template

The data structure documentation template contains the following sections:

Special Input Expected Delete this section if it does not apply.

Special Output Returned Delete this section if it does not apply.

Significant Data Values Delete this section if it does not apply.

Creating Parameter Documentation

The steps for creating parameter documentation are the same as those for creating data structure documentation, with one exception. After selecting the data item in the structure for which you want to enter notes, click the Data Structure Item Attachments binder clip. Parameter documentation has no special template.

You can enter specific notes about a data structure item to further clarify the information that should be passed in or passed out of the item, such as a mode parameter. The notes should indicate the valid values that the function accepts when you hook it up and information about how to use these values. For example, valid values might include 1 for Add and 2 for Delete. You include that information in parameter documentation.

Generating Business Function Documentation

Generating business function documentation provides you with an online list of information about business functions that you can view through the Business Function Documentation Viewer (P98ABSFN). Typically, the system administrator performs this task because generating the business function documentation for all business functions takes considerable time. If you create new business function documentation, you need to regenerate the business function documentation for that business function only.

▶ To generate business function documentation

From the Cross Application Development Tools menu (GH902), select Generate BSFN Documentation.

1. On Work with Batch Versions, choose version XJDE0001.
2. On Version Prompting, if you do not want to generate all business function documentation, choose the following option:
   - Data Selection
3. Click Submit.
4. On Data Selection, build your criteria for data selection, and then click OK.

   Choose only those functions for which you are generating documentation.

Note
Depending on the criteria that you choose, you might also need to set processing options.

5. On Report Output Destination, if you are running your report locally, choose one of the following output destinations:
   - On Screen
   - To Printer

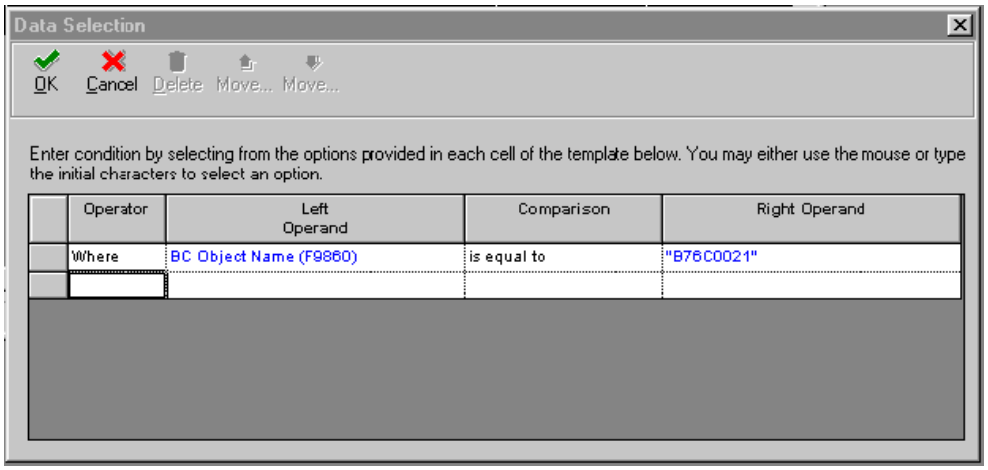
The system creates a hypertext markup language (HTML) link for each business function for which you generated documentation. It also creates an Index HTML file. These HTML files appear in your output queue directory. Output is in the following format:

```
Function Name

Function Description from

Parent DLL:

Location:

Language:

Purpose

Special Handling

Data Structure

Parameter Name dataitem data type req/ opt
```

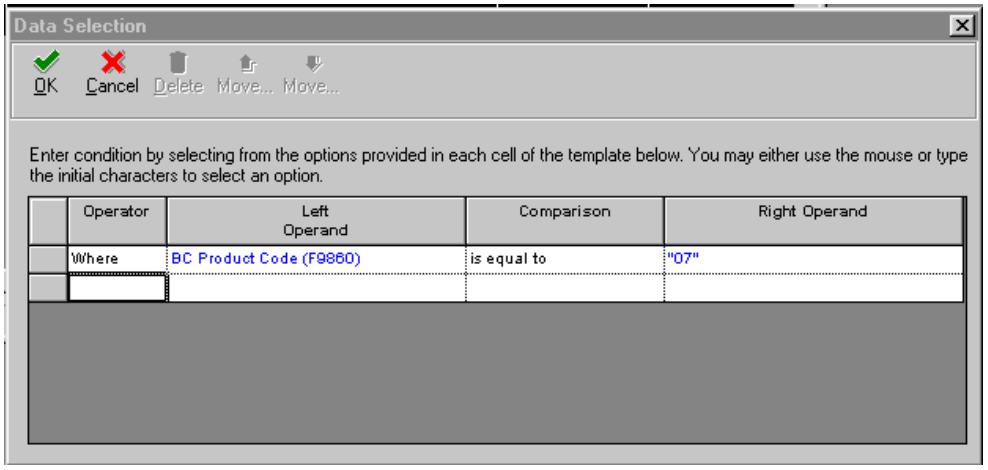
Data Selection Tips

You can use data selection to choose the business functions for which you wish to generate documentation. Generate BSFN Documentation (R98ABSFN) uses your data selection criteria to filter the business function documentation. The report might take considerable time to run when you generate documentation for all business functions. You can use data selection to generate documentation for one business function, all business functions, or any combination of business functions.

For example, if you want to generate documentation for a single business function, you can use the data item BC Object Name (F9860).



If you want to generate documentation for all of the business functions for a specific product code, such as Payroll, you use the data item BC Product Code (F9860).



You can also use the right operand on the Data Selection form to choose ranges or lists of values to further refine your data selection.

You can use any value that is associated with a business function to narrow the range of business functions for which you want to generate documentation. For example, you can use BC Date - Updated (F9860) if you have already produced the documentation for a previous release of J.D. Edwards software and, after an upgrade or update of the software, you want to create documentation for only new or modified business functions. Other examples include the following:

- Use BC Function Type (F9860) to choose Master business function documentation.
- Use BC Location Business Function (F9860) to produce documentation for client-run business functions.
- Use BC Object Type (F9860) to generate documentation for NERs only.

Viewing Documentation from Business Function Search

When you connect to a business function in event rules, the Business Function Search form appears. You can then select the function that you want to call. From the row menu, choose Data Structure Notes or Attachments to view the documentation for the business function.

Viewing Documentation from Business Function - Values to Pass

You can click any of the following buttons on Business Function - Values to Pass to view documentation for a single business function.

BSFN Notes	Displays the notes for the business function
Structure Notes	Displays the notes for the whole data structure
Parameter Notes	Displays the notes for a particular parameter

See Also

- *Business Function Event Rules* in the *Development Tools Guide* for more information about accessing the Business Function - Values to Pass form

Viewing Documentation from Business Function Documentation Viewer

You can use Business Function Documentation Viewer to view documentation for all business functions or selected business functions. After you have generated your report, use the Business Function Documentation Viewer (P98ABSFN) to display your information. J.D. Edwards suggests that you use this method to view business function documentation.

The Business Function Documentation form contains the HTML index that you generated. You can either view the entire index or choose specific functions by clicking on the appropriate letter in the index. Double-click a business function to view documentation that is specific to that function.

The media object loads the HTML index of the business functions, based on a media object queue. In the media object queue table, a queue named Business Function Doc defined.

This queue must point to the directory in which the business function HTML files are located. The system administrator usually generates the documentation for all business functions. Because the generation process places the documentation files in the local directory, the administrator must then copy the files to a central directory on the deployment server. The files must be copied to the media object queue for media object business function notes. If you are using the standalone version of the software, this path is usually the output directory from the Network Queue Settings section of your jde.ini file. If this entry is not in your jde.ini file, it is in the print queue directory in your J.D. Edwards software directory.

Note

See *ERP9.0 Text Items* in the *System Administration Guide* for more information about defining a media object queue.

► To view documentation from Business Function Documentation Viewer

From the Cross Application Development Tools menu (GH902), choose Business Function Documentation Viewer (R9000C).

View the business function documentation HTML index that you generated.

Understanding Business Function Processing Failovers

In some instances in which a business function fails to process correctly, the software can attempt to recover and reprocess the transaction. The system recognizes two principle failure states: process failure and system failure.

A process failure occurs when a jdenet_k process aborts abnormally. For a process failure, the software server processing launches a new jdenet_k process and continues processing.

A system failure occurs when all the server processing fails, the machine itself is down, or the client cannot reach the server because of network problems. For a system failure, business function processing must be rerouted either to a secondary server or to the local client. The system uses the following process to attempt to recover from this state:

When the call to the server fails, the system attempts to reconnect to the server.

- If reconnect succeeds and no cache exists, the system reruns the business function on the server. If a cache does exist, the system forces the user out of the application.
- If reconnect fails and no cache exists, the system switches to a secondary server or to the local client. If a cache does exist, the system forces the user out of the application.

After one module switches, all subsequent modules switch to the new location.

Caching

Caching is the process of storing a local copy of frequently accessed content of remote objects. You can use caching to improve performance. J.D. Edwards software uses the following two processes for caching information:

- The system automatically caches certain tables, such as those associated with constants, when it reads them from the database at startup. It caches these tables to a user's workstation or to a server for faster data access and retrieval.
- Individual applications can be enabled to use cache. JDECACHE APIs allow the server or workstation memory to be used as temporary storage.

Understanding JDECACHE

JDECACHE is a component of JDEKRNL that can hold any type of indexed data that your application needs to store in memory, regardless of the platform on which the application is running on. This means that a whole table can be read from a database and stored in memory. No limitations exist regarding the type of data, size of data, or number of data caches that an application can have, other than the limitations of the computer on which it is running. Both fixed-length and variable-length records are supported. To use JDECACHE on any supported platform, you need to know only a simple set of API calls.

Data handled by JDECACHE is in RAM. Therefore, ensure that you really need to use JDECACHE. If you use JDECACHE, design your records and indices carefully. Minimize the number of records that you store in JDECACHE because J.D. Edwards software and various other applications need this memory as well.

JDECACHE supports multiple cursors, multiple indexes, and partial keys processing. JDECACHE is flexible in terms of positioning within the cache for data manipulation. This improves performance by reducing searching within the cache.

When to Use JDECACHE

The following scenario describes when an application might use the JDECACHE APIs.

You use workfiles when an application must store records that a user enters in a detail area until OK processing is activated upon the *Button Clicked* event. On OK processing, all records must be simultaneously updated to the database. This is similar to transaction processing. For example, in the detail area of purchase order detail, if a user enters 30 lines of information and then decides to cancel the transaction, all records in the workfile are deleted and nothing is written to the database. As the user exits each detail row, editing takes place for each field, and then that record is written to the workfile.

If you implement this situation without using workfiles, irreversible updates to database tables occur when the user exits each row. Using workfiles allows you to limit updates to tables so that they only occur on OK button processing, and they are included in a transaction boundary. The workfile defines a data boundary for the grid for processing purposes. This is useful when multiple applications or processes (such as business functions) must access the data in the workfile for updates and calculations.

Although using workfiles for the example above will function correctly, using cache will probably increase performance. You can use JDECACHE to store in memory the records that

the user enters in one purchase order. The number of records that you store depends on the cache buffer size for each record, the local memory size, the location in which the business function that you use runs (for example, server or workstation), and so on. Typically, you should not store more than 1000 records. For example, do not cache your entire Address Book table in memory.

Performance Considerations

The following guidelines give the best JDECACHE performance:

- Cache as few records as possible.
- The fewer columns (segments) that you use, the faster your search, insert, and delete actions occur. In some cases, the system might have to compare each column before it determines whether to go further in the cache.
- The fewer records in your cache, the faster all operations proceed.

The JDECACHE API Set

You use a set of public APIs to interact with JDECACHE. You must understand how the JDECACHE APIs are organized to implement them effectively.

JDECACHE Management APIs

You can manage cache using the JDECACHE management APIs for the following:

- Setting up the cache
- Clearing the cache
- Terminating the cache

Use the jdeCacheGetNumRecords and jdeCacheGetNumCursors APIs to retrieve cache statistics. They are only passed the HCACHE handle. All other JDECACHE management APIs should always be passed the following handles:

- HUSER
- HCACHE

These two handles are essential for cache identification and cache management.

The set of JDECACHE management APIs consist of the following APIs:

- jdeCacheInit
- jdeCacheInitMultipleIndex
- jdeCacheInitUser
- jdeCacheInitMultipleIndexUser
- jdeCacheGetNumRecords
- jdeCacheGetNumCursors
- jdeCacheClear
- jdeCacheTerminate
- jdeCacheTerminateAll

The jdeCacheInit/jdeCacheInitMultipleIndex API initializes the cache uniquely per user. Therefore, if a user logs in to the software and then runs two sessions of the same application simultaneously, the two application sessions will share the same cache. Consequently, if the first application deletes a record from the cache, the second application cannot access the record. Conversely, if two users log in to the software and then run the same application simultaneously, the two application sessions have different caches. Consequently, if the first application deletes a record from its cache, the second application will still be able to access the record in its own cache.

The jdeCacheInitUser/jdeCacheInitMultipleIndexUser API initializes the cache uniquely per application. Therefore, if a user logs in to the software and then runs two sessions of the same application simultaneously, the two application sessions will have different caches. Consequently, if the first application deletes a record from its cache, the second application can still access the record in its own cache.

JDECACHE Manipulation APIs

You can use the JDECACHE manipulation APIs for retrieving and manipulating the data in the cache. Each API implements a cursor that acts as pointer to a record that is currently being manipulated. This cursor is essential for navigation within the cache. JDECACHE manipulation APIs should be passed handles of the following types:

HCACHE Identifies the cache that is being worked

HJDECURSOR Identifies the position in the cache that is being worked

The set of JDECACHE manipulation APIs is as follows:

- jdeCacheOpenCursor
- jdeCacheResetCursor
- jdeCacheAdd
- jdeCacheFetch
- jdeCacheFetchPosition
- jdeCacheUpdate
- jdeCacheDelete
- jdeCacheDeleteAll
- jdeCacheCloseCursor
- jdeCacheFetchPositionByRef
- jdeCacheSetIndex
- jdeCacheGetIndex

Working with JDECACHE

The JDB environment creates, manages, and destroys the JDECACHE environment. Each cache that you use within the JDECACHE environment is associated with a JDB user. Therefore, you must call JDB_InitBhvr API before you call any of the JDECACHE APIs.

Before you can use JDECACHE, you must initialize a cache. You must define an index before you initialize a cache. The index specifies to the cache which fields in a record are used to uniquely identify a cache record. You must create a separate cache for each group of data that an index references.

Calling JDECACHE APIs

JDECHACHE APIs must be called in a certain order. The following bullets list the order in which the JDECACHE-related APIs must be called, except for the sixth bullet, at which point the actual JDECACHE APIs can be called in any order:

1. JDB_InitBhvr
2. Create index or indices
3. jdeCacheInit or jdeCacheInitMultipleIndex
4. jdeCacheAdd
5. jdeCacheOpenCursor
6. JDECACHE Operations

   The following indented list of JDECACHE operations can occur in any order:

   - jdeCacheFetch
   - jdeCacheOpenCursor (the second cursor)
   - jdeCacheFetchPosition
   - jdeCacheUpdate
   - jdeCacheDelete
   - jdeCacheDeleteAll
   - jdeCacheResetCursor
   - jdeCacheCloseCursor (if the second cursor is opened)

7. jdeCacheCloseCursor
8. jdeCacheTerminate
9. JDB_FreeBhvr

Setting Up Indices

To store or retrieve any data in JDECACHE, you must set up *one and only one* index that consists of at least one column. The index is limited to a maximum of 25 columns (which are called segments) in the index structure. Use the data type that is provided to you to tell the cache manager what your index looks like. You must provide the number of columns (segments) in the index and the offset and size of each column in your data structure. To maximize performance, minimize the number of segments.

The following is the definition of the structure that holds index information:

```
#define JDECM_MAX_UM_SEGMENTS 25

struct _JDECMKeySegment

{
```

```
    short int nOffset;            /* Offset from beginning of structure in bytes */
    short int nSize;              /* Size of data item in bytes */
    int idDataType;               /* EVDT_MATH_NUMERIC or EVDT_STRING*/
}   JDECMKEYSEGMENT;
struct _JDECMKeyStruct
{
    short int nNumSegments;
    JDECMKEYSEGMENT CacheKey[JDECM_MAX_NUM_SEGMENTS];
}   JDECMINDEXSTRUCT;
```

Observe the following rules when you create indices in JDECACHE:

- Always declare the index structure as an array that holds one element for single indexes. Declare the index structure as an array that holds more than one element for multiple indexes. You can create an unlimited number of indexes.
- Always use memset() for the index structure. When you use memset() for multiple indexes, multiply the size of the index structure by the total number of indexes.
- Always assign as elements the number of segments that correspond to the number of columns that you have in the CacheKey array.
- Always use offsetof () to indicate the offset of a column in the structure that contains the columns.

The following example illustrates a cache that holds the Address Book table (F0101). The data in the cache is referenced by the index that consists of columns ABAT1, ABAC01, ABAC02, and ABDC.

```
/*Declare the index array of one element*/
JDECMINDEXSTRUCT          Index[1];
/*Initialize the structure*/
memset(&Index,0x00,sizeof(JDECMINDEXSTRUCT));
Index.nNumSegments = 4;
Index.CacheKey[0].nOffset = offsetof(F0101, abat1);
Index.CacheKey[0].nSize = sizeof(f0101.abat1);
Index.CacheKey[0].idDataType          =EVDT_STRING;
Index.CacheKey[1].nOffset = offsetof(F0101, abac01);
Index.CacheKey[1].nSize = sizeof(f0101.abac01);
Index.CacheKey[1]. idDataType         =EVDT_STRING;
Index.CacheKey[2].nOffset = offsetof(F0101, abac02);
Index.CacheKey[2].nSize = sizeof(f0101.abac02);
Index.CacheKey[2]. idDataType         =EVDT_STRING;
Index.CacheKey[3].nOffset = offsetof(F0101, abdc);
Index.CacheKey[3].nSize = sizeof(f0101.abdc);
Index.CacheKey[3]. idDataType         =EVDT_STRING;
```

The flag idDataType indicates the data type of the particular key. The following illustration uses ABAN8, which is a MATH_NUMERIC:

```
Index.nNumSegments = 1;

Index.CacheKey[0].nOffset = offsetof(F0101, aban8);

Index.CacheKey[0].nSize = sizeof(f0101. aban8);

Index.CacheKey[0]. idDataType =   EVDT_MATH_NUMERIC;
```

The following example illustrates a cache with multiple indices:

```
/*Declare the index array of 2 elements*/

JDECMSTRUCT  Index[2];

int  numIndexes=2;

/*Initialize the structure*/

memset(&Index,0x00,sizeof(JDECMSTRUCT)* numIndexes);

Index[0].nkeyID = 1;

Index[0].nNumSegments = 1;

Index[0].CacheKey[0].nOffset=offsetof(F0101,abat1);

Index[0].CacheKey[0].nSize=sizeof(f0110.abat1);

Index[0].CacheKey[0].idDataType=EVDT_STRING;

Index[1].nkeyID = 2;

Index[1].nNumSegments = 2;

Index[1].CacheKey[0].nOffset=offsetof(F0101,abac02);

Index[1].CacheKey[0].nSize=sizeof(f0110. abac02);

Index[1].CacheKey[0].idDataType=EVDT_STRING;

Index[1].nNumSegments = 1;

Index[1].CacheKey[1].nOffset=offsetof(F0101,abat1);

Index[1].CacheKey[1].nSize=sizeof(f0110.abat1);

Index[1].CacheKey[1].idDataType=EVDT_STRING;
```

Initializing the Cache

After you set up the index or indices, you call jdeCacheInit or jdeCacheInitMultipleIndex to initialize (create) the cache.

Pass a unique cache name so that JDECACHE can identify the cache. Pass the index to this API so that the JDECACHE knows how to reference the data that will be stored in the cache. Because each cache must be associated with a user, you must also pass the user handle obtained from the call to JDB_InitUser. This API returns an HCACHE handle to the cache that JDECACHE creates. This handle appears in every subsequent JDECACHE API to identify the cache.

The keys in the index must always be the same for every jdeCacheInit and jdeCacheInitMultipleIndex call for that cache until it is terminated. The keys in the index must correspond in number, order, and type for that index each time that it is used.

After the cache has been initialized successfully, JDECACHE operations can take place using the JDECACHE APIs. The cache handle obtained from jdeCacheInit must be passed for every JDECACHE operation.

JDECACHE makes an internal Index Definition Structure that accesses the cache when it is populated. The following topic provides an example that illustrates what happens when an index is defined and passed to jdeCacheInit.

Example: Index Definition Structure

In this scenario, you decide that the records that the cache stores each consist of the following structure:

```
int nInt1

char cLetter1

char cLetter2

char cLetter3

char szArray(5)
```

You decide that each of the records in the cache will be indexed uniquely by the values contained in the following:

- nInt1
- cLetter1
- cLetter3

You pass that information to jdeCacheInit, and JDECACHE creates the following Index Definition Structure for internal use. The Index Definition Structure is for STRUCT letters.

Example: Index Definition Structure

Index Key No. Index Key #1	Index Key Offset 0	Index Key Offset INTEGER
Index Key #2	4	CHAR
Index Key #3	6	CHAR

Using an Index to Access the Cache

When you use an index to access the cache, the keys in the index that are sent to the API must correspond to the keys of the index used in the call to jdeCacheInit for that cache in number, order, offset positions, and type. Therefore, if a field that was used in the index passed to jdeCacheInit offsets position 99, it must also offset position 99 in the index structure that passed to JDECACHE access API.

You should use the same index structure that was used for the call to jdeCacheInit whenever you call an API that requires an index structure.

The example in the following topic illustrates why the index offsets must be specified for the jdeCacheInit and how they are used when a record is to be retrieved from the cache. It shows how the passed key is used in conjunction with the JDECACHE internal index definition structure to access cache records.

Example: JDECACHE Internal Index Definition Structure

In this example, assume that the user is looking for a record that matches the following index key values:

- 1
- c
- i

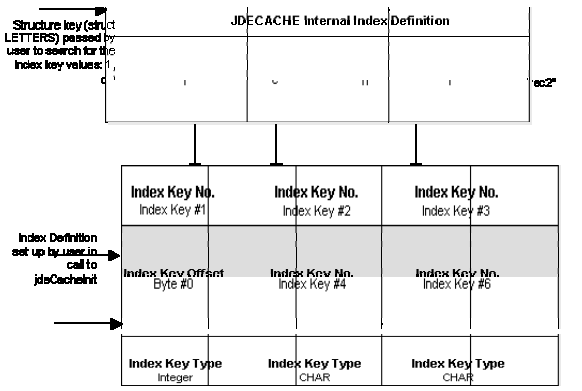
JDECACHE accesses the values that you pass in the structure at the byte offsets that were defined in the call to jdeCacheInit.

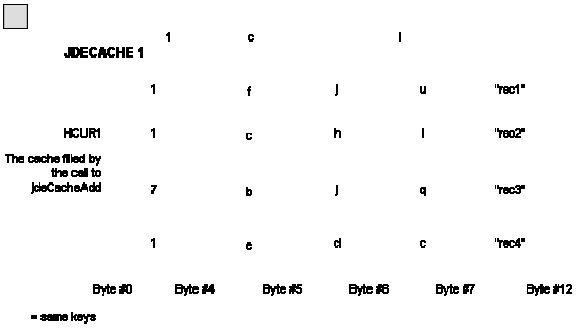
JDECACHE compares the values 1, c, and i that it retrieves from the passed structure to the corresponding values in each of the cache records at the corresponding byte offset. The cache records are stored as the structures that were inserted into the cache by jdeCacheAdd, which is the same structure as the one you pass first. The structure that matches the passed key is the second structure to which HCUR1 points.

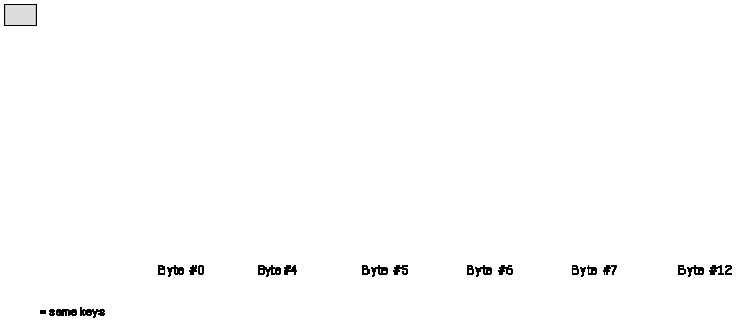
You should never create a smaller structure that contains just the key in order to access the cache. Unlike most indexing systems, JDECACHE does not store a cache record's index separately from the actual cache record. This is because JDECACHE deals with memory-resident data and is designed to be as memory-conservative as possible. Therefore, JDECACHE does not waste memory by storing an extra structure for the sole purpose of indexing. Instead, a JDECACHE record has a dual purpose of index storage and data storage. This means that, when you retrieve a record from JDECACHE using a key, the key should be contained in a structure that is of the same type as the structure that is used to store the record in the cache.

Do not use any key structure to access the cache other than the one for which offsets that were defined in the index passed to jdeCacheInit. The structure that contains the keys when accessing a cache should be the same structure that is used to store the cache records.

The following diagram shows what happens when any structure, other than the one that you used in the index definition, is used to insert into the cache.


Structure key (struct LETTERS) passed by user to search for the index key values: 1, c
JDECACHE Internal Index Definition
rec2"
Index Key No.
Index Key #1
Index Key No.
Index Key #2
Index Key No.
Index Key #3
Index Definition set up by user in call to jdeCacheInit
Index Key Offset
Byte #0
Index Key No.
Index Key #4
Index Key No.
Index Key #6
Index Key Type
Integer
Index Key Type
CHAR
Index Key Type
CHAR


1 c l
JDECACHE 1
1 f j u "rec1"
HCUR1 1 c h l "rec2"
The cache filled by the call to jdeCacheAdd
7 b j q "rec3"
1 e d c "rec4"
Byte #0 Byte #4 Byte #5 Byte #6 Byte #7 Byte #12
= same keys


Byte #0 Byte #4 Byte #5 Byte #6 Byte #7 Byte #12
= same keys

If jdeCacheInit is called twice with the same cache name and the same user handle without an intermediate call to jdeCacheTerminate, the cache that was initialized using the first jdeCacheInit will be retained. Always call jdeCacheInit with the same index each time that you call it with the same cache name. If you call jdeCacheInit for the same cache with a different index, none of the JDECACHE APIs will work.

The key for searches must always use the same structure type that stores cache records.

Using the jdeCacheInit/jdeCacheTerminate Rule

For every jdeCacheInit or jdeCacheInitMultipleIndex, a corresponding jdeCacheTerminate must exist, except instances in which the same cache is used across business functions or forms. In this case, all unterminated jdeCacheInit or jdeCacheInitMultipleIndex calls must be terminated with a jdeCacheTerminateAll.

A jdeCacheTerminate call terminates the most recent corresponding jdeCacheInit. This means that the same cache can be used in nested business functions. In each function, perform a jdeCacheInit that passes the cache name. Before exiting that function, call jdeCacheTerminate. This does not destroy the cache. Instead, it destroys the association between the cache and the passed HCACHE handle. The cache is completely destroyed from memory only when the number of jdeCacheTerminate calls matches the number of jdeCacheInit calls. In contrast, one call to jdeCacheTerminateAll destroys the cache from memory regardless of the number of jdeCacheInit or jdeCacheInitMultipleIndex calls or jdeCacheTerminate calls.

Using the Same Cache in Multiple Business Functions or Forms

If the same cache is required for two or more business functions or forms, call jdeCacheInit in the first business function or form, and add data to it. After exiting that business function or form, do not call jdeCacheTerminate because this removes your cache from memory. Instead, in the subsequent business functions or forms, call jdeCacheInit again with the same index and cache name as in the initial call to jdeCacheInit. Because the cache was not terminated the first time, JDECACHE looks for a cache with the same name and assigns that to you. Because the cache already has records in it, you do not need to refresh it. You can proceed with normal cache operations on that cache.

If a cache is initialized multiple times across business functions or forms, use jdeCacheTerminateAll to terminate all instances of the cache that were initialized. The name of the cache that corresponds to the HCACHE passed to this API will be used to determine the cache to destroy. Use this API when you do not want to call jdeCacheTerminate for the number of times that jdeCacheInit was called. If you move from one form or business function to another when you initialize the same cache across business functions or forms, you will lose your HCACHE because it is a local variable. To share the same cache across business functions or forms, do not call jdeCacheTerminate when you exit a form or business function if you intend to use the same cache in another form or business function.

JDECACHE Cursors

JDECACHE Cursors (JDECACHE Cursor Manager) is a component of JDECACHE that implements a JDECACHE cursor for record retrieval and update. A JDECACHE cursor is a pointer to a record in a user's cache. The record after the record in which the cursor is currently pointing is the next record that will be retrieved from the cache upon calling a cache fetch API.

Opening a JDECACHE Cursor

Manipulating the JDECACHE data is cursor-dependent. Before the JDECACHE data manipulation APIs will work, a cursor must be opened. A cursor must be opened to obtain a cursor handle of the type HJDECURSOR, which must, in turn, be passed to all of the JDECACHE data manipulation APIs (with the exception of the jdeCacheAdd API). To open the cursor, call the jdeCacheOpenCursor API. A call to this API also makes possible the calls to all the data manipulation APIs (except for jdeCacheAdd). If you do not open the cursor, these APIs will *not* work. With this call, the cursor opens a JDECACHE dataset, within which it will work. This API opens the dataset, but does not fetch any data. This means that the cache must be initialized by a call to jdeCacheInit and populated by a call to jdeCacheAdd before a cursor can be opened.

You can obtain multiple cursors to a cache by calling jdeCacheOpenCursor and passing different HJDECURSOR handles. In a multiple cursor environment, all the cursors are independent of each other.

When you are finished working with the cursor, you must deactivate it or close it by calling the jdeCacheCloseCursor API, and passing an HJDECURSOR handle that corresponds to the HJDECURSOR handle that was passed to the jdeCacheOpenCursor. When a cursor is closed, it cannot be used again until it is opened by a call to jdeCacheOpenCursor.

See Also

- *JDECACHE Multiple Cursor Support* in the *Development Tools Guide* or more information about multiple cursors

HJDECURSOR

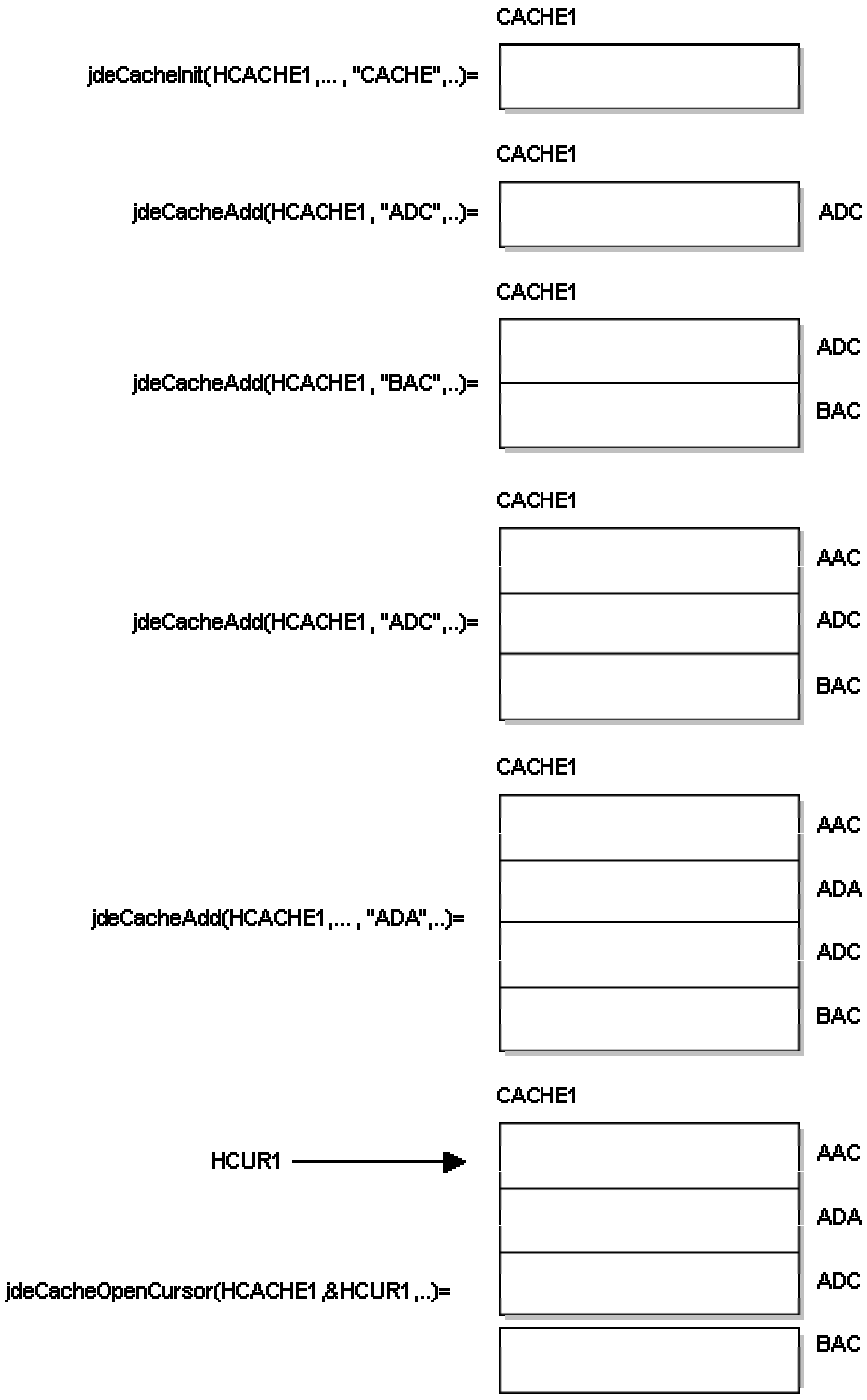
HJDECURSOR is the data type for the cursor handle. It must be passed to every API for JDECACHE data manipulation except jdeCacheAdd.

JDECACHE Dataset

The JDECACHE dataset includes all of the records from the current position of the cursor to the end of the set of sequenced records. Thus, if a cursor is in the middle of the dataset, none of the records in the cache prior to the current position of the cursor is considered part of the dataset. The JDECACHE dataset consists of the cache records sequenced in ascending order of the given index keys. This means that the order in which the records have been placed in JDECACHE is not necessarily the order in which JDECACHE Cursors retrieves them. JDECACHE Cursors retrieves records in a sequential ascending order of the index keys. A forward movement by the cursor reduces the size of the dataset during sequential retrievals. When the cursor advances past the last record in the dataset, a failure is returned.

The following example illustrates the creation of a JDECACHE cache and a JDECACHE dataset:

Example: JDECACHE Cache and Dataset Creation



Cursor-Advancing APIs

Cursor-Advancing JDECACHE Fetch APIs implement the fundamental concepts of a cursor. The cursor-advancing API set consists of APIs that advance the cursor to the next record in the JDECACHE dataset before fetching a record from JDECACHE. The following examples are cursor-advancing fetch APIs:

- jdeCacheFetch
- jdeCacheFetchPosition

A call to jdeCacheFetch first positions the cursor at the next record in the JDECACHE dataset before retrieving it. JDECACHE Cursors also allow calls to position the cursor at a specific record within the dataset. To do this, you call the jdeCacheFetchPosition API, which advances the cursor to the record that matches the given key before retrieving it.

You can use a combination of cursor-advancing fetch APIs if you need a sequential fetch of records starting from a certain position. Call jdeCacheFetchPosition, passing the key of the record from which you want to start retrieving. This advances the cursor to the desired location in the dataset and retrieves the record. All subsequent calls to jdeCacheFetch will fetch records starting from the current cursor position in the data set until the end of the dataset, or until the program stops for another reason.

Non-Cursor-Advancing APIs

Non-cursor-advancing JDECACHE Cursor APIs do not advance the cursor before retrieving a record. Instead, they keep the cursor pointing to the retrieved record. The following examples are non-cursor-advancing fetch APIs:

- jdeCacheUpdate
- jdeCacheDelete

Updating Records

If you want to update a specific record with a key that you know, call jdeCacheFetchPosition, passing the known key, to position the cursor at the location of the record that matches the key. Because the cursor is already pointing to the desired location, call jdeCacheUpdate, passing the same HJDECURSOR that you used in the call to jdeCacheFetchPosition.

If the index key changes, cache re-sorts the records, and the cursor points to the updated location. However, when you call jdeCacheFetch, the system retrieves the next record in the updated set. Consequently, the system might not retrieve the correct record because the changed index key caused the order of the records to change.

To update a sequential number of records, make a call to jdeCacheFetchPosition to return to the beginning of the sequence, if necessary. Then call jdeCacheUpdate, passing the same HJDECURSOR that you used in the call to jdeCacheFetchPosition. This call updates only the record to which the cursor is pointing. To update the rest of the records in the sequence, call jdeCacheFetch repeatedly, passing the same HJDECURSOR that you used in the call to jdeCacheFetchPosition, until you get to the end of the sequence. A sequential update will not work correctly if you have changed any index key value. However, a sequential update will work correctly if you are updating a value that is not an index key.

Deleting Records

If you want to delete a specific record with a known key, first call jdeCacheFetchPosition to point the cursor to the location of the record that matches the key. Next, call jdeCacheDelete, to remove the record from cache. Pass jdeCacheDelete the same HJDECURSOR that you used when you called jdeCacheFetchPosition. After deleting a record, use jdeCacheFetch to retrieve the record that followed the now-deleted record. This process works only when you call jdeCacheDelete.

You can also delete a specific record by calling jdeCacheDeleteAll and passing it the full key with the specific record to be deleted. In this case, jdeCacheFetch will not work following jdeCacheDeleteAll, although you can work around this condition with jdeCacheFetchPosition or jdeCacheResetCursor.

To delete a sequential set of records, first call jdeCacheFetchPosition to point the cursor to the first record in the set or call jdeCacheDeleteAll to delete the first record in the set. Then, call jdeCacheDelete sequentially. In this case, jdeCacheFetch will not work following jdeCacheDeleteAll, although you can work around this condition with jdeCacheFetchPosition or jdeCacheReset Cursor.

If you want to delete records that match a partial key, call jdeCacheDeleteAll and pass it a partial key. The system deletes all of the records that match the partial key. After you call this API, jdeCacheFetch does not work.

The jdeCacheFetchPosition API

The jdeCacheFetchPosition API searches for a specific record in the dataset; therefore, it requires a specific key. This API can perform full and partial key searches.

Note

If you pass 0 for the number of keys, the system assumes that you want to perform a full key search.

See Also

- *JDECACHE Partial Keys* in the *Development Tools Guide* for a detailed explanation of partial keys

The jdeCacheFetchPositionByRef API

The jdeCahceFetchPositionByRef API returns the address of a data set. The API finds the one record in cache and returns a reference (pointer) to the data. jdeCacheFetchPositionByRef retrieves a single, large block of data that is stored in cache. If the cache is empty or has more than one record, this API fails.

Resetting the Cursor

JDECACHE Cursors supports multiple cursors, as well as an unlimited number of cursor oscillations within the dataset. This means that the cursor can shuttle from beginning to end for an unlimited number of times. The cursor moves forward only. To reset the cursor (move the cursor back to the beginning of the dataset), you must make a call to jdeCacheResetCursor API to get a fresh JDECACHE dataset.

You can also reset a cursor to a specific position that is outside of the current dataset by calling the jdeCacheFetchPosition API.

See Also

- *JDECACHE Dataset* in the *Development Tools Guide* for more information about resetting the cursor

Closing a Cursor

When you no longer need the cursor, use a call to jdeCacheCloseCursor to close it. This call closes both the dataset and the cursor. Any subsequent call to any JDECACHE API passing the closed HJDECURSOR without having called jdeCacheOpenCursor will fail.

Although opening a JDECACHE Cursor for a long period of time requires no overhead, to release the memory that it requires, you should close the cursor as soon as you no longer need it.

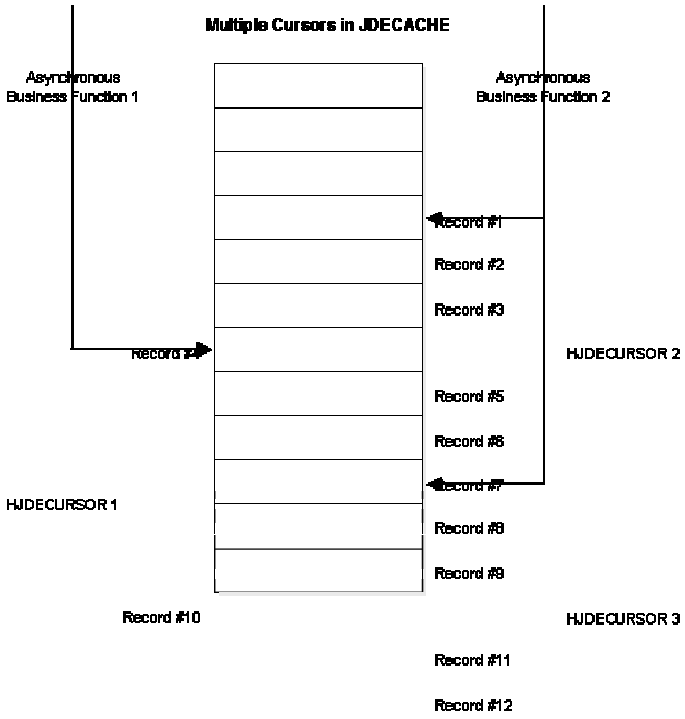
JDECACHE Multiple Cursor Support

JDECACHE supports multiple open cursors. This means that each cache allows up to 100 open cursors to access it at the same time.

JDECACHE multiple cursors are designed allow two or more asynchronously-processing business functions to use one cache. This means that asynchronously-processing business functions can open cursors to access the cache with relative positions within the cache that are independent of each other. A cursor movement by one business function does not affect any of the other open cursors.

Some J.D. Edwards software applications groups restrict the use of multiple cursors. For example, use multiple cursors only if you have a need for them. Additionally, do not use two cursors to point to the same record at the same time unless both cursors are fetching the record.

The following diagram illustrates multiple cursors in JDECACHE:


Multiple Cursors in JDECACHE
Asynchronous Business Function 1
Asynchronous Business Function 2
Record #1
Record #2
Record #3
Record #4
HJDECURSOR 2
Record #5
Record #6
Record #7
HJDECURSOR 1
Record #8
Record #9
Record #10
HJDECURSOR 3
Record #11
Record #12

JDECACHE Partial Keys

A JDECACHE partial key is a subset of a JDECACHE key that is ordered in the same way as the defined index, beginning with the first key in the defined index. For example, for a defined index of N keys, the partial key is the subset of the keys 1, 2, 3, 4...N-1 in that specific order. The order is critical. Partial key components must appear in the same order as the key components in the index. (The index is passed to jdeCacheInit).

For example, suppose that an index is defined as a structure containing the fields in the following order: A, B, C, D, E.

The partial keys that can be synthesized from this index are the following, in order: A, AB, ABC, ABCD.

The previous set is the only set of partial keys that can be synthesized for the defined index: A, B, C, D, E.

How a JDECACHE Partial Key Works

A JDECACHE partial key implements the JDECACHE cursor. When you implement the JDECACHE partial key, consider that the JDECACHE cursor works within a JDECACHE dataset, which comprises the records within the cache *ordered by* the defined index, *the full index*. If you call a jdeCacheFetchPosition API and pass the partial key, the JDECACHE cursor activates and points to the first record in the JDECACHE dataset that matches the partial key. If a jdeCacheFetchPosition API was called, subsequent calls to jdeCacheFetch will fetch all of the records in the dataset that succeed the fetched record *to the end of the dataset.* The cursor does *not* stop on the last record that matches the partial key, but continues on to fetch the next record using the next call to jdeCacheFetch, even if it does not match the partial key. When a partial key is sent to jdeCacheFetchPosition, it merely indicates from where the JDECACHE begins fetching. Because the records in the JDECACHE dataset are always ordered, the fetch always retrieves all of the records that satisfy the partial key first.

JDECACHE knows that you are passing a partial key because the fourth parameter to jdeCacheFetchPosition indicates the number of key fields that are in the key being sent to the API. If the number of key fields is less than the keys that were indicated when jdeCacheInit was called, then it is a partial key. Suppose the number of keys is N so that JDECACHE uses the first N key fields to make comparisons in order to achieve the partial key functionality. If jdeCacheFetchPosition is called with a number of keys that is greater than the number specified on the call to jdeCacheInit, an error is returned.

To delete a partial key, you must make a call to jdeCacheDeleteAll. This call deletes all of the records that match the partial key. To indicate to JDECACHE the partial keys that you are using, pass the number of key fields to this API.

Verify that the actual number of key fields in the structure corresponds to the numeric value that describes the number of keys that must be sent to either jdeCacheFetchPosition or jdeCacheDeleteAll.

JDECACHE Example Program

The following example program reads the Address Book table F0101 into a cache. The cache is indexed using the Address Book Number, which is ABAN8. With this cache, each of the JDECACHE APIs is called to operate on the cached data. You can cut and paste the program as necessary. However, it does not print any results. You can place your own input and output calls where appropriate.

```
/**************************************************************************/
/*                                                                        */
/*                 Source         :      TESTCACHE.C           */
/*                                                                        */
/*                 Programmer     :      Chikoore, T                    */
/*                                                                        */
/*                 Date           :      12/09/96                       */
/*                                                                        */
/*                 Description    :      To illustrate the use  */
/*                                       of the jdeCache APIs   */
/*                                       which will be used to  */
/*                                       simulate the 400's             */
/*                                       work files                             */
/*                                                                        */
/**************************************************************************/
#include <windows.h>
#include <windowsx.h>
#include <jde.h>
#include <F0101.H>
JDE_MEMORY_POOL GPoolCommon;
int
WinMain(
    HINSTANCE hInstance,
    HINSTANCE hPrevInstance,
    LPSTR lpCmdLine,
    int nCmdShow)
 {
    /*Environment variables*/
    HENV           hEnv                        =      NULL;

HUSER              hUser                       =      NULL;
```

```
           /*JDB - Related variables*/
JDEDB_RESULT       JDBcode                        =      JDEDB_FAILED;
HREQUEST           hAccessRequest                 =      NULL;
/*JDECACHE - Related variables*/
char               cNotUsed                       =      '\0';
JDECM_RESULT       jdeCachecode                   =      JDECM_FAILED;
HCACHE             hF0101Cache                    =      NULL;
HJDECURSOR         hF0101CacheCursor1             =      NULL;
HJDECURSOR         hF0101CacheCursor2             =      NULL;
JDECMINDEXSTRUCT   Index[1];
/*Table - Related variables*/
ID                 idTable                        =      ID_F0101;
F0101              dsInsertStruct,dsRetrieveStruct,f0101;
/*Just variables*/
KEY1_F0101         dsF0101CacheKey;
short int          nNumColsInIndex                =      1;
short int          nCursor1FetchCounter           =      0;
short int          nCursor2FetchCounter           =      0;
/*********************************************************************/
/*                                                                   */
/*                        Section 1                                  */
/*                                                                   */
/*  Initialize the JDB and USER environments as usual          */
/*  The cache environment is implicitly initialized by the     */
/*  JDB_InitEnv API, you do not have to worry about it         */
/*                                                                 */
/*********************************************************************/


/*Initialize the JDE memory pool management utility*/
GPoolCommon = jdeMemoryManagementInit();
/*Initalize the Environment*/
JDBcode = JDB_InitEnv(&hEnv);
if(JDBcode != JDEDB_PASSED)
{
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
```

```
/*initialize the User*/
JDBcode = JDB_InitUser(hEnv,&hUser,”P0101”,JDEDB_COMMIT_AUTO);
if(JDBcode != JDEDB_PASSED)
{
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
/*****************************************************************/
/*                                                               */
/*                        Section 2                              */
/*                                                               */
/*  Set up the index key that will be used to access the cache. */
/*  One and only one index is allowed per cache.                 */
/*                                                               */
/*  CODE:   Here the address book number (aban8) is being        */
/*          set up as the key.                                   */
/*                                                               */
/*                                                               */
/*****************************************************************/
/*Initialize the structure*/
memset(&Index,0x00,sizeof(JDECMINDEXSTRUCT));
/*Set up the cache index*/
Index->nKeyID = 1;
Index->nNumSegments = 1;
Index->CacheKey[0].nOffset = offsetof(F0101, aban8);
Index->CacheKey[0].nSize = sizeof(f0101.aban8);
Index->CacheKey[0].idDataType = EVDT_MATH_NUMERIC;
/*****************************************************************/
/*                                                               */
/*                        Section 3                              */
/*                                                               */
/*  Initialize the cache. The address of the cache handle        */
/*  for that particular cache is passed as well as the           */
/*  cache name and index. The cache handle will be use to        */
/*  identify this particular cache when calling any of the       */
/*  cache APIs                                                   */
```

```
/*                                                                  */
/*  CODE:   The cache named F0101 is being initialized              */
/*                                                                  */
/*                                                                  */
/******************************************************************/
/*Initialize the user cache*/
jdeCachecode = jdeCacheInit(hUser, &hF0101Cache, ”F0101”,Index);
if(jdeCachecode != JDECM_PASSED)
{
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
/*********************************************************************/
/*                                                                  */
/*                         Section 4                                */
/*                                                                  */
/*  CODE:   We are going to open the address book table             */
/*          (F0101)and place the contents of the whole table        */
/*          into the F0101cache which we have just initalized       */
/*          in Section 3.                                           */
/*                                                                  */
/*********************************************************************/
/*Open the address book table*/
JDBcode = JDB_OpenTable(hUser, idTable, 0, NULL, 0 ,NULL,&hAccessRequest);
if(JDBcode !=  JDEDB_PASSED)
{
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
/*Select all rows of the address book*/
JDBcode = JDB_SelectAll(hAccessRequest);
if (JDBcode != JDEDB_PASSED)
```

```
{
    jdeCacheTerminate(hUser, hF0101Cache);

    JDB_CloseTable(hAccessRequest);

    JDB_FreeUser(hUser);

    JDB_FreeEnv(hEnv);

    jdeMemoryManagementTerminate();

    return 0;

}   /*END IF*/

/*Initialize the structure*/

memset(&dsInsertStruct,0x00,sizeof(F0101));

/*Fetch all rows of the address book*/

while (JDB_Fetch(hAccessRequest, &dsInsertStruct, FALSE) == JDEDB_PASSED)

{

    /*Add the row to the cache*/

    jdeCachecode = jdeCacheAdd(hF0101Cache, (void *) &dsInsertStruct,
    (long int)

    sizeof(F0101));

    if(jdeCachecode == JDECM_FAILED)

    {

           break;

    }      /*END IF*/

    /*Re-Initialize the structure*/

    memset(&dsInsertStruct,0x00,sizeof(F0101));

}   /*END WHILE*/

/*********************************************************************/

/*                                                                   */

/*                        Section 5                                  */

/*                                                                   */

/*  CODE:   We are going to open the cursors. Please                 */

/*          note that cursors can only be opened after               */

/*          the cache has been filled, since the cursor has          */

/*          to point to the first record in the cache                */

/*                                                                   */

/*                                                                   */

/*********************************************************************/

/*Initialize the first cursor*/

jdeCachecode = jdeCacheOpenCursor(hF0101Cache, &hF0101CacheCursor1);
```

```
if(jdeCachecode != JDECM_PASSED)
{
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_CloseTable(hAccessRequest);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
/*Initialize the second cursor*/
jdeCachecode = jdeCacheOpenCursor(hF0101Cache, &hF0101CacheCursor2);
if(jdeCachecode != JDECM_PASSED)
{
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_CloseTable(hAccessRequest);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
/*********************************************************************/
/*                                                                   */
/*                        Section 6                                  */
/*                                                                   */
/*  CODE:   We are going to find the record with key 1001            */
/*          in the F0101 cache. If its not there, we add it.         */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
/*Initialize the key structure. It is important that this is done*/
memset(&dsF0101CacheKey,0x00,sizeof(KEY1_F0101));
/*Set up the key*/
ParseNumericString(&dsF0101CacheKey.aban8,"1001");
/*Initialize the structure to retrieve into*/
memset(&dsRetrieveStruct,0x00,sizeof(F0101));
/*Find the cache record keyed 1001 using cursor1*/
```

```
jdeCachecode = jdeCacheFetchPosition(hF0101Cache,
hF0101CacheCursor1,&dsF0101CacheKey,nNumColsInIndex,&dsRetrieveStruct,
sizeof(F0101));
if(jdeCachecode != JDECM_PASSED)
{
    /*Initialize the structure*/
    memset(&dsInsertStruct,0x00,sizeof(F0101));
    /*Fill out the structure to insert here*/
    ParseNumericString(&dsInsertStruct.aban8,”1001”);
    strcpy(dsInsertStruct.abtax,  ”000011171”);
    strcpy(dsInsertStruct.abalph, ”John Doe”);
    strcpy(dsInsertStruct.abdc, ”DOEJOHN”);
    strcpy(dsInsertStruct.abmcu, ”1001”);
    /*Add the record to the cache*/
    jdeCachecode = jdeCacheAdd(hF0101Cache, (void *) &dsInsertStruct,
    (long int)sizeof(F0101));
    if(jdeCachecode != JDECM_PASSED)
    {
            jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);
            jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);
            jdeCacheTerminate(hUser, hF0101Cache);
            JDB_CloseTable(hAccessRequest);
            JDB_FreeUser(hUser);
            JDB_FreeEnv(hEnv);
            jdeMemoryManagementTerminate();
            return 0;
    }       /*END IF*/
}   /*END IF*/
/*********************************************************************/
/*                        Section 7                                  */
/*                                                                   */
/*  CODE:   We are going to update the record with key 1002          */
/*          in the F0101 cache.                                      */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
/*Set up the key*/
ParseNumericString(&dsF0101CacheKey.aban8,”1002”);
```

```
/*Find the cache record keyed 1002 using cursor1 and keep the cursor
pointing to that record because we want to update it*/

jdeCachecode = jdeCacheFetchPosition(hF0101Cache, hF0101CacheCursor1,
&dsF0101CacheKey, nNumColsInIndex,&dsRetrieveStruct, sizeof(F0101));

if(jdeCachecode != JDECM_PASSED)

{

    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);

    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);

    jdeCacheTerminate(hUser, hF0101Cache);

    JDB_CloseTable(hAccessRequest);

    JDB_FreeUser(hUser);

    JDB_FreeEnv(hEnv);

    jdeMemoryManagementTerminate();

    return 0;

}

/*Update the structure we have just retrieved here*/

strcpy(dsRetrieveStruct.abalph, ”Put Alpha Name Here”);

/*Update the record with the record just retrieved. The cursor is already
pointing to this record so we do not need a key*/

jdeCachecode =jdeCacheUpdate(hF0101Cache, hF0101CacheCursor1,
&dsRetrieveStruct,sizeof(KEY1_F0101));

if(jdeCachecode != JDECM_PASSED)

{

    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);

    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);

    jdeCacheTerminate(hUser, hF0101Cache);

    JDB_CloseTable(hAccessRequest);

    JDB_FreeUser(hUser);

    JDB_FreeEnv(hEnv);

    jdeMemoryManagementTerminate();

    return 0;

}   /*END IF*/

/*********************************************************************/

/*                                                                   */

/*                         Section 8                                 */

/*                                                                   */

/*  CODE:   We are going to delete the record with key 1001          */

/*          in the F0101 cache.                                      */
```

```
/*                                                                  */
/*                                                                  */
/*                                                                  */
/*******************************************************************/
/*Set up the key*/
ParseNumericString(&dsF0101CacheKey.aban8,”1001”);
/*Find the cache record keyed 1002 using cursor1 and keep the cursor
pointing to that record because we want to update it*/
jdeCachecode = jdeCacheFetchPosition(hF0101Cache, hF0101CacheCursor1,
&dsF0101CacheKey,nNumColsInIndex,&dsRetrieveStruct,sizeof(F0101));
if(jdeCachecode != JDECM_PASSED)
{
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_CloseTable(hAccessRequest);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}
/*Delete the record keyed 1001 using cursor 1.*/
jdeCachecode = jdeCacheDelete(hF0101Cache, hF0101CacheCursor1);
if(jdeCachecode != JDECM_PASSED)
{
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_CloseTable(hAccessRequest);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
/*******************************************************************/
/*                                                                  */
/*                         Section 9                                */
/*                                                                  */
```

```
/*  CODE:   We are going to look for the record with key        */
/*          1001 in the F0101 cache. We have just deleted it    */
/*          so we should not find it.                           */
/*                                                              */
/*                                                              */
/*                                                              */
/*                                                              */
/****************************************************************/
/*Initialize the structure to retrieve into*/
memset(&dsRetrieveStruct,0x00,sizeof(F0101));
/*Find the cache record keyed 1001*/
jdeCachecode = jdeCacheFetchPosition(hF0101Cache, hF0101CacheCursor1,
&dsF0101CacheKey, nNumColsInIndex,&dsRetrieveStruct, sizeof(F0101));
if(jdeCachecode == JDECM_PASSED)
{
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_CloseTable(hAccessRequest);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}   /*END IF*/
/****************************************************************/
/*                                                              */
/*                        Section 10                            */
/*                                                              */
/*  CODE:   Illustration of multiple cursors at                 */
/*          work. We will use the two declared                  */
/*           cursors to alternatingly retrieve data.            */
/*          Cursor 2 should alway retrieve what                 */
/*          Cursor 1 has already retrieved.                     */
/*                                                              */
/*                                                              */
/****************************************************************/
/*First we need to reset both cursors to make
```

```
sure that we are starting from the beginning of the dataset.*/
/*Reset cursor 1*/
jdeCachecode = jdeCacheResetCursor(hF0101Cache, hF0101CacheCursor1);
if(jdeCachecode != JDECM_PASSED)
{
    /*reset failed*/
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_CloseTable(hAccessRequest);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}
/*Reset cursor 2*/
jdeCachecode = jdeCacheResetCursor(hF0101Cache, hF0101CacheCursor2);
if(jdeCachecode != JDECM_PASSED)
{
    /*reset failed*/
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);
    jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);
    jdeCacheTerminate(hUser, hF0101Cache);
    JDB_CloseTable(hAccessRequest);
    JDB_FreeUser(hUser);
    JDB_FreeEnv(hEnv);
    jdeMemoryManagementTerminate();
    return 0;
}
/*Clear the structure we are to retrieve records into*/
memset(&dsRetrieveStruct,0x00,sizeof(F0101));
/*Initialize the counter associated with cursor1*/
nCursor1FetchCounter=0;
/*Fetch the next record using cursor 1*/
while(jdeCacheFetch(hF0101Cache,hF0101CacheCursor1,&dsRetrieveStruct,NULL)
!= JDECM_FAILED)
{
```

```
    /*Increment the counter associated with cursor1*/
    nCursor1FetchCounter++;

    /*Check if cursor 1 has reached the max number of fetches*/

    if(nCursor1FetchCounter == 2)

    {

            /*Initialize the counter associated with cursor1*/

            nCursor2FetchCounter = 0;

            /*Fetch the next record using cursor 2*/

            while(jdeCacheFetch(hF0101Cache,hF0101CacheCursor2,
            &dsRetrieveStruct,NULL) != JDECM_FAILED)

    }       /*END IF*/

}   /*END WHILE*/

/*********************************************************************/

/*                                                                   */

/*                         Section 11                                */

/*                                                                   */

/*  CODE:   END!!!                                                   */

/*          Do the normal clean up work.                             */

/*                                                                   */

/*                                                                   */

/*********************************************************************/

/*First close all open cursor before terminating the cache*/

/*Close open cursor 1*/

jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor1);

/*Close open cursor 2*/

jdeCacheCloseCursor(hF0101Cache,hF0101CacheCursor2);

jdeCachecode = jdeCacheTerminate(hUser,hF0101Cache);

if(jdeCachecode != JDECM_PASSED)

{

    /*This is just a check for failure otherwise its the same as below*/

    JDB_CloseTable(hAccessRequest);

    JDB_FreeUser(hUser);

    JDB_FreeEnv(hEnv);

    jdeMemoryManagementTerminate();

    return 0;

}   /*END IF*/
```

```
/*Close the table*/
JDBcode = JDB_CloseTable(hAccessRequest);

/*Free the user*/

JDBcode = JDB_FreeUser(hUser);

/*Free the environment, the cache is implicitly killed here*/

JDBcode = JDB_FreeEnv(hEnv);

/*Terminate the memory management utility*/

jdeMemoryManagementTerminate();


    return(0);


}
```

JDECACHE Standards

J.D. Edwards recommends that you follow the standards for using JDECACHE.

Cache Business Function Source Name

The cache business function name should follow the standard naming convention for business functions.

Cache Business Function Source Description

The following standards apply to source descriptions for cache business functions:

- The cache business function description follows the business function description standards.
- The first word must be the noun Cache.
- The second word must be the verb Process.
- For an individual cache function, the words following Process should describe the cache. For a common cache function, the words following Process should describe the group to which the individual cache functions belong.

Cache Business Function Description

The following standards apply to cache business function descriptions:

- If the source file contains an individual function, the function name should match the source name.
- If the source file contains a group of cache functions, the individual function names should follow the same standards as the Cache Business Function Source Description standards.

Cache Programming Standards

A variety of cache programming standards apply, including the following:

- General standards
- Terminating versus clearing cache
- Cache name
- Defining the cache data structure
- Data structure standard data items
- Cache action code standards
- Group cache business function header file
- Individual cache business function header file

General Standards

Two types of standard cache functions exist: the individual cache function and the group cache function. An individual cache function is a single business function that acts as the file server over a single cache. A group cache function is a single business function that acts as the file server over several predefined caches. The following general standards apply to cache programming:

- Use cache APIs only within a standardized cache function. Using the standard cache function allows you to easily create and maintain code. The standard functions simplify the use of cache.
- Ensure that the cache function contains the standard cache actions. You can also include additional actions against cache that are specific to the cache.
- Use a cache function to initialize the cache, load cache, retrieve records from cache, delete records from cache, modify records, and terminate the cache.

Terminating versus Clearing Cache

You either terminate the cache or clear it, depending on whether the cache needs to remain available. This decision is specific to the design of your application.

Before terminating the cache, free memory of cache data structures, if necessary. Cache data structures are different from cache index structures. Terminating the cache frees cache index structures but does not affect cache data structures.

Cache Name

The following standards apply to the cache name:

- The cache name is a maximum of 50 characters.
- Depending on how the cache is used, the cache name should either be the data structure name or the data structure name with the job number appended to it.
- If the cache is to be terminated, the cache name should include the job number.
- When cache is used in master business functions, the cache is not terminated by the application. The job number is stored as a key in the cache. Instead of terminating the cache, all records containing the job number are cleared at the end of the transaction. The cache is not terminated due to the asynchronous processing. In this case, the cache name should contain only the data structure name.

Defining the Cache Data Structure

The cache data structure includes the following:

- Group Cache Function

  The data structure for the group cache function is also the layout and index for the individual cache. For the data structure, run typedef, and then paste it in the business function header file.

- Individual Cache Function

  The cache layout and cache index for an individual cache function should be defined in the business function header file.

Data Structure Standard Data Items

The following data items are standard to every cache business function. These data items should be the first data items in the data structure.

- NACTN - Cache action code
- NKEYS - Number of keys
- CURSOR - Cache cursor
- DTAI - Error Message ID
- JOBS - Job number (optional)

Additional data items that pass the information stored in cache should follow the standard data items. Preferably, the key fields are listed first, in order of the cache index.

Standard Cache Action Codes

Use the following predefined standard cache action codes.

CACHE_GET

- Opens cursor.
- Fetches a single record from the cache using the jdeCacheFetch API.

  Fetch can be with either a full or partial key. The number of keys used is passed to the function through the standard data items for the business function data structure.

- Does not require cache cursor to perform the fetch, and does not return the cache cursor after the record is fetched.
- Returns success or failure.

CACHE_ADD

- Inserts a record into cache using the jdeCacheAdd API.
- Must have a full key defined, and must pass values for all key fields.
- Does not allow duplicate records in cache.
- Does not require cache cursor to add a record to cache, and does not return the cache cursor after the record is added.

- Returns success or failure.

CACHE_UPDATE

- Opens cursor.
- Fetches the record for update from cache using the jdeCacheFetchPosition API (optional).
- Updates the fetched record using the jdeCacheUpdate API.
- Must have a full key, and must pass values for all key fields.
- Does not require cache cursor to update a record in cache, and does not return the cache cursor.
- Returns success or failure.

CACHE_ADD_UPDATE

- Deletes an existing record and replaces it with the new record. If a record does not exist, adds it.
- Fetches the record using the jdeCacheFetch API. If a record is found, deletes it using the jdeCacheDelete API. Adds the new record with the values passed through the business function data structure using the jdeCacheAdd API.
- Requires that a full key be defined, and must pass all values for the key fields.
- Does not require the cache cursor, and does not return the cache cursor.
- Returns success or failure on the new record being added.

CACHE_DELETE

- Deletes one record, a set of records, or all records from cache, depending on the number of keys passed.
- Deletes a single record from cache using jdeCacheDelete API if the number of keys is equal to the total number of keys in the index.
- Can be used to delete a set of records from cache by defining a partial key. Records are deleted using jdeCacheDelete API.
- Deletes all records from cache if the number of keys is set to zero. Records are deleted using jdeCacheDeleteAll API.
- Does not require a cache cursor to delete a record from cache, and does not return the cache cursor.
- Returns success or failure.

CACHE_GET_NEXT

- Opens the cursor, and then fetches the first record using jdeCacheFetchPosition, if the cache cursor is empty.
- Fetches the next record if the cursor contains a value.
- Passes a full or partial key. The number of keys must remain constant.
- Compares the value of the defined number of keys in the previous record with the next record to determine the end of file.
- Closes the cursor when a key match fails and frees the data pointer.

CACHE_TERMINATE

Terminates the cache using the jdeCacheTerminate API. The cache terminates only when the number of users of the cache equals zero.

CACHE_TERMINATE_ALL

- Terminates the cache using the jdeCacheTerminateAll API.
- Frees the data pointer.
- Terminates the cache regardless of the number of users accessing the cache.

CACHE_CLOSE_CURSOR

Closes the cursor using the jdeCacheCloseCusor API.

Additional Features

J.D. Edwards provides additional development tools and features that you can use to enhance your applications. The additional features include the following:

- Processing options
- Transaction processing
- Record locking
- Currency
- Tips of the Day

Processing Options

Processing options control how an interactive or batch application processes data. You can use processing options to change the way in which an application or a report appears or behaves. You can attach unique processing options to different versions of the same application, which allows you to change the behavior of an application without creating a new application. In addition, you can use processing options to do the following:

- Control the path that a user can use to navigate through a system.
- Set up default values.
- Customize an application for different companies or different users.
- Control the format of forms and reports.
- Control page breaks and totaling for reports.
- Specify the default version of a related application or batch process.

You can define processing options for an application that automatically appear at runtime.

In addition, you might need to create a processing option version. The procedures for creating a processing option version are similar to those for creating an interactive version.

Processing Options Templates

A processing options template contains one or more processing options. Each processing option appears on a row within the template and is defined by the following three variables:

Tab Title	A title that categorizes processing options. This text appears on the tab for a processing option.
Comment	Optional text that appears on the form with the processing options. Each comment takes the place of a processing option on the page. Adding a comment eliminates space for a processing option.
Data Item	An entry in the data dictionary. Every processing option must be a data item in the data dictionary. You specify data items for which you want to assign default values, such as cost center ranges and dates.

At runtime, a processing option template displays a set of tabs within an area called a page. Each tab represents a category of processing options. When you click the tab, the page changes to show the set of processing options for that category.

Caution

Changes to processing option text can conflict with changes to processing option templates. Template changes do not take effect until another package is built, but text changes occur immediately.

The following steps describe how to create and implement processing options:

21. Create processing options by building a list of parameters called a template.
22. Attach this template to an application and create event rules so that the application uses these values.
23. Create versions of the application.
24. Specify how the processing options are handled at runtime.

At runtime, depending on how you set up the application, one of the following events occurs:

- The processing options appear, and the user can choose to supply values to processing options.
- A version list appears from which the user can choose a version.
- The system runs the application with a predefined set of options.

When working with processing option design aid (PODA), all processing option template information is stored in the POTEXT TAM until you check it in. When you check in the processing option template, it is moved from POTEXT TAM to the Processing Option Text table (F98306). Data values for processing options are stored in the Versions List table (F983051). For batch versions, the Versions List table has an identifier that points to specifications for overrides (report overrides, data sequencing, data selection, or override location).

Each version of an application can be associated with a list of processing option values. The processing options that are specified at the time that an interactive or batch application is launched are those that the application uses when it runs. This sequence prevents users from changing processing options between the time that a batch application is submitted and the time it actually runs. Processing options can also be used for a specific running of an application. These processing options are not permanently stored in the F983051 table, and they are used only for that specific running.

Defining a Processing Options Data Structure (Template)

You can create a processing options data structure (template) that lists the values for data items that are passed to the application at runtime. Any changes that you make to the template reside on your workstation until you check in the template. This ensures that current users of the existing template are not immediately affected by your changes. After you check in your changes, the next Just-In-Time-Install (JITI) replicates the changes to the other users.

Before You Begin

- Create a processing options data structure. See *Creating a Processing Options Data Structure* in the *Development Tools Guide*.

► To define a processing options data structure (template)

1. On Object Management Workbench, check out the processing options data structure with which you want to work.
2. Ensure that the data structure is highlighted, and then click the Design button in the center column.
3. On Processing Option Design, click the Design Tools tab, and then click *Start the Processing Option Design Aid.*

   The Processing Options Design tool launches. The area on the left of the form displays how the processing option will look to the user.

4. Locate the data items that you need for your processing options with the Data Dictionary Browser.
5. Use one of the following methods to choose the data items that you want to add to your processing options:
   - Double-click the item in the Data Dictionary Browser. The item appears in the left side of the form under the tab.
   - Drag the item from the Data Dictionary Browser to the position where you want it in the structure members.
6. Click an item to edit it.
   - You can use the hatching around the control to reposition it.
   - You can choose text, and then delete or overwrite it.

   Processing Options Design automatically adjusts the size and position of data items to fit the width of the tab.

7. Choose the text button (A) to add comments.
8. Choose an object in the area on the left side of the form, and choose Properties from the View menu.

   If you are on a data item, you can view its properties and change the item name if necessary. The item name should be unique.

   You can click the Help Override Data Item tab to add an alternate szDict from which to get the help.

9. Right-click the processing option, and then choose Properties from the menu.

10. On JDE.DataItem Properties, click the Help Override Data Item tab, and then complete the following field:

    - Data Item Help Override Name

    Note
    When you name Help Override Data Items, you should use the naming guidelines as defined in the Development Guidelines for Application Design.

11. Click OK.
12. To view tab properties, click the tab and choose Properties from the View menu.

    You can also right-click a tab and choose Current Tab Properties from the menu that appears.

    If you are on a tab item, you can enter a short and long name for the tab.

    Use the Help File Name field to add the name of the help file for the tab.

13. To add a new tab, choose New Tab from the File menu.

    You can also right-click on an existing tab and choose New Tab from the menu that appears.

See Also

- *Creating a Processing Options Data Structure* in the *Development Tools Guide* for detailed instructions for creating the template object

J. D. Edwards Processing Option Naming Standards

You should follow J.D. Edwards naming standards wherever possible, unless you have a strong business case otherwise. Following the naming standards ensures a consistent approach to programming.

Processing Option Data Structure

The Object Librarian name for a data structure can be a maximum of 10 or 9 characters (depending on whether you begin with T) and may be formatted as follows: T*xxxxxyyyy* where:

T = Processing option data structure

xxxxxyyyy = The program number for the application or report

For example, the processing option data structure name for the P0101 application is T0101.

Tab Title

Use the following guidelines when you define a tab title for a processing option:

- Avoid abbreviations in tab titles.
- For future processing options, indicate that they are currently unavailable by entering the word FUTURE. If the entire tab is unavailable, enter FUTURE behind the

extended description for the tab. If a single processing option is unavailable, place FUTURE behind the data item description.

- Ensure that each tab exists only one time and that it is not divided into multiple tabs. For example, use Process instead of Process 1, Process 2.
- Include the application name, such as P4310, in the text when referencing versions that are to be used. The Version tab should always begin with the comment block, "Enter the version to be used for each program. If left blank, ZJDE0001 will be used."
- Use application-specific tabs sparingly and only when no other categories are appropriate. To allow for growth in translation, the name of an application-specific tab should be no longer than 10 characters in English.
- Use one of the eight standard tab titles. Along with the extended description and processing options for each, they are as follows:
  - Display: Options that determine whether specific fields appear or which format of a form appears on entry
  - Defaults: Options that assign default values to specific fields
  - Edits: Options that indicate whether the system performs data validation for specific fields
  - Process: Options that control the process flow of the application

  Application-specific tabs are:

  - Currency: Options that are specific to currency
  - Categories: Options that assign default category codes
  - Print: Options that control the output of a report
  - Versions: Options that specify which versions the system runs of applications that are called from this application.

Comment

- When you enter a comment for a processing option, use the following guidelines:

  Note
  When several processing options are grouped together, you can choose to number the processing options or the comments. Choose whatever works best for the situation.

- Number every option on a tab. Use sequential numbering, starting at 1, for each tab.
- Use nouns, such as Customer Master, to describe the processing option. The action required is defined in the glossary for that processing option.
- Add the word *Required* to the end of the processing option if a processing option is required.
- Use a comment block when multiple processing options refer to the same topic. The comment block is a title for the logical group of processing options.

Data Item

When choosing a data item for a processing option, use the following guidelines:

- When necessary, change the name of the data item to be descriptive.
- When renaming the data item element, the field element should comply with the naming standards for event rule variables with the alias appended, such as szCategoryCode3_CT03.
- Use a relevant data item when the data dictionary glossary applies. The user can display the glossary from the processing options. Do not use generic work fields, such as EV01.

Language Considerations for Processing Options

You can change a processing option template to incorporate language features.

► To change a template for text translation

From the System Administration Tools menu (GH9011), choose Processing Options Text Translation.

1. On Work With PO Text Translations, complete the following fields and click Find:
   - Template Name
   - To Language

   Work with PO Text Translations displays processing option text for the processing option template and language that you specify.

2. Choose a row with the text type that you want to change and click Select.

   Text types include tabs, items, and comments.

3. On PO Text Translation, enter the new text.

► To add a template with translated text

When you add a new processing option template for an application that is language-enabled, complete the following tasks:

1. Create the application.
2. Create the processing option template for the base language.
3. Add the language text.

Attaching a Processing Options Template

You must attach a processing options template (data structure) to an application to enable processing options at runtime. You can use processing options to set up default values, control formats, control report breaks, control totaling, and control how a report processes data. A processing options template has the following characteristics:

- It exists as a separate object.
- It can be attached to multiple applications.

When you attach a processing options template, if any of the processing options are designed to process on a certain event, you must attach event rule logic to enable those processing options.

► To attach a processing options template

1. On Application Design Aid, choose Design from the Form menu.
2. From the Application menu, choose Select Processing Options.
3. On Select Processing Option Template, choose the processing option template that you want to use and click OK.

Caution
The versions of an application and the event rules attached to it depend on the block of data passed to the application by way of a specific processing option template. If you disconnect that template from the application or connect a different template to the application, the application might not run properly.

To change the processing option template, first remove all existing versions of the application. Then, examine all application objects for event rules to ensure that the data that they need will still be available after you change or remove the template.

Transaction Processing

A transaction is a logical unit of work (comprised of one or more SQL statements) performed on the database to complete a common task and maintain data consistency. Transaction statements are closely related and perform interdependent actions. Each statement performs part of the task, but all of them are required for the complete task.

Transaction Processing ensures that related data is added to or deleted from the database simultaneously, thus preserving data integrity in your application. In transaction processing, data is not written to the database until a commit command is issued. When this happens, data is permanently written to the database.

For example, if a transaction comprises database operations to update two database tables, either all updates will be made to both tables, or no updates will be made to either table. This condition guarantees that the data remains in a consistent state and the integrity of the data is maintained.

You see a consistent view of the database during a transaction. You do not see changes from other users during a transaction.

Transaction Processing ensures that transactions are:

- Atomic - Either all database changes for an entire transaction are completed or none of the changes are completed.
- Consistent - Database changes transform from one consistent database state to another.
- Isolated - Transactions from concurrent applications do not interfere with each other. The updates from a transaction are not visible to other transactions that execute concurrently until the transaction commits.
- Durable - Complete database operations are permanently written to the database.

Commits and Rollbacks

The scope of a transaction is defined by the beginning and the end of the transaction. The end of a transaction occurs when the transaction is committed or rolled back. If neither a commit nor a rollback of a transaction occurs, the transaction rolls back when you exit the system.

Transaction processing uses commits to control database operations. Commits are commands to the database. Transactions can be automatically or manually committed. For automatic commits, database changes are written permanently to the database (committed) as they are executed. For manual commits, database changes are written permanently to the database only when either a commit or a rollback occurs.

Commit

A commit is an explicit command to the database to permanently store the results of operations performed by a statement. This event successfully ends a transaction.

Two-Phase Commit (Manual Commit Mode)

A two-phase commit coordinates a distributed transaction. It occurs only when at least one update statement has been executed to two separate data sources in the same transaction.

Rollback

A rollback is an explicit command to the database to cancel the results of operations performed by a statement. This event indicates that a transaction ended unsuccessfully.

Any failure of an insert, update, or delete within a transaction boundary causes all record activity within that transaction to roll back. If no failures have occurred at the end of the transaction, a commit is done, and the records become available to other processes.

In the case of a catastrophic failure (such as due to network problems), the DBMS performs an automatic rollback. Likewise, if the user clicks Cancel on a form, a rollback command is issued through a system function.

Understanding Transaction Processing

A J.D. Edwards software transaction is a logical unit of work (comprised of one or more SQL statements) performed on any number of databases. A single-statement transaction consists of one statement, and a multiple-statement transaction consists of more than one statement.

You can construct a transaction within an ERP application to group multiple database operations. The application can then request the database management system to buffer the database operations until the application executes a specific command to perform the updates requested within the transaction. Database operations that are not part of a transaction update the database immediately.

If an application has transaction processing turned on, you cannot see updated records until an update has been committed. Only processes within that transaction can access records in the transaction until the transaction is complete.

The Application Design tool allows you to enable an application for transaction processing and to define which database operations comprise a transaction. Not all transactions or applications must be enabled. Enable transaction or applications appropriately, according to your database configuration.

If transaction processing is turned on for database operations for tables that reside in DB2, then those tables must be journaled. Journaling can decrease performance because of the additional processing required. Contact your DB2 administrator if you have problems with this process.

General messages and errors for transaction processing are written to the jde.log or jdedebug.log.

Data Interdependence

Data interdependence refers to the data elements that make a transaction complete. For example, a voucher has records in both the Accounts Payable Ledger table (F0411) and the Account Ledger table (F0911). Because no data interdependence exists between the two tables, the transaction is incomplete when data exists in one table and not the other.

Transaction Boundaries

Data interdependence is defined by a transaction boundary. A transaction boundary encompasses all of the data elements that comprise a transaction. A transaction boundary might include only the data elements on a single form. When a transaction includes data from another form, the transaction boundary must be extended to include the data on that form.

Transaction Processing Scenarios

The typical flow for a transaction is as follows:

- An application starts and calls the runtime engine.
- The runtime engine initializes the transaction.
- The runtime engine opens a view.
- The runtime engine performs database operations.
- The runtime engine commits database operations.

To include two connected forms in the same transaction boundary, you must activate transaction processing for the parent form and designate *Include in parent* on interconnect to the second form. You do not need to activate transaction processing for the second form because your choice on the interconnect form overrides your choice on the called form.

The following table outlines the relationship between two forms and the boundaries that exist in each scenario. Transaction boundaries are defined through form interconnections and business function interconnections. In the example below, the OK button on Form1 invokes Form2. You can change the transaction boundaries by specifying TP On or TP Off. The table explains what happens when you define your transaction boundary in various ways.

Scenario	TP On	TP Off	Form, BSFN Interconnect, Table I/O	Comments

A	Form1		**X**		All forms use Auto Commit.
	Form2		**X**		
B	Form1		**X**	**X**	Because neither form uses Manual Commit, the Include in Parent flag on Form Interconnect Properties is ignored.
	Form2		**X**		All forms use Auto Commit.
C	Form1	**X**			Form1 (parent) uses Manual Commit mode, and Form2 (child) uses Auto Commit.
	Form2		**X**		Because the Include in Parent flag is Off, the transaction boundary does not extend to include Form2 (child).
D	Form1	**X**		**X**	Even though the transaction processing flag is Off for Form2 (child), the Include in Parent flag is On.
	Form2		**X**		The transaction boundary extends to include Form2 (child).
E	Form1		**X**		Because the Include in Parent flag is Off, Form1 (parent) and Form2 (child) operate as independent entities.
	Form2	**X**			Form1 operates in Auto Commit mode and Form2 operates in Manual Commit mode.
F	Form1		**X**	**X**	An atypical case. Because transaction processing is Off for Form1 (parent), the transaction boundary does not extend to the child, even though the Include in Parent flag is On for Form2 (child).
	Form2	**X**			Form2 (child) is in Manual Commit mode and the interconnect is ignored.
G	Form1	**X**			Transaction processing is On for both forms.
	Form2	**X**			Because the Include in Parent flag is Off, each form is a transaction boundary and a commit is issued for each.
H	Form1	**X**		**X**	Transaction processing is On for both forms. However, because the Include in Parent flag is On, the transaction processing on Form2 is ignored.
	Form2	**X**			The transaction boundary encompasses both forms. Form2 is a child of Form1.

Transaction Processing and Business Functions

An application or batch process establishes the primary transaction boundary. If a business function calls another business function, the database operations in the function that is being called are still grouped within the boundaries of the parent application.

Master business functions should not define their own boundaries. You might require two or more master business functions to create one logical transaction; in such cases, the calling application should define the boundaries.

If your application calls several business functions, and you need to include the business functions in the transaction boundary, you must enable transaction processing. Should a failure occur and you need to roll back database operations for the business function, you must designate Include in Transaction on the business function interconnect.

Note

When you use business functions within a transaction, you must be careful not to cause a deadlock. If you split the logic for manipulating a table between two functions, you might cause a deadlock if you include one function in the transaction but not the other. If a business function that selects records for information also updates or inserts data in other tables, you might want to split the business function.

Transaction Processing in Remote Business Functions

In a transaction-enabled application, if a server business function has modified a record, and a client business function outside the transaction attempts to access the record, the client function is locked out until the server business function has committed the data. Until the data is committed, the client application cannot access database changes performed by server-side business functions. If a server business function fails to commit or a user cancels a transaction on a server business function, the transactions for the business function roll back. The servers and client must all commit the transaction, or the transaction rolls back on the servers and client.

Transaction Processing System Functions

Several transaction processing system functions are available. You might need to use system functions for additional transaction processing functionality.

For example, assume a scenario with two forms—FormA and FormB—with transaction processing enabled for FormA. Furthermore, assume that FormA calls FormB with the Include in Parent option on for the *Post OK Button is Clicked* event. Because FormB inherits the transaction boundaries for FormA, if a user cancels an event on FormB, the following occurs:

- The entries for FormB will not be written.
- Control is returned to FormA.
- The entries for FormA are written and committed.

In this scenario, you can prevent commitment of the entries for FormA by using the Rollback Transaction system function.

You can use the following system functions to define transaction boundaries in a batch process:

- *Begin Transaction* to define where the transaction begins
- *Commit Transaction* to define where the transaction ends

- *Rollback Transaction* to rollback a transaction

Note

See *Online APIs* on the *Knowledge Garden* for more information about specific system functions.

Working with Transaction Processing

Transaction processing is available for the following form types:

- Fix/inspect
- Header detail
- Headerless detail

Transaction processing is only available during OK processing for the following events:

- OK Button Clicked
- OK Post Button Clicked
- Add Record to DB - Before
- Add Record to DB - After
- Update Record to DB - Before
- Update Record to DB - After
- Add Grid Rec to DB - Before
- Add Grid Rec to DB - After
- All Grid Recs Added to DB
- Update Grid Rec to DB - Before
- Update Grid Rec to DB - After
- All Grid Recs Updated to DB
- Delete Grid Rec from DB - Before
- Delete Grid Rec from DB - After
- All Grid Recs Deleted from DB

Actions that occur outside of these events are not within the transaction boundary.

Defining Transaction Processing for a Form

To define transaction processing for a form, you must specify the Transaction option on Form Properties in Form Design. This requirement means that all data for the form is committed to the database at the same time.

If a transaction includes a single form, then this is the only action that is required because the form itself is the transaction boundary. However, if the transaction includes data from another form, then you must extend the boundary to the applicable form through a form interconnection.

Note

You can also extend transaction boundaries using business functions or table I/O.

See Also

- *Extending a Transaction Boundary* in the *Development Tools Guide* for more information about transaction boundaries

► To define transaction processing for a form

1. On Form Design, double-click the form for which you want to access Form Properties.
2. Click the following Style option:
   - Transaction Processing

Transaction Processing for reports occurs at the section level.

Extending a Transaction Boundary

You can extend the transaction boundary from one form to another form by setting up a parent/child relationship between the forms. To extend the boundary, enable the Transaction Processing flag through a form interconnection in Event Rules Design.

Before You Begin

- In Form Design, define form properties so that each form within the transaction boundary includes transaction processing. See *Defining Transaction Processing for a Form* in the *Development Tools Guide*.

Extending a Transaction Boundary between Forms

If a parent form uses manual commit, the form to which you connect it must also use manual commit.

► To extend the transaction boundary between forms

1. Open Form Design Aid.
2. Choose the parent form with which you are working.
3. From the Form menu, choose Menu/Toolbar Exits.
4. Choose the OK row and click the Event Rules button.
5. From Event Rules Design, choose the Button Clicked event, and click the Form Interconnect button.
6. On Work with Applications, choose the application that you want to use.
7. On Work with Forms, choose the form that you want to include in the transaction boundary.
8. On Work with Versions, choose the version of the application that you want to use.

9. On Form Interconnect, click the following Transaction Processing option and click OK:
    - Include in Transaction

Extending a Transaction Boundary By Using Business Functions

You can include a business function in a transaction boundary. If the parent form uses automatic commit, the business function to which you extend the transaction boundary also uses automatic commit. Any business function that is not marked as Include in Transaction uses auto-commit. Business functions that process asynchronously can also be included in a transaction.

► To extend a transaction boundary by using business functions

1. Open Form Design Aid.
2. Choose the parent form with which you are working.
3. From the Form menu, choose Menu/Toolbar Exits.
4. Choose the OK row and click the Event Rules button.
5. From Event Rules Design, choose the *Button Clicked* event, and click the Business Functions button.
6. From Business Function Search, choose the business function that you want to include in the transaction boundary.
7. On Business Function, click the following Transaction Processing option:
    - Include in Transaction

Business Functions marked for both Asynchronous and Include in Transaction are included in the transaction boundary.

Extending a Transaction Boundary By Using Table I/O

Transaction processing is available only for the Open Table operation in Table I/O. The opening of a table determines whether interaction with that table will be manual commit (part of a transaction) or automatic commit. Any Open Table operation not marked as Include in Transaction uses automatic commit.

► To extend a transaction boundary by using table I/O

1. Open Form Design Aid.
2. Choose the parent form with which you are working.
3. From the Form menu, choose Menu/Toolbar Exits.
4. Choose the OK row and click the Event Rules button.
5. From Event Rules Design, choose the *Button Clicked* event, and click the Table I/O button.
6. On Insert TableIO Operation, choose the Open option under Advanced Operations, and then click Next.
7. On Data Source, click Advanced Options.
8. On Advanced Options, choose the *Include in Transaction* option, and then click OK.

9. On Data Source, click Finish.

   The Open operation appears in your event rules.

Defining Transaction Processing for a Report

In addition to interactive transaction processing, J.D. Edwards software also provides transaction processing for reports and batch processes. To enable transaction processing for a batch process, click the Advanced tab for report properties and choose Transaction Processing. Then, use the Transaction Processing system functions to define the beginning and ending boundaries of your transactions. You can also extend your transaction boundaries to include business functions and table I/O.

Note

See *Online APIs* on the *Knowledge Garden* for more information about these system functions.

Setting the jde.ini for Transaction Processing and Lock Manager

You must modify the enterprise server and workstation jde.ini files to enable transaction processing. For each J.D. Edwards software workstation, you must enable transaction processing by changing settings in the workstation jde.ini file. You should make these changes on the deployment server to the resident jde.ini file that is delivered to workstations through package deployment, and then deploy a package with the changed jde.ini file.

Understanding Concurrent Release Support

Prior to release B73.3, transaction processing was primarily controlled by settings in the [TP MONITOR ENVIRONMENT] section of the jde.ini. On the server, this section contains nine settings. On the workstation, this section contains seven settings.

For release B73.3, the [TP MONITOR ENVIRONMENT] section has been removed from the jde.ini and replaced with the [LOCK MANAGER] section. This new section contains three settings in both the server and client jde.ini files. Settings that used to be in the [TP MONITOR ENVIRONMENT] section were removed because they were either obsolete or assigned an internal default value.

The following list provides the reasons that the settings in the [TP MONITOR ENVIRONMENT] section were eliminated for release B73.3:

Setting	Reason for eliminating
Status	Obsolete. As of release B732.2, the TP monitor is always set to ON.
LogPath	Assigned the base directory from the jde.ini file.
LogStatements	Obsolete. Statements are always logged.
LogBufferSize	The system uses an internal default buffer size (1 MB) is used.

DisplayServerErrorMsg	Obsolete. The client always displays server error messages.
ServerRetryInterval	The system uses an internal default interval.
RegistryCleanupInterval	The system uses an internal default interval.
RegistryRecordLifeSpan	The system uses an internal default span.
ServerTimeout	JDENET settings provide this value.

During a transition period, the system concurrently supports both sections of the jde.ini file. The following three scenarios are possible during this transition period:

- The [LOCK MANAGER] section does not exist. In this scenario, the system checks for settings in the [TP MONITOR ENVIRONMENT] section.
- Both [LOCK MANAGER] and [TP MONITOR ENVIRONMENT] sections exist. In this scenario, the system uses the settings in the [LOCK MANAGER] section.
- Neither section exists. In this scenario, transaction processing cannot be started and a failure occurs.

Understanding Transaction Processing Logging

The commit coordinator acts in two phases.

Phase One

In the first phase, it instructs the Log Manager to flush the logs for each data source to a hard disk for a permanent backup storage. The logs contain every database operation that was carried out.

The first phase ensures that if any of the data sources fail to commit after the others have committed, all databases can be returned to a consistent state by referring to the contents of the logs. If all of the logs for each of the data sources are flushed successfully, then the second phase begins.

Phase Two

In the second phase, the coordinator instructs each of the data sources to commit its respective transaction. If any of the data sources fails to commit, a commit log report is generated from the logs that were generated in phase one (this report is written to the directory specified in the LOGPATH in the jde.ini, which contains a list by data source of all the SQL statements that were part of the transaction). The commit log also contains the details about which data sources passed and which ones did not.

The log can help the database administrator to manually synchronize the data sources so that they are all in a consistent state. The commit log report is generated only when at least one data source fails to commit. If all data sources successfully commit, then no commit log report is generated, and all the logs from phase one are deleted by the Log Manager.

From release B73.3, the log file appears in the directory specified in the jde.ini [INSTALL] section.

Setting the jde.ini for Transaction Processing and Lock Manager

As previously explained, during a transitional period, both the [TP MONITOR ENVIRONMENT] and [LOCK MANAGER] sections are supported.

If you are using a release of OneWorld prior to B73.3, enter settings for the [TP MONITOR ENVIRONMENT] section. If you are using release B73.3 or higher, enter settings for the [LOCK MANAGER] section.

Note

The following settings apply to the Lock Manager:

- Server
- RequestedService
- AvailableService

The remainder of the settings relate to transaction processing.

Settings for the [TP MONITOR ENVIRONMENT] Section (Prior to B73.3)

The following tasks describe how to enter settings for the [TP MONITOR ENVIRONMENT] section of the jde.ini file, both for the server and for the workstation. These settings take effect only if you are using a J.D. Edwards ERP release prior to B73.3.

► To enter [TP MONITOR ENVIRONMENT] settings for the server

1. Locate the jde.ini file on the enterprise server.
2. Using an ASCII editor such as Notepad, review the jde.ini file to ensure the accuracy of the following settings:

```
 [TP MONITOR ENVIRONMENT]
Status=status value
LogPath=log path
LogStatements=log on/off value
LogBufferSize=log buffer value
RequestedService=service value
Server=server name
ServerTimeout=timeout value
AvailableService=service value
RegistryCleanupInterval=cleanup value
RegistryRecordLifeSpan=life span value
RegistryRecordLifeSpan=lifespan value
LogServices=service value
```

The following table explains the variables in the jde.ini file:

Setting	Value
Status	This setting indicates whether transaction processing is turned on. The transaction processing monitor typically should be turned on unless you are not using transaction processing in any of your applications, or if you want to temporarily disable transaction processing, such as for testing. Valid values are ON and OFF. As of B73.2, transaction processing cannot be turned off, so this value is ignored in versions B73.2 and higher.
LogPath	This setting specifies the directory in which the transaction logs are placed. This path should correspond to the location of your jde.log and jdedebug.log. For example, on a UNIX machine, the path might be: `/u10/owdevel/tc283984/b73.2`
LogStatements	This setting specifies whether the transaction monitor records every operation performed within a transaction. Valid values are ON and OFF.
LogBufferSize	This setting indicates the number of bytes set aside to hold the operations being stored in memory before they are copied to disk. This value is a J.D. Edwards software internal default value and should not be changed.
RequestedService	This setting specifies the service that the client requests from the server. Valid values are: • TS: Time stamp service is requested • NONE: No service is requested
Server	This setting specifies the server that hosts the Transaction Management Server (TMS). For example, a server name might be `intelnta`.
ServerTimeout	This setting indicates the timeout in seconds for all of the network operations. This value can be adjusted based on the network traffic. It is a required value for the workstation jde.ini file. It is also necessary for the server jde.ini file in case a batch job is running on the server. This value is a J.D. Edwards software internal default value and should not be changed.
AvailableService	This setting indicates the service that this Transaction Management Server is offering. When the Transaction Manager on the workstation is initialized, it queries the TMS for this value. This is called TM-TMS handshaking. If this value is the same as the one that the workstation has in its jde.ini file, then that service will be invoked at the appropriate times when the system is running. Valid values are: • TS: Record Change Detector (Timestamp Service) • LM: Lock Management Service • ALL: Both TS and LM services • NONE: No service is available
RegistryCleanup Interval	This setting specifies the period after which all the expired records are deleted from the TMS record registry. This interval is specified in minutes. This value is a J.D. Edwards software internal default value and should not be changed.

RegistryRecordLife Span This setting specifies the maximum period during which a record can exist in the TMS record registry. After this period, the record expires and is deleted. This life span is specified in minutes. This value is a J.D. Edwards software internal default value and should not be changed.

s This setting turns on the Trace Log for TMS, and supplements the Jde.log file. Valid values are:

1: Tracing for TMS is On

0: Tracing for TMS is OFF

The default value for this setting is 0. You should turn on tracing for TMS only after you have exhausted all other debugging methods.

See Also

- *Understanding Transaction Processing Logging* in the *Development Tools Guide* for more information about logging

► To enter [TP MONITOR ENVIRONMENT] settings for the workstation

1. Complete the steps to enable transaction processing on the server.

   Note
   Be sure to enable transaction processing on the server before enabling it on the workstation. If you try to set up the workstation jde.ini file before you have set up the server jde.ini, you could be requesting a service on the server that is not yet available, which generates an error.

2. Locate the jde.ini file that will be sent to the workstation as part of a package installation. This file is located on the J.D. Edwards software deployment server in the following release share path:

```
\\B xxx\CLIENT\MISC\jde.ini
```

   where *xxx* is the installed release level of OneWorld, such as B732.

3. Using an ASCII editor such as Notepad, view the jde.ini file to ensure accuracy of the following settings:

```
[TP MONITOR ENVIRONMENT]

Status=status value

LogPath=log path

LogStatements=log on/off value

LogBufferSize=log buffer value

RequestedService=service value

Server=server name

ServerTimeout=timeout value
```

   The following table explains the variables in the jde.ini:

Setting **Value**

Status

This setting indicates whether transaction processing is on. The transaction processing monitor typically should be on unless you are not using transaction processing in any of your applications, or if you want to temporarily disable transaction processing, such as for testing. Valid values are ON and OFF. As of B73.2, transaction processing cannot be turned off, so this value is ignored in versions B73.2 and higher.

LogPath

This setting specifies the directory in which the transaction logs are placed. This path should correspond to the location of your jde.log and jdedebug.log.

For example, on a UNIX machine, the path might be:

`/u10/owdevel/tc283984/b73.2`

LogStatements

This setting specifies whether the transaction monitor should keep a log of every operation performed within a transaction. Valid values are ON and OFF.

LogBufferSize

This setting indicates the number of bytes that are reserved for the operations that are logged in memory before they are copied to disk. This value is a J.D. Edwards software internal default value and should not be changed.

RequestedService

This setting specifies the service that the client requests from the server. Valid values are:

- TS: Time stamp service is requested
- NONE: No service is requested

Server

This setting specifies the server that is hosting the Transaction Management Server. For example, a server name might be `intelnta`.

ServerTimeout

This setting indicates the timeout in seconds for all of the network operations. This value can be adjusted based on the network traffic. It is required for the workstation jde.ini file. It is also necessary for the server jde.ini file in case a batch job is running on the server. This value is a J.D. Edwards software internal default value and should not be changed.

The last three lines of the section pertain to record change detection and must be set if you want the workstation to perform *record is changed* database locking.

Note

Instead of deploying a package, you can manually copy the jde.ini file to all workstations.

See Also

- *Understanding Transaction Processing Logging* in the *Development Tools Guide* for more information about logging

Settings for the [LOCK MANAGER] Section (B73.3 and higher)

The following tasks describe how to enter settings for the [LOCK MANAGER] section of the jde.ini file, both for the server and for the workstation. The system uses these settings even if you entered values for the [TP MONITOR ENVIRONMENT] section.

► To enter [LOCK MANAGER] settings for the server

1. Locate the jde.ini file on the enterprise server.
2. Using an ASCII editor such as Notepad, view the jde.ini file to ensure the accuracy of the following settings:

```
[LOCK MANAGER]
Server=server name
AvailableService=available server service
RequestedService=client service request
```

The following table explains the variables:

Setting	Value
Server	This setting specifies the name of the lock manager server to be used to process records. For example, a server name might be `intelnta`. If the client is used as a server, such as in cases where batch applications are running on the workstation, this setting must match the same entry in the [LOCK MANAGER] section of the jde.ini file on the workstation.
AvailableService	This setting indicates the available service of the server. Valid values are: • TS: Time stamp service is available • NONE: No service is available This setting applies only to servers.
RequestedService	This setting indicates the type of service that the client requests from the server. Valid values are: • TS: Time stamp service is requested • NONE: No service is requested

Caution

Enable transaction processing on the server before you enable it on the workstation. If you try to set up the workstation jde.ini file before you set up the server jde.ini, you could be requesting a service on the server that is not yet available, which generates an error.

► To enter [LOCK MANAGER] settings for the workstation

1. Locate your workstation jde.ini file.
2. Using an ASCII editor such as Notepad, view the jde.ini file to ensure the accuracy of the following settings:

```
[LOCK MANAGER]

Server=server name

RequestedService=client service request
```

The following table explains the variables:

Setting	Value
Server	This setting specifies the name of the lock manager server to be used to process records. For example, a server name might be `intelnta`. If the client is used as a server, such as in cases where batch applications are running on the workstation, this setting must match the same entry in the [LOCK MANAGER] section of the jde.ini file on the workstation.
RequestedService	This setting indicates the type of service that the client requests from the server. Valid values are: • TS: Time stamp service is requested • NONE: No service is requested

Record Locking

J.D. Edwards software does not implement any data-locking techniques. It relies on the native locking strategy of the vendor database management system. This process improves performance by reducing duplication of efforts.

In some specific situations, the vendor database does not automatically lock as needed. In these situations, you can use explicit instructions to J.D. Edwards software to control data-locking. For example, you can use record-locking to ensure the integrity of the Next Numbers feature.

Understanding Record Locking

You can lock J.D. Edwards software data using one of the following methods:

- Optimistic Locking

  You can use optimistic locking (sometimes referred to as *record change detection*) to prevent a user from updating a record if it has changed between the time the user inquired on the record and when the user updates the record.

- Pessimistic Locking

  You can use pessimistic locking to prevent attempts to update the same record at the same time. The record is locked before it is updated.

Optimistic Locking

You can turn on record change detection within the workstation jde.ini file. This type of database locking prevents a user from updating a record that changes during the time the user is inquiring about it. If the record has changed, the user must select the record again

and then make the change. This feature is available for business functions, table I/O, and Named Event Rules.

For example, assume that two users are working within the Address Book application The following table illustrates record change detection:

Time	Action
10:00	User A selects Address Book record 1001 to inspect it.
10:05	User B selects Address Book record 1001 to inspect it. Both users now have Address Book record 1001 open.
10:10	User B updates a field in Address Book record 1001 and clicks OK. J.D. Edwards software updates Address Book record 1001 with information that User B entered.
10:15	User A updates a field in Address Book record 1001 and clicks OK. J.D. Edwards software does not update Address Book record 1001, and the system displays a message informing User A that the record has changed during the time that User A was viewing it. For User A to change the record, User A must reselect it and then perform the update.

When the system detects that a record change has occurred, it displays a message that indicates that the record has been changed since it was retrieved.

Pessimistic Locking

Pessimistic locking is sometimes simply referred to as record locking. You can use record locking to prevent multiple users or applications from updating the same record at the same time. For example, suppose a user enters a transaction that uses Next Numbers. When the user clicks OK, the Next Number feature selects the appropriate Next Number record, verifies that this number is not already in the transaction file, and then updates the Next Number record by incrementing the number. If another process tries to access the same Next Number record before the first process has successfully updated the record, the Next Number function waits until the record is unlocked, and then completes the second process.

Record locking in J.D. Edwards software is implemented by calling published JDEBase APIs. When you use record locking, you should consider the time required to select and update a record because the record is locked until the update is complete. Transaction processing uses a special set of locking APIs. A locked record might or might not be part of a transaction. Record locking APIs are independent of the transaction and its boundaries. They always lock, regardless of whether you are in manual or auto commit mode.

Records that are updated using record locking APIs (such as JDB_FetchForUpdate or JDB_UpdateCurrent) within a transaction boundary are locked from the time the record is selected for update until the commit or rollback occurs. Records within the transaction boundary that are updated without using record locking APIs are locked from the time of the update until the commit or rollback occurs. This is also true if you use a business function to define and activate transaction processing.

Using Pessimistic Record Locking Within a Transaction Boundary

You might need to use record locking in conjunction with transaction processing. For example, if you want the system to lock records between the read operation and the update, you must use record locking.

Business Functions and Pessimistic Record Locking

You might want to use record locking in a business function if the business function updates a table. The table being updated should have a high potential for record contention with another user or job. Remember that you should lock records for as short a time as possible. Ensure that the select or fetch for an update occurs as closely to the update as possible.

Currency

Enterprises that do business internationally have additional accounting needs and added complexity. This complexity arises from doing business in different currencies and having to follow different reporting and accounting requirements. Some fundamental requirements for an international enterprise include:

- Conversion of foreign currencies to the local currency
- Conversion of the different local currencies into one currency for reporting and comparisons
- Adhering to regulations defined in the countries of operation
- Revaluation of currencies due to fluctuation in exchange rates

Currency Implementation

J.D. Edwards software currency implementation includes the following features:

- Currency retrieval is accomplished through database triggers and table event rules.
- Currency retrieval logic is handled in business functions.
- System APIs assist you in accessing cached tables.

Advantages

J.D. Edwards software allows developers to control currency retrieval. Allowing developers, instead of the system, to control currency, provides greater flexibility and easier maintenance. Some of the advantages in allowing developers to control currency are:

- Additional currency tables do not require changes to system modules. Only new business functions need to be added.
- Business logic is captured in business functions, rather than in a system module that assumes knowledge of business logic.
- Table event rules allow you to attach currency retrieval logic at the table object level.
- Table event rules are triggered by table events instead of application events.
- Any applications that use the table that has currency business functions attached to it receives the same logic, so you do not need to modify each application.
- No hard-coded logic is embedded in the runtime engine.

Working with Currency

When identified amounts are written to or retrieved from a database, or when they are used in calculations during processing, proper decimal placement is extremely important. Currency implementation is needed to adjust decimal placement on Math_Numeric currency fields according to a specified currency. Common applications of currency implementation include conversion of currency amounts and revaluation of currency due to fluctuations in exchange rates.

Implementing currency involves the following steps:

- Performing currency setup.
- Creating a business function that contains logic to retrieve currency information. Currency business functions are known as currency triggers.
- Attaching a currency trigger to the *Currency Conversion* event in Table Event Rules (TER).
- Designing the TER functions through Event Rules Design. The system then converts the event rules to C and compiles them into a consolidated DLL through the Object Configuration Manager (OCM) Application.
- Modifying applications as necessary.

The JDB APIs then calls the appropriate TER function when the *Currency Conversion* event is triggered.

Understanding the Build Triggers Option

The Build Triggers option performs the following steps:

- Converts event rules to C source code.

  This creates the files *OBNM.c* and *OBNM.hxx* (where *OBNM* is the Object Name). The source file will contain one function per TER event.

  For example, if you are working with the Accounts Payable Ledger table (F0411), the Build Triggers option creates a C source member called F0411.c. You can browse through the C code and ensure that all of the parameters are set up correctly. The system generates an error log if an error occurs during the ER-to-C conversion. The error table is called eF0411.log.

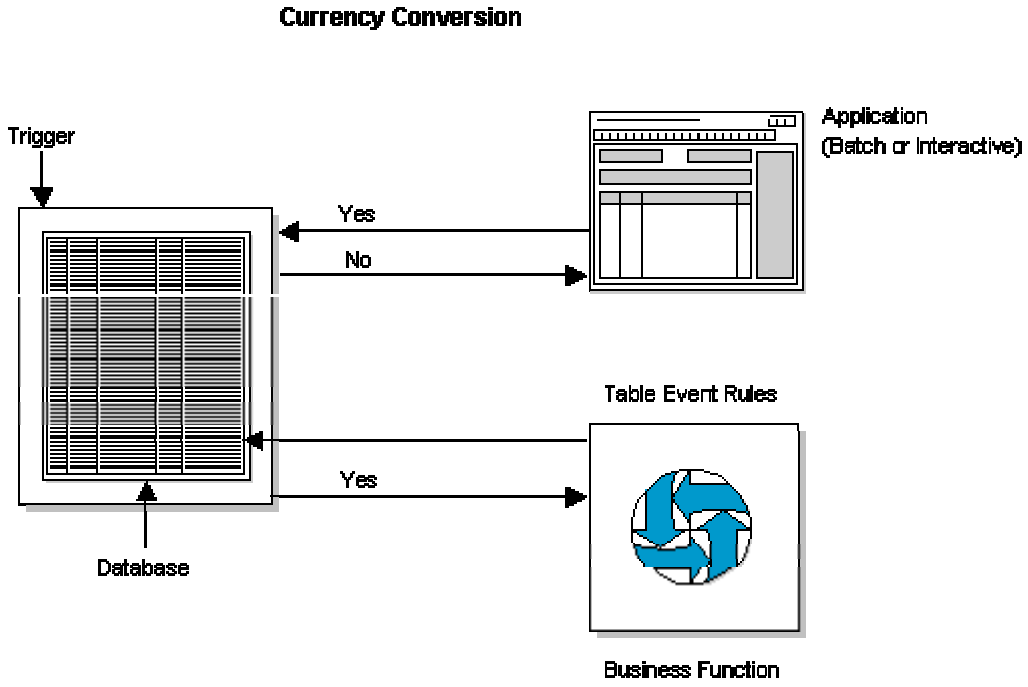
- Compiles the new functions and adds them to JDBTRIG.DLL. This is the consolidated DLL that contains TER functions.

Understanding How Table Event Rules Work with Currency Processing

The *Currency Conversion* event runs if currency processing is enabled.

Table triggers for currency run after the record is fetched and before the record is added to the database.

The following graphic illustrates the currency conversion process:



On FETCH:	On ADD/UPDATE:
1. Application requests data.	1. Application sends data.
2. Is currency on?	2. Is currency on?
3. If yes, run currency trigger.	3. If yes, run currency trigger.
4. Currency Trigger calls TER, The TER:	4. Currency Trigger calls TER. The TER:
• Executes the business function	• Executes the business function
• Performs the business logic	• Performs the business logic
• Scrubs data accordingly	• Scrubs data accordingly
5. Return data to database, and then to application	5. Update database.

When passing Math_Numeric currency fields into a business function, the currency values in the respective data structure must be populated. Math_Numeric work fields that contain currency values also need the proper currency information.

You can copy currency information to controls (work fields or others) in event rules by using the system function Copy Currency Info. You can call the currency triggers from within an application's event rules or from another business function.

Setting Up Currency Conversion

If your business uses more than one currency, you must designate the method of currency conversion to use.

► To set up currency conversion

From the Multi-Currency Setup menu (G1141), choose Set Multi-Currency Option.

1. On System Setup, click General Accounting Constants.
2. On General Accounting Constants, enter a value in the following field:
   - Multi-Currency Conversion (Y, N, Z)

The currency conversion flag is stored in Company Constant table (F0010) in the CRYR field for Company 00000.

You can set the Multi-Currency Conversion option to N so that currency conversion does not occur in JDB and the runtime engine.

Showing Currency-Sensitive Controls

When you design an application, you can decide whether to hide or show currency-sensitive controls, such as check boxes and radio buttons, at runtime.

► To show currency-sensitive controls

1. On Form Design, double-click the control that you want to appear on the form.
2. Click Control Options.
3. If you want to display currency fields, verify that the No Display if Currency is Off option is turned off.

   When the No Display if Currency is Off option is on, currency-sensitive controls do not appear. If No Display if Currency is Off option is turned off, currency fields are visible.

You must exit your current J.D. Edwards software session and begin a new one to apply currency conversion changes.

Creating a Currency Conversion Trigger

If the table that you are using contains currency fields, you must specify how many decimal places exist in each column. When the source or destination fields are currency fields and you have not created a currency trigger, problems might arise if the value is used in a calculation. If you do not create a currency conversion trigger, the system cannot determine where to locate the decimal within a field.

► **To create a currency conversion trigger**

1. From Object Management Workbench, check out the table to which you want to attach event rules.
2. Ensure that the table is highlighted, and then click the Design button in the center column.
3. On Table Design, click the Design Tools tab, and then click Start Table Trigger Design Aid.
4. On Event Rules Design, choose the Currency Conversion event and attach the currency trigger that you want to use.
5. Click the Business Functions button.

   The Business Function Search form appears.

   Use the QBE line to search for selected business functions. You can use Category CUR or System Code 11 to find existing currency business functions. To read notes that describe the purpose of the business function, its parameters, and program requirements, click the Attachments button.
6. Choose the business function with which you want to work, and then click Select.
7. On Business Functions, attach the table columns to the business function structure, and then click OK.

   The available objects that appear are for table column only.
8. On Event Rules Design, click Save, and then click OK.
9. On Table Design, click the Table Operations tab, and then click Generate Table.
10. Choose the data source for the table, and then click OK.
11. On Table Design, click the Design Tools tab, and then click Build Table Triggers.

The system creates the table event rule. The newly created or modified table event rule functions are now called from the database APIs whenever the corresponding event occurs against the table.

Tips of the Day

J.D. Edwards provides tips of the day with many J.D. Edwards software applications. Tips of the day are sets of short informational text that appear each time that the user launches an application or accesses a form. You can change these tip sets or create your own. Tips of the day appear sequentially, so the user can browse through the tips. When the user closes the tip form, the system records where in the tip sequence the user is and displays the next tip when the user launches the object again.

Working with Tips of the Day

In J.D. Edwards software, tips of the day are the glossary texts of data dictionary items. You create one data dictionary item for each tip. Since you can translate data dictionary glossaries, tips of the day can appear in different languages.

You can associate tips with an application, a form, or an application version. The tips appear in the order that you specify, and you can override a user's option to turn off the tip of the day feature for the tip set.

After you have associated tips with an object, you can rearrange the tip order, add new tips, or delete existing ones from the tip set.

Before You Begin

- Create a data dictionary item with glossary text for each tip of the day. See *Creating a Data Item* in the *Development Tools Guide* for more information about creating data dictionary items.

► To work with the Tip of the Day utility

From the System Administration Tools menu (GH9011), choose Tip of the Day.

1. On Work With Tips of the Day, click Find to see the objects to which tips have been added.

   To limit your search, enter an application name in the Application Name field.

   A tree-style file structure appears on the left side of the form. Each object has its own folder. Tips can be associated with applications, forms, or application versions. Folder names include the application, form, and application version, in that order. For example, RDA\\ indicates the RDA application alone. *P0911\V0911I\ZJDE0001* indicates form V0911I in the ZJDE0001 version of application P0911.

2. To see the specific tips associated with an object, expand the folder for the object.

   The data dictionary items associated with the object as tips appear in the file structure.

3. To view the text for a tip, click the tip.

   The glossary text associated with the data dictionary item appears on the right side of the form.

4. To change the order of the tips or to add or delete tips for an object that already has tips associated with it, double-click one of the tips under the object.

   The Tips of the Day Revisions form appears.

► To add tips of the day to an object

You can add tips to an application, form, or application version that does not already have tips associated with it. To add tips to an existing tip set, double-click one of the existing tips on the Work With Tips of the Day form to access the Tips of the Day Revisions form.

1. On Work With Tips of the Day, click Add.
2. On Tips of the Day Revisions, complete the following fields:
   - J.D. edwards ERP Tool
   - Force tip to all users
3. In the detail area, add a data dictionary item for each tip that you want to associate with the application. Complete the following columns for each row:

- Tip Sequence
- Data Item

Note
You cannot add a data dictionary item to the tip set if it does not have glossary text.

4. Click OK.

Messaging

Use J.D. Edwards messaging features to communicate pertinent information to the end user in the most effective and user-friendly manner. When you design an application to use messaging, you must evaluate what information is necessary to enable a user to accomplish a task. You can deliver a message in real time, whereupon the message is displayed on the status bar. The method that you use to provide information to the user depends on the situation. For example, you can do the following:

- Use an interactive error message if the system encounters an error during the entry of a record.
- Use an informational message that the system sends to the Workflow Center if information needs to be conveyed and responded to.
- Use an alert message if information is urgent and requires immediate attention.
- Use a batch error message if the system detects errors in a batch process, such as while a report is running.

The three components to creating system-generated messages are as follows:

- The message itself

  Do you require a simple message or a text substitution message? Are all of the text substitution pieces available?

- The logic that applies to the message

  Has certain criteria, such as event rule logic, been met so that a message should be sent?

- The message type

  For example, does the message require action by the users? Are all of the required parameters available at the time the message is to be sent?

Message Types

The system provides two main types of messages, as follows:

- Error and warning messages
- Information messages

  Information messages can also be action messages that enable the user to connect from a current form to another form that will allow them to correct an error, or to evaluate information and then take action. To use action messaging, you must ensure that the parameters for the connecting form are available at runtime.

Within these message types you can use simple messages or text substitution messages. Text substitution messages allow you to use variable text substitution. The system inserts substitution values into the message for the appropriate variable at runtime. This provides the user a customized message unique to every instance of the message.

Text substitution messages are of two types, as follows:

- Error messages (glossary group E)

- Workflow messages (glossary group Y)

Both types are created in the same manner.

Error Messages

Error messages are messages that are used to inform users whether information has been entered incorrectly (for instance, entering a three-digit UDC code that doesn't exist) or if the system encounters technical difficulties retrieving information. Typically, error message tell the user how to proceed.

Error messages are stored in the data dictionary. The primary data dictionary design tool is the Data Dictionary Application (P7992002).

Workflow Messages

In addition to sending and receiving internal and external messages, you can receive an active message, which is a type of message that a system workflow process automatically sends to a recipient.

Active Messages

Workflow processes sometimes generate messages that require you to take action, such as approving or rejecting a change to a customer record. A lightning bolt icon identifies an active message.

Active messages contain a shortcut icon that links directly to an application. When you click the shortcut icon, the system retrieves the most current information from the database, which ensures that you get accurate information even if changes are made after an active message is sent to you.

You can set up a workflow process to send active messages to specific queues.

Level Messages

Level messages are used to categorize error messages into the proper level break within a report. They are like a container for messages. Level messages can be thought of in terms of "Here are your batch errors" or "Here are the document errors," and so on. Level messages are used to separate every logical grouping of error messages. Messages that begin with "LM" are level messages. Level messages that belong to glossary group "Y" indicate that they are workflow messages.

Information Messages

Messages that are not level messages ("LM") but are in glossary group "Y" are considered informational messages. These messages supply pertinent information to the user and usually require that action be taken.

Understanding Error Handling

Use error handling to prevent your program from being shut down by the operating system.

Event-Driven Model

Interactive messages appear whenever a specific event occurs. This means that errors clear, set, and display based on certain events. When an error occurs within an event, the event then runs again to clear the error.

For example, suppose the user types an incorrect value in a field. An error is set when the *Control is Exited* event is run (if you have assigned logic on this event or a high-level trigger is causing validation of the field). The user receives notification of the error through a visual cue (the field in error typically appears in red). In addition, the status bar displays information about the error. For more information about why the error occurred and how it can be corrected, the user can press the F8 function key (or the F7 function key if multiple errors occur and the user needs to view the errors on a form in sequence).

The user corrects the error by entering a valid value, and then exiting the field. This causes the same *Control is Exited* event to be run again, which clears the error and sets it again in the event that another incorrect or invalid value is entered again. If the value entered is valid, no error is set.

When is an Error Set?

When a user enters data in a form field or grid cell and presses the tab key to move out of the field, the runtime engine validates the value that was entered. You set an error so that if the validation process fails, (for example, if a value is not found in the appropriate UDC table, or an invalid date has been entered), the system issues an error with the appropriate error code and highlights the field. The system displays the error message and the message count on the status bar.

How Does the Application Know Which Field to Highlight?

When the system issues an error, the handle is on the field in error. If the error is within a grid, then the system identifies the row and column coordinates of the particular grid cell. The system stores this information in an Error_Ctrl_Key structure, along with the application form handle. When the system displays the error, it changes the color of the control and displays the error information from the error link list. If you use the system function *Set Control Error or Set Grid Cell Error,* you can specify the field or cell to highlight.

How Is an Event ID Used for Error Setting?

J.D. Edwards software applications are event-driven. Each keystroke or mouse click is considered an event. When a user enters a value in a control and tabs out of the field, the *Leave Control* event or *Leave Column* event validates that field. All errors are set using the event ID in the Error_Event_Key structure. This event ID is used to clear the errors that were set on this event when the event is reprocessed. For example, when the user enters an invalid address book number and tabs out of the field, an error is displayed. This error is set with the Control Handle, Event ID and Grid Cell Coordinate (if any). To clear this error, the user must enter a valid address book number and tab out again. The error is cleared if no more errors are found on this control.

Error Setting

Errors can either be set automatically or manually.

Automatic Error Setting

The runtime engine validates a field and automatically sets errors in the following instances:

- The item is a data dictionary item, for which an edit rule trigger has been defined in the data dictionary. In this case, the field for the data item is validated across all J.D. Edwards software applications. Data dictionary triggers can also be assigned or redefined using overrides within the Form Design tool. However, in this case the trigger for the data item is specific to the application where the override was defined.
- Validation is performed when the *Control is Exited* event, *Column is Exited* event, or OK Button Processing occurs. You can use validation to check for situations such as invalid data or invalid dates.

Manual Error Setting

You can use either a system function or a business function API to set other error messages.

System Function

You can use a system function for setting an error message. The following system functions are available for this purpose:

- Set Edit Control Error
- Set Grid Cell Error

You use *Set Edit Control Error* to set an error on a Form Control field through event rules. You pass in the following parameters as system function arguments:

- Control (for example, the field that is in error)
- Error Code (a literal in this case means the error message created through the Data Dictionary Application (P7992002) or a variable)

You use *Set Grid Cell Error* to set an error on a Grid Control field through event rules. You pass in the following parameters as system function arguments:

- Grid (does not receive any value)
- Row Number
- Column Number
- Error Code

System functions cannot use data items with text substitution.

Business Function API

You use business functions to manually set error messages. Use one of the following business function APIs to set an error message without text substitution:

- jdeErrorSet (lpBhvrCom, lpErrInfo, idItem, lpzError)
- jdeSetGBRError (lpBhvrCom, lpVoid, (ID)0, "Error#")

The following example is an error message without text substitution:

```
{
    jdeSetGBRError(lpBhvrCom,lpVoid,IDERRcRetainedEarningsLedger_3,”4524”);
    idReturn = ER_ERROR;
}
```

The return code successful message has no influence on what happens next. It is used for information.

Use one of the following business function APIs to set an error message with text substitution:

- jdeErrorSet (lpBhvrCom, lpvoid, idItem, lpzError, lpDs) sets errors through business functions using substitution text. It always gets called.
- jdeSetGBRErrorSubText

JdeSetGBRError and jdeSetGBRErrorSubText work the same except that jdeSetGBRErrorSubText has an additional parameter in which you pass the address of the data structure that holds the information you want substituted in.

The following example is the setup for a text substitution error message:

```
/**************************************************************************
* Declare structures
**************************************************************************/
DSDE0018   dsDE0018;.
.
.
/**************************************************************************
* Main Processing
**************************************************************************/
    strncpy(dsDE0018.szAccountID, (const char *)(lpDS->szAccountID),
            sizeof(dsDE0018.szAccountID));
.
.
.
if (idReturn != ER_SUCCESS)
    {
            jdeSetGBRErrorSubText(lpBhvrCom, lpVoid,
            IDERRszAccountID_1, ”044E”, &dsDE0018);
            JDB_CloseTable(hRequestF0901);
            JDB_FreeBhvr(hUser);
            return ER_ERROR;
```

```
}
```

In this example, DSDE0018 is the data structure for the error messages and is declared in jdeapper.h. Jdeapper.h is where all of the data structures are declared for text substituted error messages used by J.D. Edwards. Non-J.D. Edwards substituted error messages should be defined in their own global declaration header file or in the function's header file that is using the structure. The line IDERRszAccountID_1 in this example contains the values to substitute.

A business function may call a validation routine (jdeddValidation), which when called may set an error if the field in question is invalid.

To use text substitution error messages in C business functions, you create an instance of a data structure in the global header file for every custom business function. If the error data structure exists, it should exist in jdeapperr.h

Resetting Errors

The system can reset errors on the OK button or on the Find button. This action occurs on both manual and automatic errors.

Resetting Errors on the OK Button

The system resets errors when the OK button is clicked on a header detail form or a headerless detail form. The following actions occur:

5. Setup Error_Event_Key structure with event *Button Clicked,* the control handle is the OK button.
6. Clear event errors on OK *Button Clicked*.
7. Clear error due to the following events:
    - *Button Clicked Processing Done*
    - *Add Record to DB - Before*
    - *Add Record to DB - After*
    - *Update Record to DB - Before*
    - *Update Record to DB - After*
    - *All Grid Recs Added to DB*
    - *All Grid Recs Updated to DB*
    - *Delete Record from DB - Before*
    - *Delete Record from DB - After*
    - *All Grid Recs Deleted from DB*
    - *Delete Grid Rec Verify - Before*
    - *Delete Grid Rec Verify - After*
    - *Row is Exited*
8. Stop processing if error still exists.
9. Perform event rule on *Button Clicked*.
10. ValidateAllData - including form controls.

11. Stop processing if error occurred.
12. Delete any rows that were removed from the grid.
13. Perform event rule for Add or Update to Database Before or After.
14. Perform grid changes (validate any unprocessed grid row).
15. Stop processing if error occurred.
16. Perform event rule on *After Button Clicked*.
17. Stop processing if error occurred.
18. Otherwise, clear screen and exit.

Note

Do not try to validate and set errors on any grid control field for the *Button Clicked* event on the OK button. The *Button Clicked* event will not process all the grid rows.

Resetting Errors on the Find Button

The system resets errors on the Find button. It performs the following steps:

19. Setup Error_Event_Key structure with event *Button Clicked*.
20. Clear event errors on OK/Select *Button Clicked*.
21. Clear errors due to the following events:
    - *Button Clicked*
    - *Last grid record has been read.*
    - *Form Record is Fetched*
    - *Grid Record is Fetched*
    - *Confirm Delete - Before*
    - *Confirm Delete - After*
22. Perform event rule on *Button Click*.

Multilevel Error Messaging for C Business Functions

When a business function calls another business function and the error is issued from the second business function, you must provide a mapping key array. Otherwise, errors will be set incorrectly.

When you use jdeCallObject (the standard API for calling other business functions from within a business function) for the second business function call, the sixth parameter is for error mapping. Each business function has its own header and definition. You need to know why you are calling the second level business function. For example, assume that you are calling a second level business function to validate the company number. You must have the company number ID in the first business function header so you can determine the company number ID in the second business function.

► To create multilevel error messaging

1. Open the header file for the called business function and determine the maximum number of possible mapping fields.

Calling Function's Header File	Called Function's Header File
#define IDERRszComputerid_1 1L	#define IDERRcHeader_1 1L
#define IDERRszCompany_2 2L	#define IDERRcEvent_2 2L
#define IDERRszDate_3 3L	#define IDERRDetail_3 3L
#define IDERRszValue_4 4L	#define IDERRCompany_4 4L
#define IDEERszPoint_5 5L	#define IDERRDateOpen_5 5L

2. Create an Error map section in the C file for the calling business function.

   In the following example of an active error message, you need to map one field (IDERRCompany_4).

```
/************************************************
* Business Function: B1234
*
*
* Parameters:
*         LPBHVRCOM
*         LPVOID
*         LPDS1234
************************************************/
/************************************************
* Error Mapping Section
*
* Map to function ”ValidateCompanyNumber”
* #define N1234 1
************************************************/
```

   The number 1234 is the data structure number of the called business function. The number 1 is the number of mapped fields.

   Before each #define statement, include a comment that refers to the business function name for which this number will be used.

   In the variable section, create a *cm_xxx* map array for each function that needs to return errors.

For example:

```
/*********************************************

* Variable declarations

*********************************************/

CALLMAP            cm_1234[N1234]={{IDERRCompany_2,IDERRCompany_4}};
```

The array is mapped from IDERRCompany_2 to IDERRCompany_4.

The function call to jdeCallObject is:

```
idReturn = jdeCallObjdect("ValidateCompanyNumber", ValidateCompanyNumber,
lpBhvrCom,lpVoid, &ds1234, cm_1234, N1234, (char *)NULL, (char *)NULL, (int)0);
```

The business function sets the error on the ID field.

Working with Error Messages

J.D. Edwards software automatically displays messages based on certain events. For example, you can display an error message whenever an invalid value has been entered into a field.

J.D. Edwards software uses the data dictionary glossary to display messages. The message is contained within the glossary portion of a data item. By using the existing framework of the data dictionary, you do not have to create a separate messaging system.

Locating an Existing Error Message

Whenever possible, you should use an existing message instead of creating a new one. Use Work with Glossary Items to locate an existing message. You can narrow your search by using glossary group types and descriptions similar to the error message that you want.

► To locate an existing error message

From the Data Dictionary Design menu (GH951), choose Work With Data Dictionary Items.

1. On Work With Data Items, choose Glossary Data Item from the Form menu.
2. On Work with Glossary Items, complete any of the fields in the header area to filter your search to specific error messages and click Find.
3. Choose the message that you want to use and click Select.
4. Click the Item Glossary tab to preview the text for the error message.

Creating a Simple Error Message

Simple error messages (static messages) contain literal text-- for example, "Enter a valid date." Simple error messages do not use text substitution.

Adding an Interactive Message Data Item

You can create a new data item or choose an existing item to display a message. Before the error message is functional, you must connect it to a form control by using event rule logic.

► **To add an interactive message data item**

1. On Work With Glossary Items, click Add.
2. On Glossary Items, click the Item Specifications tab, and then complete the following fields:
   - Glossary Group
   - Product Code
   - Description
   - Error Level
3. Click OK.

Creating a Text Substitution Error Message

A text substitution error message is an error message that allows variable text to be substituted directly into the glossary text for the error message. This allows you to display the same basic message with certain variable values.

For example, assume that a user enters an invalid search type in a field. The error message "Search type *xx* is not contained in the 00 ST table" appears. The system will replace the *xx* variable in the message by the search type that the user entered.

If you want to use text substitution error messages in batch processes, you must create a business function to pass values to the data dictionary data structure. The event rule engine (set user error) will not pass values to the text-substituted error message.

Adding an Interactive Message Data Item

You can create a new data item or choose an existing item to display a message. Before the error message is functional, you must connect it to a form control using event rule logic.

This example creates an error message in the Data Dictionary for error ID 018A.

► **To add an interactive message data item**

1. On Work With Data Items, choose Glossary Data Item from the Form menu.
2. On Work with Glossary Items, click Add.
3. On Glossary Items, click the Item Specifications tab, and then complete the following fields:
   - Glossary Group
   - Product Code

- Description
- Error Level

When you type the description, use *&* followed by a number for each subset variable. In this example, the short description is `&2 not found in User Defined Code &3 &4`.

Now you are ready to define the glossary text to display at runtime.

Defining the Glossary Text for a Runtime Message

After you add an interactive message data item, you must add a glossary for that item.

► To define the glossary text for a runtime message

1. On Work with Glossary Items, choose Glossary from the Row menu.
2. Type the text of your message.

   Use *&x* to assign variables in the text. These variables correspond to members in a data structure.

   The order of the data structure is the index of the *&x* structure. If the structure contains four members, assign &1 to the first member, &2 to the second, and so on. For example:

   Description = &1

   UDC Value = &2

   System = &3

   Type = &4

3. When your text is complete, click OK.

Note
Type a period with no blank spaces at the end of your glossary so that you do not have any repetition problems.

Attaching a Data Structure Template to a Message

Each text substitution error message requires a corresponding data structure. If the data structure does not already exist, then you must create it. You must ensure that the members in your message match the members in your data structure.

See Also

- See *Data Structures* in the *Development Tools Guide* for information about adding a data structure

► To attach a data structure template to the message

1. On Glossary Items, click the Data Structure Template tab.
2. To locate an existing structure, click Text Substitution, and then the Browse button.
3. On Individual Object Search & Select, choose a data structure and click OK.

   If no existing structure meets your needs for the interactive message, you must create one.

Attaching an Interactive Message Data Item

To make an interactive error message appear at runtime, you must attach a system function.

► To attach a message data item

1. On Event Rules Design, click the system function button.
2. Choose the system function that you want to use.
3. Use available objects to complete the control value in Parameters.
4. Choose <Literal> for the Error Code Value in Parameters.

   Use the number of the data dictionary item that contains the error message that you want to appear for the literal value.

Working with the Send Message System Function

The Send Message API is associated with the following tables:

- F01131 - PPAT Message Control File
- F01131M – JDEM Multi Level Message
- F01133 - PPAT Message Detail File
- F00165 - Media Objects Storage

The PPAT Message Control File table and the PPAT Message Detail table (F01133) are used by the Message Center application for delivery of messages. They contain information about who is to receive the message, the current status of the message, who sent the message, what date the message was sent, which mailbox the message belongs to, and all other pertinent mail delivery information. The Media Object Storage table (F00165) contains the subject and body of the message.

The Send Message system function is made up of three components:

- The addressing and destination
- The message, with or without text substitution
- The action message, the act of calling other programs from a message

The following table lists the parameters and their functions for the Send Message system function.

Parameter	Description	Typical Values	Mandatory
Address Number	The address book number of the person who is to receive the message.	Address Book Number - Data Dictionary item AN8	Yes
Mailbox	The mailbox to which the message should be delivered (for example, "Personal in Basket")	The two-character field associated with a Mailbox, which is found in UDC 02/MB.	Yes
*Subject	The subject of the message.	A brief description of the message, or Blank if a message template is used.	No Choose "None" if a message template is to be used.
*Text	The main body of the message.	The message that will be sent, or Blank if a message template will be used.	No Choose "None" if a message template is to be used.
Active	A value that indicates whether a connection exists between the message being sent and another form.	When this item is used, the user is prompted through the form interconnect process.	No
DDMessage	The message template from the data dictionary.	Any valid data dictionary item whose glossary can be used for a message.	No
MessageKey	A returned parameter that holds the key value for the message sent.	Data dictionary item (for example SERK).	No

If the Subject and Text fields are used in conjunction with the DDMessage field, then the DDMessage (MessageTemplate) will be concatenated with the Subject and Text fields.

▶ To use the send message system function

1. On Object Management Workbench, check out the table with which you want to work.
2. Ensure that the table is highlighted, and then click the Design button in the center column.
3. On Table Design, click the Design Tools tab, and then click Start Table Trigger Design Aid.
4. Click System Functions, and then click the Function Selection tab.
5. In the Function Selection pane, choose Messaging, and then choose Send Message.
6. Under Parameters, complete the Recipient field to designate who is to receive the message.

This field typically uses an address book number. You can also use an e-mail address here.

7. Designate the Mailbox.

   The mailbox indicates what type of message is being sent. Mailboxes are stored in the UDC table 02/MB. Mailboxes from UDC table 02/MB appear when focus is on the Mailbox field.

8. Click the data item called Active, and then choose Define Active Message to begin the form interconnection process.

   The active message portion of the message works similarly to form interconnections from event rules.

Defining an Active Message

Complete the following task to define an active message.

► **To define an active message**

1. Double-click Define Active Message.

   Work with Applications appears.

2. Choose the application with which you want to work.
3. Choose the form with which you want to work.
4. Choose the version with which you want to work (if necessary).

   The Processing Options form might appear if processing options are attached to the form.

   The Form Interconnections form appears, on which you can assign all of the values to be passed.

5. Designate the values that you want to pass and then click OK.
6. On System Functions, choose Define Message.

   The system prompts you to choose a message.

7. Enter the appropriate alias in the Dictionary Item field and click Find.

   The substitution points are numbered &1, &2, and so on. The parameter numbers correspond to the substitution numbers. Substitution variables can appear in both the description and the glossary of the message.

8. Map the appropriate objects to the substitution parameters to complete the message.

Batch Error Messages

The error message system gives users a consistent interface to review errors when working with batch programs. When a batch program has finished processing all messages regarding the success or failure of a job, the system sends a message is sent to the user. To enhance the usability of the messages, the system uses a tree structure (or parent/child structure) to group related messages. To provide additional flexibility and functionality, you can use text substitution, and you can make a message "active," meaning that the user can open an associated form by clicking within the message.

Understanding Batch Error Messaging

The Work Center displays the error messages that appear after a batch job has completed. When you create these batch error messages, you need to determine the possible messages J.D. Edwards software users will need. For example, you might create a number of different messages that are generated when a journal entry report is run. You can create a message stating that the report completed normally if the report balances. Additionally, you can create multiple levels of messages describing various errors if the report is out of balance. The first level might state that the report completed with errors, and additional levels would explain the specific details about the errors.

Level-Break Messages

A level-break message is a message that acts as a container for other error messages that are produced by the batch process. Level-break messages can be action messages, which contain a shortcut to an application and require action on the part of the user. They can also be messages that require no action, but that might instruct the user to review some information.

To understand the role of level-break messages, you must examine how errors occur in batch jobs. Most errors are created by edits that occur at level breaks in the entire batch process. You typically want to group any errors that might have occurred at these different level breaks. The mechanism that you use to group these errors is the level-break message. This implies that for each reporting program that uses the Work Center application program interface (API) to manage errors, you need to create one level-break message for each phase of level-break.

Understanding How Level-Break Messages Work

Level break and action messages are used to group (or package) one or more errors.

All individual messages are level-break messages except for the final error messages. The Work Center API creates and manages Job Completed level-break messages, but you create all other messages. The level-break messages are not error messages. They are packaging or categorizing messages that you set up to communicate to the user information about in the batch, document, line, and so on, in which the error occurred. You set these messages using the jdeSetGBRError or the jdeSetGBRErrorSubText function.

For example, "Job R89004 ZJDE0001.c" and "Batch 3230 G in Error" are level break messages. "Job R89004 ZJDE0001.c" is a level-one message that is automatically generated by the system and "Batch 3230 G in Error" is a level-two message. "AA 20050606 3031" and "Intercompany Out of Balance" are actual error messages.

The level-break message consists of two distinct components. The first component of a level-break message is the text for the message. The second component indicates whether the message will be an action message.

All level-break messages contain the text component, but they might not all be enabled as action messages. The decision to enable the action message piece of the level-break message is left to the report designer.

You use appropriate level breaks within your design to group related messages. The Work Center API should be called at these level breaks. A level break usually should be set up any time that a record is no longer processed and a new record is about to be read. This concept is consistent even if the report has several nested record breaks.

The following topics show the how messages might appear when an out-of-balance journal entry upload has completed.

First-Level Messages

First-level messages appear when users open their personal in-baskets. A plus symbol next to the message indicates that additional levels of messages exist beneath it. First-level messages might show the name of the batch job, explain that it completed with errors, and instruct the user to review the details about the errors.

Second-Level Messages

Second-level messages appear when the user double-clicks the plus sign next to the first-level message. In this example, the second-level message informs the user that a specific batch number needs to be reviewed.

Third-Level Messages

Third-level messages appear when the user double-clicks the plus sign next to the second-level message. In this example, the third-level message informs the user that the batch job completed with errors because it was out of balance, and then provides several solutions to resolve the problem.

See Also

- *Working with Level-Break Header and Footer Sections* in the *Enterprise Report Writing Guide* for more information about level breaks within sections

Text Substitution Error Messages

Error messages must be as informative to the user as possible. You can accomplish this through text substitution, which allows the system to embed variable text (such as dates, amounts, and so on) into a message at run time. You set up text substitution messages using the data dictionary, which helps to ensure consistency of jargon and terminology. For example, the message "Voucher Batch 2453 contains errors," uses the value 2453 as a parameter to the message. This value is substituted at runtime, and the rest of the information from the message is stored in the data dictionary error glossary. This message is only the short description in the data dictionary. When you open the message, the complete data dictionary glossary with text substitution appears.

See Also

- *Creating a Text Substitution Error Message* in the *Development Tools Guide* for more information about creating interactive and batch message data items, defining the glossary text for a run time message, and creating a new data structure for the message

Action Messages

After users review errors and determine resolutions, they typically need to access a revision program to resolve the errors. You can set up specific level-break messages known as action messages that provide users the ability to resolve the errors by calling the corresponding revision program directly from the Work Center. Action messages call a J.D. Edwards software application and pass the required variables to that application. For example, the user would be able to automatically load the Voucher Revision form with the record in error by clicking a shortcut within the error message. You determine the appropriate application and the correct values that need to be passed to that application. The system highlights action messages in the grid to differentiate them from nonaction messages.

Work Center API

When you call the Work Center API, it assumes a child/parent order. In other words, when the API is called, it assumes that any error that is in the runtime error message stack belongs to the level sent into that instance of that API call. This means that all of the errors in the error space at that time, whether they have been set through business functions or through J.D. Edwards software event rules, are packaged or grouped together as children of the level that was passed to the Work Center API. These error messages are then cleared from the error space so that the next group of messages can be made based on a new set of records.

The timing of the calls to the Work Center API is critical. The reporting program likely will start by editing the header-level record, which will lead to a set of detail records. The detail records are the first to be read and processed. Thus, the calls to the Work Center API will likely be sending level-break numbers in descending level-break order.

For example, the actual series of level-break calls to the API might look like this: 4,4,4,3,4,4,3,2,4,4,3,2,1.

This series indicates that the call structure started four levels down. The first call at level 4 would let the Work Center API find any messages that have occurred at that time and create child messages using the level 4 message as the parent. If no errors occurred, then no messages would have been created. This call sequence example shows that the API was called at level 3 after three calls to level 4. When the call to level 3 is made, the Work Center API remembers if any level 4 messages have been written or not. In other words, if no errors occurred when any of the level 4 calls were made, then the Work Center API will not create the level 3 messages. If at least one error exists at any of the level 4 calls, the level 3 and the level 2 message will be created.

You must call the Work Center API at every level. Because the Work Center error messages are created based on a parent/child structure, if a level call is skipped, the API has no way to group the child messages and child levels that were already created.

For example, the following level call structure is valid: 6, 6, 5, 4, 3, 4, 4, 3, 2, 1. The call sequence 6, 6, 4, 3, 4, 4, 3, 2, 1 is invalid because when level 6 is called, no corresponding call to level 5 exists.

The Work Center API must be called with a level 1 when the reporting job is about to complete. Hence, level 1 is the parent to all errors and level-break messages. It issues the "job completed" message. The level 1 call to the Work Center API is essential. A level 1 call to the API ensures not only that no orphan Work Center records are created, but also cleans up all allocated storage used by the Work Center system. The level 1 call to the API should occur only once in the report, typically, in the End Section event of the primary section of the report.

Creating a Level-Break Message

Level-break messages act as a container for error messages. You can create level-break messages that are action messages or nonaction messages.

You create level-break messages by creating data dictionary items, error data structures, business function error structures, and business functions.

See Also

- *Action Messages* in the *Development Tools Guide* for more information about active and nonactive messages

Creating a Data Dictionary Item for a Level-Break Message

The data dictionary item is the text portion of the level-break message, as it appears in the work center. Before you create a data dictionary item, you should review the level-break messages that have already been created to determine whether a level-break message that you want to use already exists.

▶ To create a data dictionary item for a level-break message

1. To search through the list of existing level-break messages, use Work With Data Dictionary Items.

   For every level-break message created, a data dictionary item and at least one business function are also created to reference that item. To determine the level-break messages that already exist, use query by example rows in the Object Management Workbench (OMW) to locate all business functions (object type BSFN) that start with the letters BLM.

   The BLM naming convention refers specifically to business functions for level-break messages that J.D. Edwards creates. J.D. Edwards recommends that you use the following criteria to name your own business functions for level-break messages: BLM*xxyy*, where *xx* refers to the system code that you are using (between 50 and 55) and *yy* is a unique number. This unique number should be carried forward to other items. The maximum number of characters is eight.

   Note
   Use the Description field to help you decide which existing messages might work in your report.

   If you find several business functions for level-break messages that seem to fit your report design, write them down and verify the text within the data dictionary item itself, using the data dictionary to inquire on data items that begin with LM and are followed by the same numbers that followed the corresponding BLM function name.

The LM naming convention refers specifically to level-break messages with text substitutions that are created by J.D. Edwards. These are classified under glossary group Y. J.D. Edwards recommends that you name your own level-break message with text substitutions using the following criteria: *Lxxyy*, where *xx* refers to the system code that you are using (between 50 and 55) and the *yy* is a unique number. The maximum number of characters is eight.

For example, if business function Set Level A/R Receipt Pre-Post error (BLM0025) is a level-break message for which you want to see the description, inquire on data item Receipt &1 Customer &2 In Error (LM0025).

2. If the text description meets your criteria, verify whether any substituted variables that the level-break message uses are valid for your circumstance.

   If the text in the LM message contains substituted variables (such as *&1*), you then need to verify the data items of the data structure used by the level-break message. The data items in the structure must be the exact data items that you will be passing in your report.

   To verify that the data item is in the data structure, use OMW and inquire on data structure DELM followed by the same numbers that you used before.

   The DELM naming convention refers specifically to level-break message data structures that J.D. Edwards created. J.D. Edwards recommends that you name your own level-break messages using the following criteria: `DELM`*xxyy*, where *xx* refers to the system code that you are using and *yy* is a unique number. This unique number should be the same number that you used previously. The maximum number of characters is eight.

   For example, DELM0025 would be the data structure created for the text substitution of level-break message LM0025. You might need to check out the structure to view individual fields.

Creating a Data Structure for the Data Dictionary Item

Each level-break message created requires a corresponding data structure to go with it. The data structure must be defined with the exact data items that will be substituted when the message is displayed. For example, a level-break message describing a particular error for Address Book Number would imply that the corresponding data structure would have data item AN8, the unique number that identifies an entry in the Address Book system. This restriction implies that many new data structures are going to be created.

To create the data structure, use OMW. The name should use the same unique number that was used when creating the L*xx* data dictionary item. This number is to be appended to DEL*xx*. For example, level-break message L55025 would use DEL55025 as the name of the data structure.

You will also need to create a typedef for this data structure. You include this typedef in the business function that you create. The typedef converts the data structure to C so it can be used in the business function.

See Also

- *Data Structures* in the *Development Tools Guide* for more information about data structures

Creating a Data Structure for a Level-Break Message Business Function

You create business functions to deliver level-break messages. Each business function that you create needs to have several standard parameters in addition to the variables that are used for the text substitution and the variables needed for the message to be active. This means that you must create a second data structure to pass all of these variables.

The DLM naming convention refers specifically to J.D. Edwards-created business function data structures. J.D. Edwards recommends naming your own level-break messages using the following criteria: DL*xxyy* where *xx* refers to the system code that you are using (between 55 and 59) and the *yy* is a unique number. This unique number should be the same number used previously. The maximum number of characters is eight.

For example, the J.D. Edwards-created level-break message LM0025 would use DLM0025 as the name of the business function data structure. You must have a business function for each level break message. Do not confuse this data structure with the data structure that was created for the data dictionary item in the previous procedure. The difference between the two is that the data structure for the business function is used to move data variables to the level-break function. The data structure used for the data dictionary item is used to store data that is mapped to the glossary for a particular data dictionary item.

When you create the data structure for the business function, include the following items:

- All data items used for the level-break text substitution message.
- All data items needed for the message to be active (that is, any variable or variables needed to load the form data structure for a given J.D. Edwards software application). Any data items that are used for the form interconnection only need to be renamed so that the letters FI_ appear after the Hungarian prefix. For example, jdFI_GlDate, or mnFI_Openamount. If you are not making the message active, you do not need to include these items.
- Add data item ev01 and change the variable name from OneWorldEventPoint01 to cIncludeInterconnect. This parameter is used as a flag to determine if the message is active. This parameter should be a common parameter to all level-break messages, even if the original intention of the level-break message is not to call a J.D. Edwards software application. This allows you to use level break messages in different applications, but not launch into applications. You must have a 1 in the data structure value to launch an application.
- Add data item genlng and change the variable name from GenericLong to idGenlong. You use this parameter to control all Work Center messaging. It is not intended to be used for anything other than as a work field for the system.

Creating a Level-Break Business Function

After you have created the DL*xx* data structure, you create the business function that processes the level-break errors and performs all of the mapping for the active message.

► To create a level-break business function

1. Create an object in the Object Management Workbench for the new business function.

   The name of the business function is the unique number, preceded by BL*xx*. For example, if you named the data dictionary item for the level-break message Receipt &1 Customer &2 In Error (L55025), you would name the business function Set Level

A/R Receipt Pre-Post error (BL55025). The J.D. Edwards naming convention is BLM*xx*.

2. Enter the name of the actual function on the Business Function Design form within Object Management Workbench.

   When you name the function, the standard specifies that you start the function with the name SetLevel_*xx*, where *xx* refers to the system code. Append the function with other descriptive words to identify the purpose of the level-break message. For example, you might name the business function BLM0025.

3. In Business Function Design, attach the business function data structure to it by highlighting the row and then choosing Parameters from the Row menu.

   This data structure should be the DL*xx* data structure that you created earlier.

4. Choose Form Create to generate a .h file.
5. Copy and paste the typedef for the business function into its header file.
6. Create a typedef for the text substitution data structure DE*xx*.

   To create the typedef, you will need to create an inactive function line.

7. After you create the typedef, paste the data structure template into the Structure Definitions section of the business function header file.
8. Modify the source file for the level-break message by copying the source code of an existing BLM*xxxx*.C business function.
9. After you have copied the source into the new level-break business function, review the copied source and make any appropriate changes.

Sample Source Code Highlights

The following sample of the shell source code shows which pieces need to be included and where you will be required to enter your own code for a business function.

You need to manually map fields from the business function's data structure to the dsTextData data structure. This is the data structure for text substitution in the level-break message. You also need to manually map fields from the business function's data structure to the dsFormData data structure. This is the data structure that is used for the active message.

Variable Declarations

In the "Variable declarations" section, you should have the following lines to declare the level-break message variables:

```
char      szForm[11];     /* Name of form in application */
char      szDDitem[11];   /* Data dictionary name of the level message */
char      szDLLName[11];  /* Name of the application DLL */
char      szDsTmp1[11];   /* Name of the text substitution data structure */
```

Declare Structures

In the "Declare structures" section, you enter your own code for the appropriate type of level-break message. The following are examples from an existing business function:

```
DSDELM0002 dsTextData;     /* Instance of text substitution structure */
FORMDSW0411Z1D dsFormData; /* Instance of form interconnect structure */
```

Set Pointers

In the "Set pointers" section, you should have the following lines to ensure that the level-break message will work:

```
if (lpDS->idGenLong == (ID) 0)
{
   jdeSetGBRError (lpBhvrCom, lpVoid, (ID) 0, “4363”);
   if (hUser)
   {
   JDB_FreeBhvr (hUser);
   }
   return ER_ERROR;
}
else
   lpDSwork = (LPDS_B0100011A) jdeRetrieveDataPtr (hUser, lpDS->idGenLong);
```

Main Processing

In the "Main Processing" section, you should have the following lines. Substitute your own items for the italicized items:

```
strncopy  ((char*) szDsTmp1, (const char*) (”DELM002”), sizeof (szDsTmp1) -
1);
strncopy  (szDDitem, (const char*) (“LM0002”), sizeof (szDDitem));
memset          ((void*) (&dsTextData), (int) (’\0’), sizeof (dsTextData));
```

Assign Values from lpDS Data Structure to dsTextData Here

In the "Assign values from lpDS data structure to dsTextData here" section, you enter your own code for the appropriate level-break message. When you assign values, you map the business function data structure items to the data dictionary data structure items. The following are examples from an existing business function:

```
strncpy (dsTextData.szEdiuserid,(const char *)(lpDs-> szEdiuserid),
   sizeof(dsTextData.szEdiuserid));
strncpy (dsTextData.szEdibatchnumber,(const char *)(lpDS->
szEdibatchnumber),
   sizeof(dsTextData.szEdibatchnumber));
strncpy (dsTextData.szEditransactnumber,
   (const char *)(lpDS->szEditransactnumber),
   sizeof(dsTextData.szEditransactnumber));
```

In this example, `dsTextData.szEditransactnumber` is the data dictionary data structure item and `pDS->szEditransactnumber` is the business function data structure item. Use the Strncopy API for strings and the Mathcopy API for math numerics. If you use memcpy for dates, the characters are assigned directly.

Assign Values from lpDS Data Structure to dsTextData Here

In the "Assign values from lpDS data structure to dsTextData here" section, you should have the following lines to ensure that the level-break message will work:

```
JDBRS_GetDSTMPLSpecs (hUser, (char*) szDsTmpl, &lpDSwork->lpBlob-
>lpTSDSMPL);
if (lpDSwork->lpBlob->lpTSDSMPL != (LPDSTMPL)NULL)
{
    lpDSwork->lpBlob->lpTSTEXT=(LPSTR)AllocBuildStrFromDstmplName((LPDSTMPL)
    lpDSwork->lpBlob->lpTSDSMPL,(char*)szDsTmpl,
    (LPVOID)&dsTextData);
    strncpy (lpDSwork->lpBlob->szDDItem, (const char *)(szDDitem),
    sizeof(lpDSwork->lpBlob->szDDItem));
}
if(lpDS->cIncludeInterconnect == '1')
```

Form Interconnect Processing

In the "Form interconnect processing" section, you enter your own code for the appropriate level-break message. The following is an example from an existing business function. In the "Form interconnect processing" section, you should have the following lines to ensure that the level-break message will work.

```
strncpy   (szDLLName, (const char*)("P0411Z1"), sizeof (szDLLName));
memset    ((void *)(&dsFormData), (int)('\0'), sizeof(dsFormData));
memset    ((void *)(szForm), (int)('\0'), suzeif(szForm))
strncpy   ((char *) szForm, (const char *)("W0411Z1D"), sizeof (szForm) -1);
```

Assign Values from LpDS Data Structure to dsFormData

In the "Assign values from LpDS data structure to dsFormData" section, you enter your own code for the appropriate level-break message. The following is an example from an existing business function. This example shows how you pass information from the data structure for the business function to the data structure for the form.

```
strncpy (dsFormData.EDUS,(const char *)(lpDS->szEdiuserid),
    sizeof(dsFormData.EDUS));
strncpy (dsFormData.EDBT,(const char *)(lpDS-> szEdibatchnumber),
    sizeof(dsFormData.EDBT));
strncpy (dsFormData.EDTN, (const char *)(lpDS->szEditransactnumber),
    sizeof(dsFormData.EDTN));
```

```
ParseNumericString(&dsFormData.EDLN, ”1.0”);
dsFormData.EV01 = ’1’;
```

Get the Form Data Structure ID from the SVRDTL Table

In the "Get the form data structure id from the SVRDTL table" section, you should have the following lines to ensure that the level-break message will work:

```
lptam = jdeTAMInit (FILENAME_SVRDTL);

 strncpy ((char *) lpDSwork->lpBlob->szForm, (const char *)(szForm),size of
   (lpDswork->lpBlob->szForm) -1);

if (lptam != (LPTAM) NULL)

{

   lpASVRdtl = TAMAllocFetchByKey (lptam, INDEX4_ASVRDTL, szForm, 1);

   if (lpASVRdtl != (void *) NULL)

   {

          JDBRS_GetDSTMPLSpecs(hUser, (char*)lpASVRdtl->szFITemplateName,

   &lpDswork->lpBlob->lpFINDSMPL);

          if (lpDSwork->lpBlob->lpFIDSMPL != (LPDSTMPL)Null)

          {

   lpDSwork->lpBlob->lpFITEXT=(LPSTR) AllocBuildStrFromDstmplName
                ((LPSTMPL)

                lpDSWork->lpBlob->lpFIDSMPL,

   (char*)lpASVRdtl->szFITEmplateName

                      (LPVOID) &dsFormData);

          strngcpy (lpDSwork->lpBlob->szDLLName, (const char *)(szDLLName),

               sizeof(lpDSwork->lpBlob->szDLLName));

          }

   TAMFree(lpASVRdtl);

   }

  TAMTerminate(lptam);

 }

}
```

Function Clean Up

In the "Function Clean Up" section, you should have the following lines to ensure that the level-break message work:

```
   if(hUser)

   {

      JDB_FreeBhvr(hUser);
```

```
   }
   return (ER_SUCCESS);
}
```

Calling the Work Center Initialization API

After you create the business function, you must compile and check it in to the object librarian. Then, you must attach the Work Center APIs. The first step in attaching the APIs is to call an event rule in the Work Center. You usually call this on the init section in the parent section.

Calling the Processing Work Center APIs

After the Work Center system has been initialized, you must determine the various level-break points within the report and call the Work Center system at each of these points to group the errors.

► To call the processing Work Center APIs

1. From Report Design, establish all of the appropriate level-breaks for the reporting batch job.

   You need to analyze the events that will logically group all errors at a given event. This typically happen at events in which all editing has been completed for a group of records or immediately after all edits for an individual record have taken place.

2. For each level-break established, do the following:

   a. Call the business function for the level-break message at the appropriate level-break. The business function for the level-break message should relate to the type of error grouping that you want to occur at the particular level-break. For example, SetLevel_SFVoucher groups errors related at the voucher level-break. For reports, this business function is typically called in the Do Section. If the interconnect is blank, then it is not calling an action message.

   Note
   The level that you send the API is never 1; it is sent only once, when you terminate the process.

   b. Call the Work Center error message function immediately after the call to the level-break message. This function is called ProcessErrorsToPPAT. B0100011.c processes batch errors to JDEM and makes repeated calls.

   c. Refer to the Windows Help file of APIs to identify the parameters to send.

Use the following table to identify which parameters to send. This is where you designate a level for the data dictionary level break message. Start your message with a level 2. The system automatically generates a level 1.

Parameter	Description	Allowed Values	Typical Values
mnLeveloftotaling	The message level that you want the Work Center API to process.	Any valid number from 1-20. Use the number 1 only when the UBE is almost finished. 1 writes the Job Completed message.	Numbers 1-20
idDataBaseWorkField	A work field used by the Work Center API. This is where the GENLNG work field should be passed.	This must be a work field defined in the UBE. Use the GENLNG data item for this.	The GENLNG work field
cErrorPreProcessFlag	This parameter allows the UBE to call the Work Center API at some event to flush the error space and to group any errors that are there by a level break message, which has yet to be sent.	Leave blank or use the letter P. If you leave this parameter blank, errors that are in the error space are grouped by the level message being sent in the first parameter.	Blank value or default
szUserid	When the cAllowUserIDToChange option has been set in the initialization function, this parameter accepts the new user ID.	Leave blank or use any valid user ID. If you leave this parameter blank, all messages are written to the last user ID used.	Blank value or default

cAllowUserIdToChange Parameter

This parameter on the initialize API works in conjunction with the szUserid parameter on the ProcessErrorsToPPAT API. It allows you to set up the UBE so that when any batch errors are encountered, errors are sent to the user who created the original records and not to the person submitting the job (such as the night operator). For example, if a single batch job contains 1,000 transactions created by 50 users, then only those users who created transactions with errors will receive error messages. The night operator will still receive a message, but it would be a message such as "Job completed normally" or "Job completed normally with errors." Other users whose transactions were successful will not receive any error messages.

To set up this functionality, you need to enter a "1" in the cAllowUserIDToChange parameter when you initialize the batch error processing system. When you process the level 2 level-break message and then call the ProcessErrorstoPPAT API, you can still specify who will receive the messages by using the szUserid parameter. You can determine who should receive the message by reviewing the transaction record.

Terminating the Work Center Process

After all messages have been sent to the Work Center, you must terminate the Work Center process before the reporting job is finished. When the batch program is about to terminate, call the Work Center error message function, ProcessErrorsToPPAT, one last time, sending it to level 1. The level 1 indicates the level of totaling is equal to 1 and that it is completed. This creates the job-completed message and frees any workspace that the Work Center API created.

Every report design that uses the Work Center API to process errors must use a level 1 to call the API at the end of processing. This call should also be done by reporting jobs that are monitoring for any critical errors and that need to terminate early.

When the system has finished processing the report, it creates Work Center messages, which can then be read using the OneWorld Work Center application. Batch errors are processed to JDEM system. Messages that are created are sent to the user who ran the report unless you specify that the message be sent to another user.

If the system encounters no errors, the API sends a message to the Work Center to indicate that the job completed successfully.

▶ To call the Work Center initialization API

1. Within Report Design, create a global work field. When creating the work field, use the data dictionary item GENLNG.
2. Call the Work Center initialization function. The report finds this business function. This function is named InitializePPATapi. (The actual name of the source file is B0100025.C.). F01131 is EditJDEM Error Message.

   Generally, this function is called in the primary section of the report using the Initialize Section API.

   Use the following table to identify which parameters to send:

Parameter	Description	Allowed Values	Typical Values
szUserid	User ID override. If not passed, the user who ran the UBE receives all messages. If this field is completed, it supersedes the following Address Number override parameter.	Leave blank or use any valid user ID. If left blank, all messages go to the submitter of the UBE.	Blank value
mnAddressnumber	User ID override. Use this field if you know the user address, but not the user ID for a user.	Leave blank or use any address number of a valid user. If left blank, all messages go to the UBE submitter.	Blank value
cDoNotLogWarnings	If this feature is turned on, no warning messages will be sent to the Work Center.	Leave blank or use the number 1. If left blank. all	Blank value

		warnings and errors are processed.	
cAllowUserIDToChange	If this feature is turned on, you can, at any time, change the user who receives the messages. Some restrictions do apply.	Leave blank or use the number 1. If left blank, all messages will be sent to one user.	Blank value
szMailboxdesignator	Mailbox (or queue) override. If this field is turned on, then messages are sent to the overridden mailbox. (Work Center use.)	Leave blank or use any valid mailbox designator. If left blank, all messages are written to the default queue.	Blank value
idPPATworkField	The work field used by the Work Center API. This is where the GENLNG work field should be passed.	This must be a work field defined in the UBE. Use the GENLNG data item for this.	The GENLNG work field
cSendErrorsToReport	If this feature is turned on, no messages (except Job Completed) will be sent to the Work Center. The messages will then be available to read through another Work Center function.	Leave blank or use the number 1.	Blank value

3. Choose the F01131 Edit JDEM Error Message function within the API.
4. Refer to the Windows Help file of APIs to identify the parameters to send.

Debugging

Debugging is the method you use to determine the state of your program at any point of execution. You can use debugging to help you solve problems and to test and confirm program execution.

You can use a debugger to stop program execution so you can see the state of the program at a specific point. This allows you to view the values of input parameters, output parameters, and variables at the specified point. When program execution has been stopped, you can step through the code line-by-line to check such issues as flow of execution and data integrity.

In J.D. Edwards software, there are two debugging tools you can use:

- J.D. Edwards software Event Rules Debugger
- Microsoft Visual C++ Debugger

You use the Event Rules Debugger to debug event rules, as well as the following:

- Interactive applications
- Reports
- Table Conversions

You use the Visual C++ Debugger to debug C business functions.

Overview of the Debugging Process

The debugging process consists of determining where problems occur and fixing those problems. You should isolate each problem to a particular area, and then examine exactly how the program operates in that area.

If you make a change in your program while you are debugging with the Event Rules Debugger, you must:

25. Stop the Event Rules Debugger.
26. Rebuild debug information.
27. Reset breakpoints.
28. Run the application.

The following table lists some common features that are available in the debuggers:

Feature	Available in:	Description
Go	Visual C++ and Event Rules Debugger	A command that restarts program after a breakpoint has been reached. In Visual C++, after you start an application, the application will run until the breakpoint is reached. In Event Rules Debugger, the application must initially be started from OneWorld Explorer.
Breakpoints	Visual C++ and Event Rules Debugger	Commands that tell the debugger to stop when a particular line is reached. You can set breakpoints on lines of code where you want to start debugging.
Step	Visual C++ and Event Rules Debugger	A command that executes the current line of code. The Step feature lets you run the program one line at a time. You can use this feature to determine the results of every line of code as that line is executed.
Step Into	Visual C++ an Event Rules Debugger	A command that is used when the current line of code contains a function call. The debugger will step into the function so that it can be debugged line by line. When the function is complete, the debugger returns to the next line of code after the function call in the calling routine. In J.D. Edwards software, the Step Into command can be used to debug a second application that is called from within a J.D. Edwards software-calling application.
Skip	Visual C++ and Event Rules Debugger	A command that skips execution of a line of code. The line of code which is not executed turns red.
Step Over		A command that executes a single line of code. If the line of code is a function call, report interconnection, or form interconnection then that call will not be stepped into.
Stop	Visual C++ and Event Rules Debugger	A command that stops the debugging process. If you stop the Event Rules Debugger, the application continues to run, as if the debugger had not been started. In Visual C++ the debugging process stops and the running application is also terminated.
Watch	Visual C++ and Event Rules Debugger	A command that displays the value of variables while the program is running. It also lets you inspect expressions, so that you can see how a particular expression changes when variables change.

Interpretive and Compiled Code

J.D. Edwards software uses both interpretive and compiled code.

Interpretive code refers to code that is compiled as it runs. The translation from program instruction to machine instruction happens at runtime. Interpretive code lies within the application. The scripting code for event rules used in Form Design and Report Design is interpretive. Interpretive code allows you to customize applications without having to recompile every time you change something.

Compiled code is compiled and stored in an object file that can be called independently. The translation from program instruction to machine instruction happens at compile time. For example, table event rules, named event rules, and business functions are compiled. They reside outside the application. They are also less subject to change. You can use Visual C++ to debug compiled code. The event rules scripting language can be translated into C, Java, or your current language of choice. The logic only needs to be interpreted one time. Compiled code is typically less flexible than interpretive code.

Working with the Event Rules Debugger

The Event Rules Debugger provides the essential debugging tools (such as breakpoints, step commands, and variable inspection) that you need to debug J.D. Edwards software applications, both interactive and batch. You can use the Event Rules Debugger to debug named event rules and table event rules. When the Event Rules Debugger generates debug information for an application, it includes named event rule and table event rule information for that application.

Setting up and using Event Rules Debugger involves two steps:

- Running the Event Rules Debugger and setting breakpoints
- Running and debugging the application, report, or table conversion

If you want to save the debug information table but do not want the Debugger active during your work, you can deactivate debug information. You can activate the table at any time to continue debugging.

Understanding the Event Rules Debugger

The Event Rules Debugger is a stand-alone tools program that consists of five main controls:

- Object Browse window
- Event Rules windows
- Breakpoint Manager
- Variable Selection and Display window
- Search combo box

All windows except the Event Rules windows are dockable to any side of the main application. You can right-click a window to dock it or to hide it. If you close the Debugger, it saves your docking settings until the next time you run the Debugger.

Object Browse Window

The Object Browse window lists applications that have debug information built and that are available for debugging. You can navigate through a tree structure to a specific event and open an Event Rules window for that event.

Event Rules Window

The Event Rules window displays the event rules for one event. The event name and path appear in the title bar for each Event Rule window. You can right-click to toggle the title between its long and short versions. The Event Rules windows show the line in the event rules that is currently being executed.

The left side of an Event Rule window displays icons that describe the state of a line in the event rules. States include the following:

- Breakpoint
- Disabled
- Current line of execution

You can use the Event Rules window to set and remove breakpoints. You can use any of the following methods:

- Double-click the line in event rules.
- Choose a line and choose Breakpoints from the Debug menu.
- Right-click a line and choose Breakpoints from the pop-up menu.
- Choose a line and press F9.

Variable Selection and Display Window

The Variable Selection and Display window consists of two views. The left view contains a tree structure that lists the variable types as parent nodes, and the current variables of each variable type as child nodes. The variables displayed are relative to the current Event Rule window. The right view is the variable display view. This view displays user-selected variables and their current values. You can add a variable to the Variable Display view by double-clicking the desired variable in the Variables tree.

You can change the value of variables while you are debugging an application. To change the value of a variable, double-click the variable in the Variable Display window and enter a different value. The new value appears in the Variable Display window. If you enter an inappropriate value—for example if you change a numeric value to an alpha value—the new value is not set and the value is not changed.

Note the following three special values that are displayed for variables:

blank The value for the variable contains only blanks. This applies to string and character types only.

null The value for the variable is set to ASCII "\0".

unknown The value for the variable could not be obtained from the runtime engine. This happens when the applications are not running or when the variables are out of scope.

Note

Variable inspection and modification is not available for debugging named event rules and table event rules.

Breakpoint Manager

Breakpoints tell the debugger where or when to halt the execution of a program. When the program is halted at a breakpoint, you can examine the state of your runtime structures, step through your event rules, and evaluate expressions using the Variable Selection and Display window.

The Breakpoint Manager tracks the breakpoints that are set and the location of those breakpoints in an application. When you set a new breakpoint, the system creates an entry in the Breakpoint Manager. That entry contains the application name, form name, event name, and event rule line.

Right-click within Breakpoint Manager to perform the following operations:

- Delete a breakpoint.
- Delete all breakpoints.
- Go to a breakpoint.

You can also double-click an entry in Breakpoint Manager to open the Event Rule window in which the breakpoint is set.

Search Combo Box

You can use the Search combo box on the toolbar to search for event rule text. Enter the text that you want to search for in the Search combo box and either press Enter or F3. If the system locates the search text in your event rules text, it highlights the text. If you again press Enter or F3, the next occurrence of your search text is located and highlighted.

The search control accommodates regular expression searches. A regular expression search uses special characters to match text. For example, ^If: will find every line that starts with "If" and If$: will find every line that ends with "If."

The following table describes the special characters that you can use to perform more advanced searches.

^ The caret (^) indicates the beginning of the string. For example, the expression "^A" matches an "A" only at the beginning of the string.

^ The caret (^) immediately following the left bracket ([ ) is used to exclude any remaining characters within brackets from matching the target string. For example, the expression "[^0-9]" indicates that the target character should not be a digit.

**$** The dollar sign ($) matches the end of the string. For example, the expression "abc$" will match the substring "abc" only if it is at the end of the string.

| The alternation character (|) allows the expression on either side of it to match the target string. For example, the expression "a|b" will match "a" as well as "b".

. The dot (.) matches any character.

***** The asterisk (*) indicates that the character to the left of the asterisk in the expression should match 0 or more times.

+ The plus (+) is similar to the asterisk, except that at least one match of the character should occur to the left of the + sign in the expression.

? The question mark (?) matches the character to its left 0 or 1 times.

() The parentheses affects the order of pattern evaluation and serves as a tagged expression that you can use to replace a matched substring with another expression.

[ ] Brackets that enclose a set of characters indicate that any of the enclosed characters can match the target character.

Debugging an Application

The Event Rules Debugger allows you to debug interactive or batch applications.

▶ To debug an application

From the Cross Application Development Tools menu (GH902), choose Debug Application.

1. Choose the object that you want to debug.
2. Choose a form (for interactive applications) or section (for batch applications) and an event to view.
3. Choose the event rule line on which you want to set a breakpoint.
4. From the Debug menu, choose Breakpoint.

   A red dot appears on the line, indicating the breakpoint.

   You can remove the breakpoint by choosing Breakpoint from the Debug menu. The options on the Debug menu toggle on and off.

5. Minimize, but do not close, Debugger.

6. From J.D. Edwards Menus or from the Object Librarian, run the application that you selected to debug.

   As your application encounters a breakpoint, the application pauses and displays the Event Rules Debugger.

   When execution stops, you can use the variables view to inspect and modify the values of runtime structures.

7. From the Debug menu, choose one of the following options:
   - Go
   - Stop
   - Step Over
   - Step Into

Inspecting or Modifying a Variable

When you debug an application and encounter a point at which the interactive or batch application fails, you can modify the appropriate variable to correct it. You then save your modifications and rerun the application to determine whether further debugging is required.

► To modify a variable

1. On Event Rules Debugger, double-click a variable in the Event Rules Variables window.
2. Revise the information in the following field:
   - New Value

Just in Time Debugging

The Event Rules Debugger also uses "Just in Time Debugging." Just in Time Debugging occurs after you build the debug information, run the Event Rules Debugger, and then run the application.

If the runtime engine has a problem resolving an event rule object or calling a business function, a message box appears that allows you to activate the Debugger. If you choose to activate the Debugger, then the system places the Debugger at the top and displays the event rule line that could not be processed, along with with a yellow arrow to the left of it.

Setting Breakpoints

You should set at least one breakpoint on a starting event, such as *Dialog is Initialized.* Any event that you want the Debugger to stop on must have at least one line of event rule code.

Debugging Business Functions By Using Microsoft Visual C++

You can use Microsoft Visual C++ to debug business functions that are written in C. If you use OneWorld B7331 or later versions of J.D. Edwards ERP software, you must use version

6.0 of Microsoft Visual C++. You can debug business functions that are attached to interactive applications or to batch applications.

Debugging Business Functions Attached to Interactive Applications

You can debug business functions that are attached to interactive applications or to batch applications.

► To debug a business function attached to an interactive application

1. Close the J.D. Edwards 5 application.

   The application must be closed to debug in Visual C++.

2. Open Visual C++ and verify that all workspaces have been closed.
3. From the File menu, choose Open.
4. Choose List Files of Type to accept executables (.exe).
5. Select your OEXPLORE.EXE on path `\B9\System\bin32` and click OK.

   The system creates a project workspace.

6. Choose your OEXPLORE.EXE project heading.
7. From the Project menu, choose Settings.
8. Click the Debug Tab.
9. In the Category list, choose Additional DLLs.
10. Click the Browse button to select the CALLBSFN.dll or other appropriate DLL on path `\B9\bin32`.

    This path might vary, depending on your path code.

11. Click OK.
12. Choose your .h and .c files for the source that you want to debug from and then, from the File menu, choose Open.
13. To set breakpoints in your code, choose Breakpoints from the Edit menu

    If the following message appears, click OK.

    ```
    cannot open *.pdb
    ```

    If a message appears notifying you that breakpoints have been moved to the next valid lines, a source code and object mismatch might exist, and you might need to rebuild your business function.

14. From the Build menu, choose Start Debug, Go.

    The J.D. Edwards software signon window appears.

15. Sign on to the application as you normally would sign on.
16. Run the application.

    When your application reaches the business function in Debug, the debugger opens or displays the C code in Visual C so that you can step through it.

If you are debugging event rules for business functions and C business functions, you can use the J.D. Edwards software debugger and the Visual C++ debugger together. Follow the steps above until you log into J.D. Edwards software. At that point, follow the steps for the J.D. Edwards software debugger. Program execution stops if C code is accessed. You can then use Visual C++ to continue debugging. This is useful if you are trying to locate a problem and you are not sure whether the problem is in a C business function or in the application that calls the business function.

Debugging Business Functions Attached to Batch Applications

You can debug business functions that are attached to batch applications.

► To debug a business function attached to a batch application

1. Close the J.D. Edwards application.
2. Open Visual C++ and verify that all workspaces are closed.
3. From the File menu, choose Open.
4. Specify executables (.exe) in the Files of Type field.
5. Locate and choose LaunchUBE.exe
6. On LaunchUBE, browse for the report and version that you want to use.
7. Complete the Server Name field by specifying the location in which the report will run.

   You can choose Local or specify a server.
8. Set the Debug Level.
9. Click one of the following Print Options:
   - On Screen
   - To Printer
10. Click Submit to submit the report.

Working with the Visual C++ Debugger

You must use the Microsoft Visual C++ Debugger to debug business functions written with the Event Rules scripting language or in C code. You can run the entire J.D. Edwards software system through the Visual C++ debugger (that is, you can start the oexplore.exe file from within the Visual C++ Debugger). This allows you to "step out" of the CASE tool-generated application code into the business functions that are called in the event rules.

You can use the debugger to debug a C program and interactively stop and start it as needed. During debugging, you can check specific values of variables and parameters to determine whether a program is running correctly. You can also step through the code to see what code is actually being executed.

The debug commands are listed in the Debug menu. You can customize the toolbar to contain debug buttons, which you can use instead of the menu.

Useful Features of the Visual C++ Debugger

The Visual C++ has many features in the Debug menu. The Visual C++ debugger helps you efficiently solve real-world problems.

The Go Command

You can run a program using the Go command from the Debug menu. The program runs until completion unless you set up breakpoints.

The Step Command

The Step command is available on the Debug menu and executes the current line of code. When the line of code has been executed, the yellow arrow cursor appears on the next line of code to be executed.

The Step Into Command

You can access the Step Into command from the Debug menu. Use this command when the current line of code contains a function call. The debugger steps into the function so that it can be debugged line by line. When the function is complete, the debugger returns to the next line of code after the function call in the calling routine. If the source code of the function to be stepped into does not exist on the workstation, the debugger skips over the line of code as though the Step command was used.

Stepping into a standard C function takes you into the function, which you might not want to do. If so, use the Step Over command to skip those functions.

Setting Breakpoints

You use breakpoints to run the program until it reaches a certain line of code. If a breakpoint is set, the Go command runs the program until it encounters that line of code.

You can set a breakpoint by placing the cursor anywhere on the line of code. When you choose Breakpoints from the Debug menu, a red octagon appears to the left of the line of code where the breakpoint is set. When the program is run, all lines of code up to the breakpoint are executed. To continue execution after the breakpoint, you can use Step, Step Into, or Go.

Using Watch

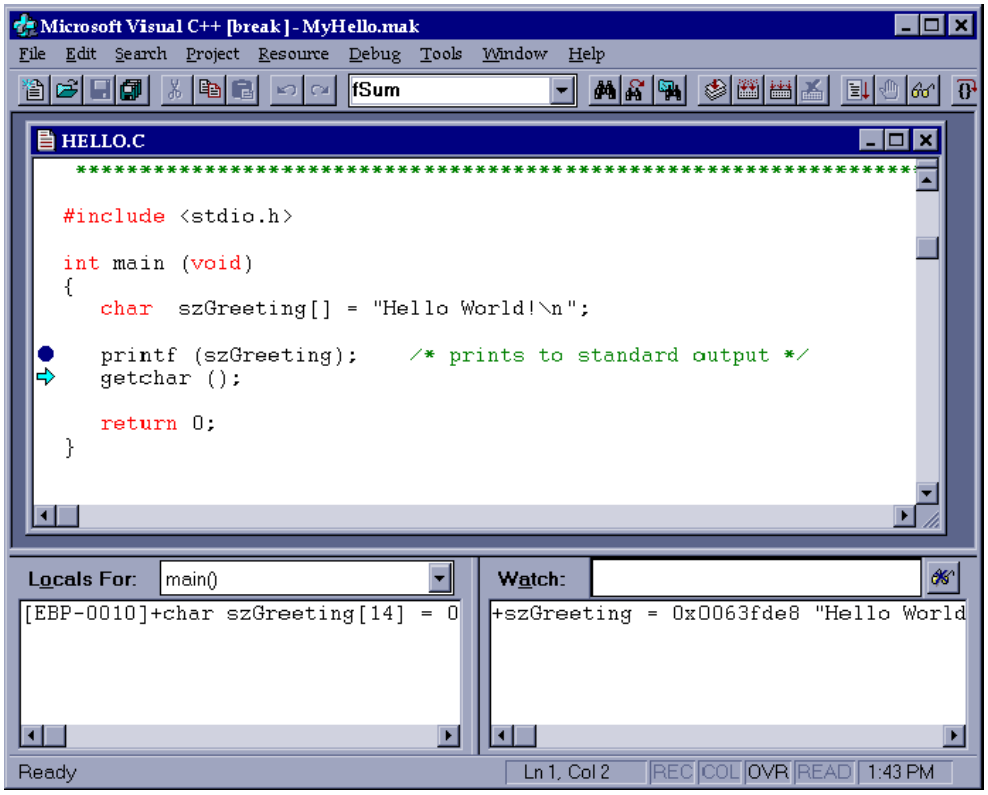
You can use Watch to inspect what values variables are set to. To use Watch, click the item that you want to watch and drag it to the Watch window.

Locals Window

All local variables and parameters to a function are listed with their data types and values in the Locals window. You can modify the values of all items in the Locals window during debugging. This is useful if you are debugging infinite loops.

Example: Debugging with the Visual C++ Debugger

In the following example, a breakpoint, Watch, Locals, and the Step command have been used.



- A breakpoint has been set on the line of code with the call to `printf`. The red octagon is to the left of the code. The call to `printf` has been executed with the Step command.
- The current line to execute has a yellow arrow to the left of it. It contains a call to the `getchar` function. That line of code has not yet been executed.
- `szGreeting` appears in the Locals window and in the Watch window. You can scroll these windows horizontally to review the entire line. You can see the beginning of the value of `szGreeting` in the Watch window.
- A plus sign next to a variable in the Locals and Watch windows indicates the data may be expanded. This is useful for inspecting the values of complex data structures.

Customizing the Environment

You can modify the Visual C++ debugging environment. You can customize the editor, colors, fonts, debugger, default directories, workspace, and help.

► To customize the environment

1. On Event Rules Debugger, from the Tools menu, select Options.
2. On Options, customize your environment as desired.

Debugging Strategies

You can use several strategies to make debugging faster and easier. Begin by observing the nature of the problem.

Is the Program Ending Unexpectedly?

If the program is ending unexpectedly, the cause is likely an unhandled exception. An unhandled exception is a failure to handle memory correctly. It is an easy problem to track down if it is happening in the same place. Simply set breakpoints at strategic points throughout the code and run the program until you find the problem.

If the problem resides in C code, you can find the problem by tracing into the code.

If the problem exists in the J.D. Edwards-generated code, finding the problem might be more difficult. The debugger provides error messages that are helpful. The most common problem has to do with missing objects. If a business function that is being called does not exist, the tool issues an error message that identifies the missing function. For example, "Business function load failed - CALLBSFN.DLL." In this case, you can either rebuild the business function or check it out and build it using BusBuild to correct this error.

Remember that *all* business functions are built into larger DLLs. The most generic of these is CALLBSFN.DLL. Most application-specific DLLs are not in CALLBSFN. For example, J.D. Edwards financial business functions use CFIN.DLL. The object (BSN func) might need to be checked out to the workstation again and built through BusBuild again in CALLBSFN.DLL (or the specific DLL).

If other objects are missing, termination is more abrupt. Remember to transfer all Media Object (also called Generic Text) objects correctly. If an application has a row exit to an application that does not exist, it immediately causes an unhandled exception in the program.

Termination of the program is more abrupt and less helpful when other kinds of objects are missing. You must review all of the pieces of your application to verify that they are all present and correctly built. A common error is to overlook media objects. If you cannot enter your program at all, a missing object is most likely the problem.

Ensure that the program is terminating in the same place. If the program is failing to restore memory after its use, the program may eventually have insufficient memory to run. If so, you must reboot the workstation to restore memory.

Is the Application Encountering Errors?

When a business function is called from event rules, its processing is unknown to the user. This situation is both a benefit and a hindrance.

- It is a benefit because it should not be a concern to the user how the function works, only that it does work.
- The disadvantage is that it is not uncommon to call a function with more than 50 parameters, any one of which might cause errors.

The two solutions to this sort of issue are:

- Review the function specifications to make sure that you have hooked it up correctly.
- Step into the code to see what is going wrong.

Is the Output of the Program Incorrect?

Incorrect program output indicates a flaw within the logic of the code. Trace into the code to find the issue.

Where Else Could the Problem Be Coming From?

Spend some time thinking about where the source of the problem might be.

For example, consider the "Null pointer error." Somewhere in the code memory is a memory leak. To help determine where the leak is, you can toggle between the grid rows to force the execution of the `Row is Exited` event. If the problem occurs, you have narrowed your search for the leak, because you know that it is occurring in the grid processing.

Is the Function Being Called as Expected?

You can set a breakpoint at the beginning of a called function to ensure that it is being called and that the input is as you had expected. To do so, set the break point at the beginning of the business function or at the beginning of an event such as `Grid Row is Fetched`, and then do the following:

- Step through every code path.

  Use the debugger to test the code. Both the J.D. Edwards Debugger and the Microsoft Visual C++ Debugger provide you with the ability to modify values as the code is running. Use this ability to trace through *every* line of code. This is also a powerful way to test everything that could happen to your code, not just what *should* happen to it. This method of testing will help demonstrate whether you have handled errors correctly. For example, step through an If branch and input bad data to see if errors occur as expected.

- Find the cause of the problem, not the symptom.
- Look for problems with object transfer/reinstall.

Debug Logs

Several sections of the jde.ini file relate to debugging. The first statement that must be checked is in the `[JDE_CG]` section. The line `Target = Release` should be modified to read `Target = Debug`, as shown below. An application install of ERP will deliver the jde.ini file with `Target = Release`. To debug business functions, the jde.ini files must be changed to `Target = Debug`, and the business functions that you want to debug must be rebuilt.

```
[JDE_CG]

STDLIBDIR=c:\MSDEV\LIB

TPLNAME=EXEFORM2

ERRNAME=CGERR

TARGET=Debug

INCLUDES=c:\MSDEV\INCLUDE;$(SYSTEM)\INCLUDE;$(SYSTEM)\INCLUDEV;
$(SYSTEM)\CG;$(APP)\INCLUDE;

LIBS=c:\MSDEV\LIB;$(SYSTEM)\LIB32;$(SYSTEM)\LIBV32;$(APP)\LIB32;
```

```
MAKEDIR=c:\MSDEV\BIN
USER=DEMO
```

You can output to a file a log of SQL statements and events by changing the line in your jde.ini file under [DEBUG] from Output = NONE to Output = FILE, as shown below. This is a useful debugging tool when you have narrowed a problem to a specific issue involving the JDEDB APIs.

```
[DEBUG]

TAMMULTIUSERON=0

Output=FILE

ServerLog=0

LEVEL=BSFN,EVENTS

DebugFile=c:\jdedebug.log

JobFile=c:\jde.log

Frequency=10000

RepTrace=0
```

The memory frequency setting allows you to validate the memory heap at a particular 1000th location. You can set breakpoints and examine the code.

See Also

- *Viewing Log and Debug Log Files for Enterprise Server Processes* in the *Server and Workstation Administration Guide* for more information about other logs that you can view for troubleshooting

SQL Log Tracing

You can use SQL Log Tracing to help you determine the exact SQL statement that is generated and sent to the database.

► To turn on SQL Log tracing

1. From the Control Panel on your workstation, choose Administrative Tools, and then Data Sources (ODBC).
2. Choose the 32 bit ODBC driver, and then click the Tracing tab.
3. Specify when you want the system to trace.
4. Specify the log output path in the Log file Path.

Debug Tracing

Use debug tracing to trace database and runtime events, business functions, and system functions. You can turn on debug tracing and store the results in a log file. This debug log is also useful for verifying how the tool constructs an SQL statement.

▶ To turn on debug tracing

1. In the JDE.INI file under [DEBUG], change Output=NONE to one of the following values:

Output=FILE Prints both database tracing and runtime tracing.

Output=EXCFILE Prints runtime tracing only.

2. Change the value for Level= to suit your specific debugging needs.

   Possible values for Level are contained in the comment line following the Level= line. Any combination is acceptable. Use commas to separate values. The possible values for Level are as follows:

EVENTS Records when an event starts and when it finishes.

BSFN Records when business functions are entered and when they return.

SF_? Records when system functions execute. In place of the question mark, you can designate a specific type of system function, such as control or messaging.

System Function Tracing

When you review the jdedebug.log, note that system functions are grouped by category (using the same categories as design time). Where reasonable, the log includes information about what component within the program the system function is acting upon. For example, in many of the grid system functions the row number is printed. For most control system functions the log includes the alias of the control and the control ID.

The following example shows the jdedebug.log output as a result of running the Journal Entry with the following jde.ini options:

```
Output=EXCFILE

Level=EVENTS,BSFN,SF_GRID,SF_CONTROL
```

RT: >>>Beginning ER: Dialog is Initialized App: P0911 Form: W0911I
RT: <<<Finished ER: Dialog is Initialized App: P0911 Form: W0911I
RT: >>>Beginning ER: Post Dialog is Initialized App: P0911 Form: W0911I
RT: <<<Finished ER: Post Dialog is Initialized App: P0911 Form: W0911I
RT: >>>Beginning ER: Add Button Clicked App: P0911 Form: W0911I
RT: >>>Beginning ER: Dialog is Initialized App: P0911 Form: W0911A
RT: SYSFN: Hide Control < > 0
RT: SYSFN: Disable Control <ICU> 5258
RT: SYSFN: Hide Grid Column COL: 5
RT: SYSFN: Hide Control <ATDOW> 5392
RT: SYSFN: Hide Control <REMA> 5405
RT: SYSFN: Hide Control < > 5295
RT: SYSFN: Hide Control < > 5385
RT: SYSFN: Hide Control <DOC> 5297
RT: SYSFN: Hide Control <KCO> 5299
RT: SYSFN: Hide Grid Column COL: 7
RT: SYSFN: Hide Grid Column COL: 8
RT: SYSFN: Hide Grid Column COL: 9
RT: SYSFN: Hide Grid Column COL: 11
RT: BSFN: Calling : BatchOpenOnInitialization App: P0911 Form: W0911A
RT: BSFN: Returned 0: BatchOpenOnInitialization App: P0911 Form: W0911A
RT: BSFN: Calling : GetAuditInfo App: P0911 Form: W0911A
RT: BSFN: Returned 0: GetAuditInfo App: P0911 Form: W0911A
RT: <<<Finished ER: Dialog is Initialized App: P0911 Form: W0911A
RT: >>>Beginning ER: Clear Screen Before Add App: P0911 Form: W0911A
RT: SYSFN: Enable Control <PCTOW> 5390
RT: SYSFN: Hide Control <ATDOW> 5392
RT: SYSFN: Hide Grid Column COL: 5
RT: SYSFN: Hide Control <REMA> 5405
RT: SYSFN: Enable Control <CRCD> 5273
RT: SYSFN: Enable Control <LT> 5292
RT: SYSFN: Enable Control <LT> 5351
RT: SYSFN: Show Grid Column COL: 6
RT: SYSFN: Hide Grid Column COL: 12
RT: SYSFN: Show Control <LT> 5292
RT: SYSFN: Show Control <CRDC> 5271
RT: SYSFN: Hide Control <LT> 5351
RT: SYSFN: Hide Control <CCD0> 5358
RT: BSFN: Calling : GetLocalComputerId App: P0911 Form: W0911A
RT: BSFN: Returned 0: GetLocalComputerId App: P0911 Form: W0911A
RT: <<<Finished ER: Clear Screen Before Add App: P0911 Form: W0911A
RT: >>>Beginning ER: Post Dialog is Initialized App: P0911 Form: W0911A
RT: <<<Finished ER: Post Dialog is Initialized App: P0911 Form: W0911A
RT: >>>Beginning ER: Add Last Entry Row to Grid App: P0911 Form: W0911A
RT: <<<Finished ER: Add Last Entry Row to Grid App: P0911 Form: W0911A

Developing Web Applications

The Development Tools make it easy for you to develop and maintain applications for use both on Windows clients and Web clients, even if the clients require slight differences in the design of the forms. You can create Windows, Java, or HTML applications. As you design a form, Form Design Aid allows you to view it in one of three modes. Your design team should decide which modes to use for which client types. For example, you might use Mode 1 for forms to be generated in Windows, Mode 2 for forms to be generated in Java, and Mode 3 for forms to be generated in HTML.

Most of the controls that you put on a form are appropriate for any of the modes, but you can choose to show or hide (enable or disable) any control on the applicable form for each of these three modes. In this way, you can develop one set of forms from which you generate three versions of the application (one for each mode). If you customize any of the J.D. Edwards Web applications, or if you develop new ones, you must use the Web Generation Facility to generate them into Java or HTML applications.

You typically create an application in Mode 1, which is the default mode. This application is automatically enabled for Windows. You can then use Mode 2 or Mode 3 to modify your application for Java or HTML.

Although you can develop or change Web-based applications (in Java or HTML), on your workstation, you need a workstation that is Web-enabled to test the application. All J.D. Edwards ERP clients are Web- enabled. The following components are required for your client:

- Internet Explorer 4.01 or above
- J.D. Edwards Web Generation Facility (installed with J.D. Edwards ERP client)
- Network access to a J.D. Edwards Web server

If you customize any of the J.D. Edwards Web applications, or if you create new applications, you must regenerate them to create the specified Java or HTML applications. you must generate those to create Java or HTML applications.

You might want to make changes in a windows application to make it easier to use on the Web. For example, you typically use fewer fields in a Web application.

Note

If you change the font size in your style sheets, be aware that doing so can alter the appearance of the form, including displacing controls, and wrapping or hiding control text.

To test a Java application you must do the following:

- Save your application in Form Design.
- Generate the application to the Web server.
- Attach the application to a menu and designate the mode in which it should run.
- Run the application.

To create Web applications, use Development Tools in the same manner as you would for standard applications.

If you use Development Tools to create your own applications, and these applications are designed for use as Web applications, you should consider the following to ensure optimal performance:

29. Each data and business function request runs on a data or enterprise server, not the Web server. As a result, your Web client performance is limited by the speed of your network or modem connection as well as network traffic restrictions. If possible, you should limit or bundle data and business function requests in a manner most efficient for WAN and Internet connections. If you have several table I/O calls serially linked (for example, each one is dependent on the previous call), consider using named event rules to combine all calls, which are compiled and executed on the enterprise server.
30. Whenever possible, design the Web-ready application to perform logic using event rules. This provides better performance than if you use C language business functions or event rules business functions (named event rules). Keep in mind that whenever you call a business function the logic is performed on the remote J.D. Edwards software enterprise server. However, as mentioned above, if the event rules contain several table I/O or business function calls that are serially linked, these will perform better as a business function (named event rule) on the enterprise server.
31. Design the Web-ready application to request data in manageable chunks. If your application performs a business function request before and after each grid line, performance will suffer. Also, you should try to avoid using business functions as a means to request data; use business views or table I/O instead.
32. Educate users in the importance of using search criteria in query by example columns. This is important given the constraints of transferring data at modem speeds across typical Internet connections. For example, users should routinely try to narrow their searches, because data retrievals are configured to obtain only 10 records at a time. If you develop custom applications for Web use, consider defining query by example fields as required entries.

Batch Versions - Web Version (P98305W) is a version list application created specifically for the Web client. You can use this application to look up Web versions of applications.

Understanding the HTML Client

The HTML client automatically posts (refreshes) on the following critical events:

- Form startup
- Set focus on grid (only when ER exists)
- Check box (only when ER exists)
- Radio button (only when ER exists)
- Bitmap clicked
- URL clicked
- Tab is selected
- Node expanded in tree control
- Drag-and-drop action occurs in tree control

In addition to the critical events listed above, the client also refreshes the page when noncritical events occur that contain hide/show or enable/disable grid functions. The following is a list of these noncritical events:

For Edit controls	Control is exited.
	Control is exited and changed-inline.
	Control is exited and changed-asynchronous.
For Grid controls	Column is exited.
	Column is exited and changed-inline.
	Column is exited and changed-asynchronous.
For Parent/Child form grid	Tree node level is changed.
For Tree control	Tree node is selected.

These post rules for critical and non-critical events form the default post model used by the HTML client. The HTML post model can cause usability issues for high volume data entry applications and inquiry applications that are used frequently on the Web. The issue occurs when an application performs hide/show or enable/disable grid on noncritical events, which forces the HTML page to refresh. The refresh typically causes the screen to flash. The duration of the flash depends on network traffic, hardware, system configuration, and so on. Consequently, you might want to override the HTML post model in some situations.

You can use the HTML Auto Refresh option in a form's property settings to turn off the automatic post on all noncritical events for that form (the default is to have the attribute turned on). Use the HTMLPOST option in an event rule to turn on the post for a single non-critical event (the default is to have the attribute turned off). Enabling posting overrides a disable. For example, if you turn off posting for a form, but turn it on in the ER for a single event, posting is suppressed for all events on the form except for the one with the HTMLPOST option turned on in its ER.

The Windows and Java clients ignore both the form and event attributes.

Before You Begin

- Install the J.D. Edwards HTML Web Server. See the *J.D. Edwards HTML Web Server Installation Guide* on the *Update Center* page on the *Knowledge Garden*.

See Also

- *Designing Forms Using Multiple Modes* in the *Form Design Aid Guide* for information about HTML form design
- *Form Controls* in the *Form Design Aid Guide* for more information about using different modes and customizing the controls on forms for different modes

Performance

This section includes tips and tools to help you enhance the performance of your applications.

Triggers

Data dictionary triggers can be used for both formatting and validation. Triggers are the most costly way to format or edit data values. Most of the formatting that occurs in J.D. Edwards software involves date and math fields. These fields require the most overhead for editing and formatting. Ensure that all triggers are coded as efficiently as possible.

Overrides

You can use data dictionary overrides to override the data dictionary characteristics of a form control, grid column, or report field at design time. This causes additional overhead at application startup because of the extra processing required to evaluate and apply the overrides. The overrides that are applied can have either a positive or negative affect on performance during runtime processing. For example, if you use the override feature to disable some of the validation functionality, then performance is increased because disabling features causes some runtime overhead to be removed. Adding overrides such as edit/format triggers or next numbering increases runtime overhead and decreases performance.

Validation

Validation is based on the data dictionary item that is attached to a control, column, or field. The overrides can also affect validation. Validation is most costly for data items that have triggers. Validation of user defined codes also requires I/O to validate data values. General validation can be more costly for data types that require special logic to manipulate the J.D. Edwards software-specific data types.

Table Design Performance

Use SELECT statements cautiously. Try to use existing indices for a table. Using additional keys is better than creating a new index. Additional indices create overhead.

Use a partial key only for sequential and fetch next or to review a few more records.

If you open a table and then a fetch key, the action destroys the pointer, so perform a fetch single instead. Almost any other database API also destrosy the pointer.

Opening a table the first time is a big performance drain.

The fetch matching key uses a greater than or equal key so it might select more than you need. Use the correct JDB API for what you need.

Index Considerations

Adding a suitable index will almost always improve performance when the system selects and fetches data from the database. However, each additional index adds maintenance overhead when records are added, updated or deleted in the database. You should consider these two factors when you weigh the decision to add a new database index over a table.

J.D. Edwards software is designed to access databases efficiently. Use ordinary database design considerations, including normalization considerations, when determining the optimal design of database tables and indices.

Join fields should be the keys in two tables.

Limits on Row Set Size

The lowest common denominator for row size is the specification given in the SQLSERVER database.

SQL Server 6.5 can have as many as 2 billion tables per database and 250 columns per table. The maximum number of bytes per row is 1962. If you create tables with `varchar` or `varbinary` columns whose total defined width exceeds 1962 bytes, the system allows the table to be created; but it generates a warning message.

If you insert more than 1962 bytes into such a row or update a row so that its total row size exceeds 1962, the system generates an error message and the statement fails.

Considerations for Coexistence with WorldSoftware

Ensure that tables in J.D. Edwards ERP software match AS/400 tables. Data that is not structured the same causes problems.

If you plan custom modifications in a coexistence environment, the WorldSoftware RPG programs must be able to read the structure of any tables to be read by WorldSoftware. This means that the tables that WorldSoftware must access should be initially created in WorldSoftware database structure, not from J.D. Edwards ERP software using AS/400 foreign databases (Access, Oracle, SQL Server). The WorldSoftware environment must be set up first before J.D. Edwards ERP is set up on top of it.

Ensure that date and time conversions on AS400 and J.D. Edwards ERP software are the same.

Index Limitations for Various Databases

This section discusses index limitations for the following databases:

- Access32
- SQLSERVER
- DB2 for OS/400
- Oracle

Access32

The following index limitations apply to Access 32:

- The maximum number of indices per table is 32.
- The maximum number of fields in an index is 10.
- The maximum number of fields in a record is 255.

SQLSERVER

The following index limitations apply to SQLSERVER:

- The maximum number of clustered indices per table is one.
- The maximum number of nonclustered indices per table is 249.
- The maximum number of columns in a composite index is 16.

DB2 for OS/400

The following index limitations apply to DB2 for OS/400:

- The maximum number of identifiers for an index name is 10.
- The maximum size of an index is one terabyte.
- The maximum length of an index key is 2,000.
- The maximum number of columns per index key is 120.
- The maximum number of indexes per table is approximately 4,000.

Oracle

The following index limitations apply to Oracle:

- The maximum length for an index is 254 bytes, minus the number of keys that allow NULL values.
- The maximum number of columns per index is 16, or a maximum key length of 900.

Example: Table Index

In the F32944 table, the index is defined as follows:

```
{
   MATH_NUMERIC ktkit;        /* 0 to 48 */
   char   ktmc01[251];        /* 49 to 299 */
   char   ktmc02[[252];       /* 300 to 550 */
   char   ktmc03[251];        /* 551 to 801 */
   char   ktmc04[251];        /* 802 to 1052 */
   MATH_NUMERIC ktseqn;       /* 1053 TO 1101 */
} KEY1_F32944, FAR *LPKEY1_F32944;
#define ID_F32944_KIT_CONFIGURED_STRING_ID_B 2L
```

This situation is not permitted because the key length, in this case, is 1101 (>900).

Key Column Violation

When you define indexes on various columns, ensure that no two indices, one of which might be a primary unique index, are defined on the same column.

Example: Key Column Violation

In this example, the indexes for the Credit/Collection Date Pattern table (F03B08) were defined as follows:

```
#define ID_F03B08_COMPANY_FISCAL_YEAR 1L /* PRIMARY &
UNIQUE */
typedef struct
{
   char rdco[6];          /* 0 to 5 (ASC)*/
   MATH_NUMERIC rdctry;       /* 6 to 54 (DESC) */
   MATH_NUMERIC rdfy;          /* 55 to 103 (DESC) */
   MATH_NUMERIC rdpn;          /* 104 to 152 (DESC) */
} KEY1_F03B08, FAR *LPKEY1_F03B08;
#define ID_F03B08_COMPANY_FISCAL_YEAR_(ASCEND) 2L /*
NONUNIQUE */
typedef struct
{
   char rdco[6];          /* 153 to 158 (ASC) */
   MATH_NUMERIC rdctry;       /* 159 to 207 (ASC) */
   MATH_NUMERIC rdfy;          /* 208 to 256 (ASC) */
   MATH_NUMERIC rdpn;          /* 257 to 305 (ASC) */
} KEY2_F03B08, FAR *LPKEY2_F03B08;
```

This results in a Key Column violation, which is not permitted because two indexes have been defined on the same column.

Specification File Corruption

If you encounter specification file corruption, re-create the tables in the source database.

Table I/O Objects

The following guidelines apply to table I/O objects:

- Table I/O header size is 206 bytes.
- Table I/O mapped item size is 181 bytes.
- Maximum number of table I/O mapped items size to fit in 32K is (32768-206)/181 for about 180 items.

To provide space for literal values, use a mapping size not greater than 130 elements. The 130 elements relate to the number of mappings on any table I/O statement. A table can have more than 180 columns, but you can still map fewer than 180 of them without problems. If you need to use table I/O with more than 180 mappings, J.D. Edwards recommends that you create several table I/O statements for specific requirements.

Business View Performance

This section discusses the performance ramifications of using single-table or multiple-table business views, restricting the number of fields in a business view, unions, and joined business views.

Should I Use a Single-Table or Multiple-Table Business View?

In many instances, an application must access data from multiple database tables to perform a business operation. You can accomplish this in two ways:

- Use a multiple-table business view to access all the related data fields.
- Use a single-table business view to access the data fields from the primary table, and use a business function or table I/O to access the data fields from secondary tables.

The best choice is not always obvious, but you can usually decide by examining the number of database I/O operations that will be performed. A joined business view that uses cross-data source joins causes slower performance.

If the secondary tables are "master" files, using a single-table business view is usually preferable because it makes better use of database caching. For example, suppose the primary table contains a company number and the related company name is stored in a secondary Company Master file. If, in practice, the same Company Master record is likely to be retrieved for several records in the primary table, then fetching the company name explicitly using a business function or table I/O is usually preferable.

J.D. Edwards software is particularly optimized to fetch user defined codes. User defined code tables should never be included in a multiple-table business view.

Should I Restrict the Number of Fields in a Business View?

You might need to choose between using an existing business view that contains unused fields or creating a new business view with only the required fields. Although extraneous fields cause additional work both for the server and the workstation, they are usually not a significant performance concern. In cases in which tables will be updated, J.D. Edwards software can automatically process all fields in a table, even if they do not exist in the business view.

Minimizing the number of fields in a data structure improves runtime performance better than minimizing the number of fields in a business view. You can create new business views that meet your specific needs and that do not affect performance.

Unions

Unions are the most expensive database operation out of all the SQL SELECT statement types. J.D Edwards recommends that you avoid using them if possible. Situations in which unions might be appropriate are applications and processes (such as the process for posting journal entries) that use the same parts of tables, but at different times.

See Also

- *The Post Process* in the *General Accounting Guide* for more information about the various tables that the system uses

Joined Business View Versus Table I/O

Use a joined business view if you are reading and updating two or more major tables. Use table I/O if the table being read or updated is merely an unintended result of another action.

Consider writing applications with the minimum number of grid columns required for the application's basic purpose. With minimal effort, you can add columns to the associated business view to supplement the basic features of the application. Therefore, adding columns to a business view is preferable to adding columns to a grid.

Data Structure Performance

This section discusses the performance ramifications of restricting the number of fields in a data structure and data structure objects.

Should I Restrict the Number of Fields in a Data Structure?

Performance measurements indicate that you should attempt to minimize the number of fields in a data structure, particularly when Configurable Network Computing (CNC) capabilities require that the data structure be passed between the server and the workstations.

Data Structure Objects

The following guidelines apply to data structure objects:

- Data structure header size is 237 bytes.
- Data structure item size is 72 bytes.
- Maximum number of data structure items to fit in 32K is (32768-237)/72 for 450 elements.

To provide space for literal values, limit your structure size to 350 elements or fewer. You should reconsider creating any data structure that exceeds 100 elements.

Data Selection and Sequencing

Use the following two system functions in the `Initialize Section` event to conditionally change the data selection for that section:

- Set User Selection
- Set Selection Append Flag

The Initialize Section event is normally used in the first level-one section of a report to conditionally select data based on values passed through the report data structure.

For example, Bill of Material Inquiry calls the Bill of Material report and passes the Parent Item, Parent Branch, Type of Bill, and Batch Quantity. In the Initialize Section event of the first level-one section of the Bill of Material report, the report values for the data structure are checked. If they are not equal to blank, the Set User Selection system function is used to add these selections.

Form Design

Use the following guidelines to increase performance across all form types.

- Limit the number of columns in the grid to the minimum required by the application.
- Keep the number of columns in the business view to the minimum required by the application.
- Limit the number of form controls, whether hidden or visible, to the minimum required by the application.
- Use event rule variables as work fields instead of hidden form controls.
- Disable data dictionary functions on form and grid controls that are not required, such as edits and default values, whether hidden or visible.
- Limit the amount of input and output performed for each grid row to the minimum required for the application. For example, avoid associated descriptions wherever possible.
- Use the Stop Processing system function whenever feasible to skip the processing of unnecessary event rules.
- Consider the design for the most efficient method of temporary data storage available at the time, such as cache versus either linked list or work files.

Find/Browse

Adherence to the following standards results in increased performance on Find/Browse forms.

- Do not use QBE assignments.
- The sort order on the grid should match both an index defined in J.D. Edwards ERP and a logical defined on the AS/400, either partially or completely. The logical file and index must contain at least all fields that are in the grid sort, and the fields selected for the grid sort must be in the same sequence as the logical/index fields. Additional fields might exist in the index or logical that are not included in the grid sort. For example, in a partial match, the grid sort can be KIT, MMCU; and the logical and index can include KIT, MMCU, TBM, BQTY.

Header Detail and Headerless Detail

Adherence to the following standards results in increased performance on Header Detail and Headerless Detail forms.

- For maximum performance, the grid sort should match an index of the table in the business view. The index should exist both in the AS/400 and the J.D. Edwards ERP tables.
- The sort order on the grid should match both an index defined in J.D. Edwards ERP and a logical file defined on the AS/400, either partially or completely. The logical and index must contain at least all fields that are in the grid sort, and the fields selected for the grid sort must be in the same sequence as the logical/index fields. Additional fields might exist in the index or logical that are not included in the grid sort. For example, in a partial match, the grid sort can be KIT, MMCU; and the logical and index can include KIT, MMCU, TBM, BQTY.

Batch Application Performance

This section discusses the performance ramifications of setting up level breaks. It also discusses the causes of slow performance.

Slow Performance

If the server side performance for your batch process is exceptionally slow and you cannot determine the cause, ask your system administrator to verify whether the `RequestedService` setting in the jde.ini file is set appropriately.

Event Rules Performance

When you create logic, if a row did not change then skip it. Do not check every row for changes.

Put master business function end docs on the `Post Button Clicked` event.

On asynchronous processing, put the `Post Button Clicked` event only on OK and Cancel. This ensures that your form does not terminate while the business function is still running. If the form terminates while the business function is still running, the business function cannot return values or handle errors.

Use system functions for repeated processes.

You can also use system functions to get to information that you cannot access, for example to write grid lines.

`FetchKeyed` is made up of `Clear Selection`, `Select Keyed`, and `Fetch`. Avoid using `FetchKeyed` unless the keys are changing.

If keys are not changing use `Select`, and then in a loop use `Fetch Next` for better performance, only if you do need to read records sequentially.

You should hide and show fields on the `Dialog is Initialized` event. You should put logic on the `Post Dialog is Initialized` event.

Always code If statements for the usual.

Use explicit comparisons instead of implied. It takes more code, but it runs faster.

You should make sure that the lines in a loop really need to be in there. If something does not really need to be done each time, then do not put it in a loop.

Reduce the number of returns inside code so you have only one exit point.

Use named variables to store temporary values. Do not use hidden controls or grid columns to store temporary values.

Using jdeCache Instead of Work Tables

In early versions of J.D. Edwards software, developers used temporary local tables to contain working arrays. This technique is now obsolete. The `jdeCache` routines provide similar capabilities but with improved performance.

When multiple business functions access the same cache, locate the related functions in the same source member. For example, assume that an `EditGridLine` function adds records to a cache and a corresponding `EndDocument` function retrieves the cached records and inserts them to the database. If the business functions are placed in different source members, a change in the CNC configuration might cause the application to fail.

Choosing JDB API Calls in a Business Function or Table I/O Commands in Event Rule Code

When deciding whether to use JDB API calls in a business function or table I/O commands in event rule code to manage the database, let context guide your choice. Neither choice affects performance more than the other. For example, if event rule code needs to access the database, use event rule table I/O instead of writing and calling a business function.

Using JDBFetchNext Versus Multiple JDBFetch Statements

When multiple related database records must be read from the database, from a performance standpoint, J.D. Edwards recommends that you select the records at one time and use `JDBFetchNext` to loop through the qualifying records. The alternative, multiple calls to `JDBFetch,` is usually considerably slower.

Business Function Performance

You can have data dictionary edits in business functions.

If you have validation in your code and this validation is also part of a master business function, the tool will know that you have already validated and will return and say it is already done, instead of performing the validation twice.

If you go into a grid and do a custom select it is a big performance hit. You might want to restrict people from resequencing the grid. If there is a business need to resequence a grid, make sure there is an index over that table that matches the sort sequence.

Use business function caching to retain pieces in memory.

Do not use linked lists; use caching instead.

Create a structure and pass a pointer instead of adding items.

Verify that variables are used only if needed.

Do not use static variables. You should probably use a single record cache instead. An instance where you might want a static variable would be if you were getting parts of something repeatedly and totalling them.

Because `jdeAlloc` actually allocates space, you should not generally use it. You can, however, use `jdeAlloc` if you want to keep a storage area for multiple calls.

For example, suppose you have a function that is split into server and workstation components and you have parent/child information. The client makes a request for what the parent/child looks like. The server needs to know where to go back to. You can use `jdeAlloc` to keep the information in sequence.

`jdeCallObject` - When functions are built there is one .c in source. If you have more functions in here, then all functions run on the server if the main one does. You may, however, want some functions to run on the workstation and some on the server. Make sure

that if you use more than one function that they are all completely dependent and you want them to run on the same place. `jdeCallObject` goes across DLLs and platforms.

Memory Allocation

Allocated memory that is not freed when it is no longer needed results in a memory leak. This can cause performance to degrade continuously as the application runs. You should be aware that `jdeCache` allocates memory. A cache that is created in a `BeginDoc` master business function must be destroyed in the corresponding `EndDoc` function to avoid memory leaks.

One frequent source of unexpected memory leaks comes from failing to free allocated memory when processing errors or other conditions. Failing to free allocated memory might cause the system to traverse an alternate execution path in a business function.

Review the `jdedebug.log` to identify possible memory leaks in business functions. You can also use a third-party tool for detecting memory leaks.

Balance Table Opens and Closes

Ensure that each `jdbOpen` is matched with a corresponding `jdbClose` within the same business function for all possible execution paths. Serious performance problems can arise from business functions within which table opens do not share a one-to-one correspondence with table closes.

Error Messaging Performance

You can classify error messages in the data dictionary as errors or warnings. An error appears as a red stop sign and a warning appears as a yellow yield sign. Validation is automatically performed using the data dictionary. You can create error messages that are validated by event rules. Ensure that you do the following:

- Use event rules to check in these error messages manually.
- Specify the field and error message number that the error is from.
- Code an If statement in event rules to prevent the system from redisplaying an error that is already displayed.

Note

If the error message exists in the data dictionary but not in event rules, the error displays every time.

Transaction Processing Performance

When you design applications that use transaction processing, you should maintain as narrow a scope as possible and you should start your transaction at a point that allows for the shortest possible time between the start of the transaction and the commitment or rollback. When you update a record that is part of a transaction, it is locked until the transaction is committed. If any part of a transaction fails, the entire transaction rolls back.

J.D. Edwards Modification Rules

Because the J.D. Edwards Tools are comprehensive and flexible, you can customize certain aspects of business solutions and applications without making custom modifications. J.D. Edwards refers to this concept as "modless mods," which are modifications that you can perform easily without the help of a developer. You can perform modless mods on the following:

- User overrides
- User defined codes
- Menu revisions
- All text
- Processing options values
- Data dictionary attributes
- Workflow processes

The flexibility of modless mods improves efficiency and provides distinct advantages, such as the ability to do the following:

- Export grid records to other applications, such as a Microsoft Excel spreadsheet.
- Resequence a grid, based on a different column.
- Change grid fonts and colors.
- Control major functionality using processing options.

However, even with the full commitment of J.D. Edwards to making the tools as flexible and robust as possible, if the need does arise to modify J.D. Edwards software, certain rules and standards exist to ensure that software modifications perform like modless mods for a seamless and predictable upgrade to the next release level.

You should prepare for the upgrade before making any custom modifications to ensure a smooth upgrade. If you plan modifications properly, you will have minimal work to do following an upgrade. This should result in the least amount of disruption to your business and reduced costs because the upgrade time is reduced.

J.D. Edwards software tracks all custom modifications as you check them into the server. Using this feature, you can run the Object Librarian Modifications Report (R9840D) prior to a merge to review a list of the changed objects.

J.D. Edwards software consists of control tables (such as menus, user defined codes, versions, and the data dictionary) and transaction tables (such as Address Book Master (F0101) and Sales Order Header File (F4201)). The transaction files contain your business data. J.D. Edwards ships the control tables with data that you can modify.

Both types of tables undergo an automatic merge process during an upgrade; control tables are merged with new J.D. Edwards data, while transaction files are converted to the new specifications, while maintaining your existing data. For the object specification merges (such as business views, tables, data structures, processing options, event rules, and applications), processes are in place that merge the specifications or overlay them depending upon the rules defined in the next section.

What an Upgrade Preserves and Replaces

If your business needs require custom software modifications, observe the following general terms for J.D. Edwards software modifications to ensure a smooth and predictable upgrade. These terms describe which of your modifications the upgrade process preserves and which modifications it replaces.

- "Preserve" means that, during an upgrade, J.D. Edwards software automatically merges your modifications with the new J.D. Edwards applications shipped with the upgrade, and you do not lose your modifications. If your specifications conflict with J.D. Edwards specifications, the upgrade process uses yours. When no direct conflict exists between the two, then the upgrade process merges the two specifications.
- "Replace" means that the upgrade does *not* merge those types of modifications and, therefore, J.D. Edwards replaces your modifications. You will need to perform them again after the upgrade process completes.

You can run the Object Librarian Modifications Report (R9840D), before the upgrade process to identify objects that you modified.

General Rules for Modification

The following general modification rules apply to all J.D. Edwards software objects:

- When adding new objects, use system codes 55 through 59. J.D. Edwards software uses reserved system codes that enable it to categorize different applications and vertical groups. When you use system codes 55 through 59 for your custom modifications, J.D. Edwards software does not overlay your modifications with J.D. Edwards applications.
- Do not create custom or new version names that begin with ZJDE or XJDE. These prefixes are reserved for standard version templates that J.D. Edwards provides for you to copy for the purpose of creating new templates or versions. If your modifications use these prefixes, the system does not preserve your custom versions in case of a naming conflict.
- For upgrades, you should build a package from the last modified central objects set and perform backups of your development server, central objects, and Object Librarian data sources so that you can access those specifications for comparison or for troubleshooting purposes.

Interactive Applications

Do not delete controls, grid columns, or hyper-items on existing J.D. Edwards interactive software applications. Instead, hide or disable them. J.D. Edwards software might use these items for calculations or as variables; deleting them might disable major functionality.

What an Upgrade Replaces

Custom forms on existing J.D. Edwards software applications are replaced during an upgrade. Instead of placing custom forms on existing J.D. Edwards software applications, you should create a custom application using system codes 55 - 59, and then place the custom forms on that custom application. You can then add to existing applications form exits and row exits that call your custom forms within your custom applications. From a performance standpoint, the system recognizes no difference whether an external application is called from a row exit or a form within the application.

In addition to custom forms, the following interactive application elements are replaced during an upgrade:

Object	Comments
New applications	You can create an application from scratch or copy an existing application using the Application Design Aid's "Copy" feature. The Copy feature allows you to copy all of the application specifications, including event rules. **Caution** If you use the Copy feature to copy an existing application upon which you add some modifications, during an upgrade your new application *does not* reflect any changes that J.D. Edwards might have made to the original application on which yours is based.
New hyper-items added to existing forms	
New controls added to existing forms	
New grid columns added to existing forms	
Style changes	Style changes include fonts and colors. New J.D. Edwards controls have standard base definitions. If you revise the style, you need to do the same for any new controls added to an application.
Code-generator overrides	
Data dictionary overrides	
Location & size changes	If J.D. Edwards places a new control in the new release of the software in the same location that you have placed a custom control, the controls appear on top of each other. This does not affect the event rules or the functionality of the application. After the upgrade, you can use Application Design Aid to rearrange the controls.
Sequence changes for tabs or columns	The upgrade process adds new J.D. Edwards controls to the end of your custom tab sequence. You can review the tab sequence after the upgrade.

What an Upgrade Preserves

The following interactive application elements are preserved during an upgrade:

Object	Comments
New applications	You can create a new application either from scratch, or by copying an existing application by using the “Copy" feature within Application Design Aid. This application allows you to copy all of the application specifications, including event rules. If you use the Copy feature to copy an existing application for some modifications, during an upgrade your new application *does not* receive any changes that J.D. Edwards might have made to the original application upon which your copy was based.

New hyper-items added to existing forms	
New controls added to existing forms	
New grid columns added to existing forms	
Style changes	Style changes include fonts and colors. New J.D. Edwards controls have standard base definitions. If you revise the style, you need to do the same for any new controls added to an application.
Code-generator overrides	
Data dictionary overrides	
Location & size changes	If J.D. Edwards places a new control in the new release of the software in the same place that you have placed a custom control, the controls appear on top of each other. This does not affect the event rules or the functionality of the application. After the upgrade, you can use Application Design Aid to rearrange those controls.
Sequence changes for tabs or column	The upgrade process adds new J.D. Edwards controls to the end of your custom tab sequence. You can review the tab sequence after an upgrade.

Reports

The following rule applies to Report Design Aid specifications:

Do not delete objects on existing J.D. Edwards software reports. Instead, hide them. The system might use these for calculations or as variables, and deleting them might disable major functionality.

What an Upgrade Preserves

The following report elements are preserved during an upgrade:

Object	Comments
New reports	You can create a report either from scratch, or by copying an existing report by using the "Copy" feature within Report Design Aid. This feature enables you to copy all of the report specifications, including event rules. If you use the Copy feature to copy an existing report for some modifications, during an upgrade your new report *does not* receive any updates that J.D. Edwards made to the original report on which your copy was based.
New constants added to existing reports	
New alpha variables added to existing reports	

Object	Comments
New numeric variables added to existing reports	
New data variables added to existing reports	
New runtime variables added to existing reports	
New database variables added to existing reports	
New data dictionary variables added to existing reports	
Style changes	Style changes include fonts and colors. New J.D. Edwards controls have standard base definitions. If you revise the style, you need to do the same for any new controls added to a report.
Location and size changes for objects	If J.D. Edwards places a new object, such as a control, in the new release of the software in the same place that you have placed a custom object, the objects appear next to each other. This does not affect the event rules or the functionality of the report in any way. After the upgrade, you can use Report Design Aid to rearrange objects.
Data dictionary overrides	

What an Upgrade Replaces

During an upgrade, the system replaces custom sections on existing J.D. Edwards software reports. Instead of adding custom sections to existing reports, use Report Interconnect and connect to a new custom report that uses system codes 55 - 59. System performance is not affected if a report is called through report interconnections.

Application Text Changes

What an Upgrade Preserves

The following application text elements are preserved during an upgrade.

- Overrides created in Application Design Aid
- Overrides created in Report Design Aid
- Overrides created in Interactive Vocabulary Override
- Overrides created in Batch Vocabulary Override

Table Specifications

An upgrade merges your table specifications from one release level to the next.

What an Upgrade Preserves and Replaces

The following table describes the table specification elements that are preserved or replaced during an upgrade:

Object	Preserved	Replaced	Comments
New tables	X		
Custom indexes to J.D. Edwards tables	X		
Columns added to or removed from existing J.D. Edwards tables		X	These modifications include changing field length, field type, and decimal position. Instead of adding a new column to an existing J.D. Edwards table, use a tag file with system codes 55 - 59.

Note

For custom tag files, be aware of data item changes in the J.D. Edwards data dictionary. From one release to the next, J.D. Edwards might change certain data item attributes, such as data item size, which can affect data integrity and how data is stored in the database. For this reason, you might need to use the Table Conversion tool to convert the tag file data to the new release level. For base J.D. Edwards files, the upgrade process performs the data dictionary changes by upgrading the J.D. Edwards software database to the new release level. The upgrade process preserves custom indices over the custom tag files.

Control Tables

Control tables contain user defined codes (UDCs), menus, and data dictionary items. An upgrade merges your control tables from one release level to the next using the Change Table process, which uses your control tables, *not* J.D. Edwards tables, as the basis on which the data is merged.

What an Upgrade Preserves and Replaces

The following table describes the control table elements that are preserved or replaced during an upgrade:

Object	Preserved	Replaced	Comments
Data dictionary custom changes	X		This includes changes to row, column, and glossary text. The upgrade process uses your data dictionary as the base. If your values conflict with J.D. Edwards data items, your values override J.D. Edwards values. Create new data items using system codes 55 - 59.
User defined codes	X		The upgrade process merges any new hard-coded J.D. Edwards values. (Values owned by J.D. Edwards are system 90 and above, and H90 and above.) The process also reports any J.D. Edwards hard-coded values that

			conflict with your custom values.
Menus	X		If your custom menus conflict with J.D. Edwards base menus, your custom changes override J.D. Edwards base menus.
Columns added or removed from existing J.D. Edwards control tables		X	

Business Views

Do not remove columns from existing business views. Modifications to business views that applications use can cause unpredictable results when you run the applications. If you need to hide columns, do so at the application design level using either Application Design Aid or Report Design Aid. Performance that might be gained by deleting a few columns from a business view is negligible.

What an Upgrade Preserves and Replaces

The following table describes the business view elements that are preserved or replaced during an upgrade:

Object	Preserved	Replaced
New custom business views	X	
New columns, joins, or indexes added to existing J.D. Edwards software business views	X	
Columns removed from J.D. Edwards business views		X

Data Structures

The following table describes the data structure elements that are preserved or replaced during an upgrade:

Object	Preserved	Replaced
Custom forms data structures	X	
Custom processing-options data structures	X	
Custom reports data structures	X	
Custom business-function data structures	X	
Custom generic-text data structures	X	
Modifications to existing J.D. Edwards forms data structures		X

Modifications to existing J.D. Edwards processing-options data structures		X
Modifications to existing J.D. Edwards reports data structures		X
Modifications to existing J.D. Edwards business-function data structures		X
Modifications to existing J.D. Edwards generic-text data structures		X

To bring your custom modifications made to J.D. Edwards data structures forward to the next release level, run the Object Management Workbench Modifications Report (R9840D) to list all of the modified data structures, and use this report as a guide for manually refitting data structure changes.

Event Rules

Before you begin the upgrade process, J.D. Edwards recommends that you complete the following procedures

- Run the Object Management Workbench Modifications Report (R9840D) to identify modified applications.
- Print the event rules for modified applications so that you can review the logic for the event when you restore custom event rules.

The following table describes the event rules elements that are preserved or replaced during an upgrade:

Object	Preserved	Replaced	Comments
Custom event rules for custom applications, reports, and tables	X		
Custom event rules for custom business functions	X		
Custom event rules on a new custom control	X		
Events for J.D. Edwards applications, reports, and tables that do not have any J.D. Edwards event rules attached to the same event	X		
Events for J.D. Edwards business functions that do not have any J.D. Edwards event rules attached to the same event	X		
Events for J.D. Edwards applications, reports, and tables that have existing event rules attached to the same event		X	An upgrade disables and appends your custom event rules to the end of the event rules. The system generates the Object Librarian Modifications Report (R9840D) to notify you of any event rules that the upgrade

			process disabled.
Events for J.D. Edwards business functions that have event rules attached to the same event		X	An upgrade disables and appends your custom event rules to the end of the event rules. The system generates the Object Librarian Modifications Report (R9840D) to notify you of any event rules that the upgrade process disabled.

To restore your custom event rules to J.D. Edwards objects, drag the event rules back to the proper place in the event and enable them.

Versions

Prior to an upgrade process, verify that new custom versions are named such that they do not begin with XJDE or ZJDE.

What an Upgrade Preserves and Replaces

The following table describes the versions elements that are preserved or replaced during an upgrade:

Object	Preserved	Replaced
Non-JDE versions	X	
Version specifications	X	
Processing option data	X	
All ZJDE and XJDE version specifications		X
All processing option data for XJDE versions		X

In addition to the information in the preceding table, the system copies processing option data, but does not convert it for non-JDE versions using JDE processing option templates. The system generates a warning at runtime. Some data might be lost. Additionally, event rule modifications for custom versions on JDE templates are not reconciled with the JDE parent template.

Business Functions

For any new custom business functions, create a new (custom) parent DLL to store your custom modifications.

To carry your custom changes forward to the next release level, run the Object Librarian Modifications Report (R9840D) to list all of the modified business functions, and use this report as a guide for manually refitting the business function changes.

To prevent unpredictable results, always use the standard API (jdeCallObject) to call other business functions from within a business function.

To determine modifications to the source of existing base J.D. Edwards business functions, use a third-party source-compare tool, such as Microsoft WinDiff. To determine modifications

to APIs within business functions, see the J.D. Edwards software online help feature for the most current APIs.

What an Upgrade Preserves and Replaces

The following table describes the business function elements that are preserved or replaced during an upgrade.

Object	Preserved	Replaced	Comments
New custom business function objects	X		
Modifications made to existing J.D. Edwards business function objects		X	NER business functions can be modified

Form and Control Processing

Processing for the following form types is discussed in this section:

- Find/browse
- Parent/child
- Fix/inspect
- Header detail
- Headerless detail
- Search/select
- Message form

This section also provides information about edit and grid control processing.

Process Flow for Find/Browse Forms

Find/browse forms are used to query business views and select records from business views for operations.

Default Flags

The system does not check by default any form option flags on find/browse forms. The only form option flag that can affect this form type is the "No Fetch on Grid Business View" flag. Choosing any of the other form option flags does not have any effect on the form processing.

Find/browse forms and parent/child browse forms are the only forms that have the "Entry Point" property activated by default. Find/browse forms are typically the entry point into applications. The application developer can deactivate the entry point property.

Dialog Initialization

- Initialize Thread Handling.
- Initialize Error Handling Process.
- Initialize Business View Columns.
- Initialize Form Controls.
- Initialize Grid Fields.
- Initialize Static Text.
- Initialize Helps.
- Initialize Event Rules Structures.
- Create Toolbar.
- Load Form Interconnection data into corresponding business view columns and filter fields, if any.
- Perform Event Rules: Dialog is Initialized

- Perform Event Rules: Post Dialog is Initialized
- Begin Detail Data Selection and Sequencing (if the grid option "Automatically Find On Entry" is activated).

Header Data Retrieval

Find/browse forms do not have header records.

Detail Data Selection and Sequencing

The system creates an internal structure that represents the data selection and data sequencing requirements specified by the user. The system then passes this to the database engine to perform the actual database select and sequencing. The data used for selection is based on values from filter fields and QBE columns. The system holds the data until the data is retrieved.

If the form option flag called "No Fetch On Grid Business View" is not checked, the following two actions occur:

- Select and Sequence
- Begin Data Retrieval

If the form option flag "No Fetch On Grid Business View" is checked, the system does not retrieve data

Data Retrieval

The system issues a request to the JDEKRNL, which actual fetches the data from the database. The system reads one record at a time; it performs the following processing for each record:

1. Attempts to fetch a record from the database.
2. If it succeeds, the following processing occurs:
    - Copy the data into the business view data structures.
    - Perform Event Rules: Grid Record is Fetched
3. If the application developer has not chosen to suppress the writing of this grid record, the following occurs:
    - Copy the business view data into the grid data structures.
    - Perform Event Rules: Write Grid Line - Before
    - Add the row to the grid. The row now exists in the grid control.
    - Perform Event Rules: Write Grid Line - After
    - Clear the grid data structures for reading the next record
    - Remove the suppress grid line flag

The previous steps occur for each record read from the database. After all records have been read, the following processing occurs:

4. Perform Event Rules: Last Grid Record Has Been Read

Closing Form

1. Perform Event Rules: End Dialog
2. Load Form Interconnection data from corresponding business view columns, if any.
3. Terminate Error Handling.
4. Terminate Thread Handling.
5. Terminate Helps.
6. Free all structures for form, including structures for business view columns, form controls, grid columns, and event rules.
7. Destroy the window.

Menu/Toolbar Items

This section discusses the following menu and toolbar items:

- Select
- Close
- Delete
- Find
- Copy
- Add
- User Defined Items

Select

Select is a standard item that is automatically placed on Find/Browse forms. No default processing exists for Select on find/browse forms. Select acts as a user defined item.

Close

Close is a standard item that automatically appears on find/browse forms. It closes the form.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked
3. Begin Closing Form

Find

Find is a standard item that automatically appears on Find/Browse forms. When the user clicks it, it is the signal to the runtime engine to call the database and reload the grid based on the information in the filter fields.

1. Perform Event Rules: Button Clicked
2. If no errors exist in any filter fields, do the following:
    - Begin Data Selection and Sequencing.

- Perform Event Rules: Post Button Clicked

Delete

Delete is a standard item that can be added to Find/Browse forms. It deletes a record in the grid from the database.

1. Perform Event Rules: Button Clicked
2. Do the following for each selected grid row that you can delete:
    - Copy the grid row data into the Business View structures.
    - Remove Suppress Delete flag.
    - Perform Event Rules: Delete Grid Rec Verify – Before.
3. If the Suppress Delete flag is not set, do the following:
    - Display Delete Confirmation dialog. If the user clicks NO or CANCEL the system skips therest of this processing.
    - Perform Event Rules: Delete Grid Rec Verify – After.
    - Perform Event Rules: Delete Grid Rec from DB – Before.
    - Delete the record in the Business View from the database.
    - Delete the grid row from the grid control.
    - Perform Event Rules: Delete Grid Rec from DB – After.
    - Perform Event Rules: All Grid Recs Deleted.
    - Perform Event Rules: Post Button Clicked.

Copy

Copy is a standard item that can be added to Find/Browse forms. The copy function allows users to duplicate and rename an object. No default processing exists for the copy function on Find/Browse forms. They act as user-defined items. If a form interconnection is placed on the Button Clicked event, then the called form opens in copy mode.

Add

Add is a standard item that can be added to Find/Browse forms. No default processing exists for add on Find/Browse forms. They act as user-defined items. If a form interconnection is placed on the Button Clicked event, then the called form will open in add mode.

User Defined Items

User-defined items are nonstandard items that you can add to Find/Browse forms to perform specialized processing that is not handled by the standard items.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked

Process Flow for Parent/Child Browse Forms

A parent/child browse form is used to query a business view and represent the data in a hierarchical manner. Records can also be selected from that business view for an operation. The following sections describe the processing flow of a parent/child browse form type.

Default Flags

No form options flags are checked by default on parent/child browse forms. The only form option flag that can have an effect for this form type is the "No Fetch on Grid Business View" flag. Checking any of the other form option flags does not have any effect on the form processing.

The parent/child browse forms (along with find/browse forms) are the only forms that have the "Entry Point" property checked by default. Parent/child browse forms are typically the entry points into applications. The entry point property can be unchecked by the application developer.

Dialog Initialization

- Initialize Thread Handling.
- Initialize Error Handling Process.
- Initialize Business View Columns.
- Initialize Form Controls.
- Initialize Grid/Tree Fields.
- Initialize Static Text.
- Initialize Helps.
- Initialize Event Rules Structures.
- Create Toolbar.
- Load Form Interconnection data into corresponding business view columns and filter fields, if any.
- Perform Event Rules: Dialog is Initialized
- Perform Event Rules: Post Dialog is Initialized
- Begin Detail Data Selection and Sequencing ilf the grid option flag "Automatically Find On Entry" is checked.

Header Data Retrieval

Parent/child browse forms have no header records.

Detail Data Selection and Sequencing

The system creates an internal structure that represents the data selection and data sequencing requirements specified by the user. This structure is then passed to the database

engine to perform the actual database selection and sequencing. The data is then held until the data is retrieved in the next step.

The data used for selection is pulled from filter fields and QBE columns.

If the form option flag "No Fetch On Grid Business View" is not checked, the following occur:

- Select and Sequence
- Begin Data Retrieval

Data Retrieval

A request is issued to the JDEKRNL, which performs the actual fetch of the data from the database. It reads one record at a time; and for each record, it performs the required processing. The data retrieval is performed in two different ways in the parent/child browse form. The fetch performed to get the first level nodes in the tree is similar to the one performed in the find/browse form.

Data Retrieval for the First Level Node in the Tree

1. Attempt to fetch a record from the database
2. If a record is fetched, do the following:
    - Copy the data into the business view data structures.
    - Perform Event Rules: Grid Record is Fetched
3. If the application developer has not chosen to suppress the writing of this record, do the following:
    - Copy the business view data into the grid data structures.
    - Perform Event Rules: Write Grid Line – Before
    - Add the row to the grid and the corresponding column in Tree. The row and the corresponding tree node now exist in the control.
    - Perform Event Rules: Write Grid Line - After
    - Clear the data structures to read the next record

The previous steps occur for each record read from the database. After all records have been read, the following occur:

4. If the parent/child browse form has the grid permanently hidden, then expand the header node and move the selection to the first child node under the header. This initiates the events “Tree - Node Level Changed” and “Tree - Node Selection Changed.”
5. Perform Event Rules: Last Grid Record Has Been Read

The parent/child browse form also performs data retrieval whenever a particular node on the tree is expanded. However, this fetch is performed only once for each node that is expanded. If a particular node is collapsed and expanded again, then the tree and the grid are replenished from internal structures. The processing performed for node expand event is given below:

Data Retrieval for Tree Node Expand

1. Perform Event Rules: Tree - Node is expanding

2. Check for internal flags to see whether the fetch is suppressed. If the fetch is suppressed through the system function, Suppress Fetch on Node Expand, the processing stops here.
3. Perform the key substitution (copying child key into parent key) that was set up in the design of the form.
4. Attempt to fetch a record from the database.
5. If a record is fetched, do the following:

    - Copy the data into the business view data structures.
    - Perform Event Rules: Grid Record is Fetched

    If the application developer has not chosen to suppress the writing of this record, do the following:

    - Copy the business view data into the grid data structures.
    - Perform Event Rules: Write Grid Line - Before
    - Add the row to the grid and the corresponding column in the tree. The row and the corresponding tree node now exist in the control.
    - Perform Event Rules: Write Grid Line - After
    - Clear the data structures to read the next record.
    - Perform Event Rules: Last Grid Record Has Been Read
    - Move the tree selection to the first child node under the expanding node. This initiates the Events: Tree - Node Level Changed and Tree - Node Selection Changed.

Closing the Form

1. Perform Event Rules: End Dialog
2. Load Form Interconnection data from corresponding business view columns, if any.
3. Terminate Error Handling.
4. Terminate Thread Handling.
5. Terminate Helps.
6. Free all structures for form, including structures for business view columns, form controls, grid columns, and event rules.
7. Destroy the window.

Menu/Toolbar Items

The following is the process flow for the menu/toolbar items on a Parent Child Form.

Select

Select is a standard item that is automatically placed on parent/child browse forms. No default processing exists for Select on parent/child browse forms. It acts as a user-defined item.

Close

Close is a standard item that automatically appears on parent/child browse forms. It closes the form.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked
3. Begin Closing Form

Delete

Delete is a standard item that can be added to parent/child browse forms. Similar to the find/browse form, the parent/child browse form does the following.

1. Perform Event Rules: Button Clicked
2. For the selected tree node:
    - Copy the grid row data into the Business View structures.
    - Remove Suppress Delete flag.
    - Perform Event Rules: Delete Grid Rec Verify - Before
3. If the Suppress Delete flag is not set, do the following:
    - Display Delete Confirmation dialog. If the user clicks No or Cancel, the rest of this processing is skipped.
    - Perform Event Rules: Delete Grid Rec Verify - After
    - Perform Event Rules: Delete Grid Rec from DB - Before
4. If the Suppress Delete flag is not set, do the following:
    - Delete the record in the Business View from the database.
    - This will not delete the child records of the node, if any, from the database. It is your responsibility to delete them from the database.
    - Delete the grid row from the grid control.
    - Perform Event Rules: Delete Grid Rec from DB - After
5. Perform Event Rules: All Grid Recs Deleted
6. Perform Event Rules: Post Button Clicked

Find

Find is a standard item that automatically appears on parent/child browse forms. When the user clicks Find, the system signals the runtime engine to call the database and reload the grid based on the information in the filter fields and the QBE columns.

1. Perform Event Rules: Button Clicked
2. If no errors are in any filter fields, do the following:
    - Begin Data Selection and Sequencing.
    - Perform Event Rules: Post Button Clicked

Copy

Copy is a standard item that can be added to parent/child browse forms. No default processing exists for copy on parent/child browse forms. The forms work as user defined items. If a form interconnection is placed on the Button Clicked event then the called form will open in copy mode.

Add

Add is a standard item that can be added to parent/child browse forms. No default processing exists for add on parent/child browse forms. The forms work as user defined items. If a form interconnection is placed on the Button Clicked event then the called form will open in add mode.

User-Defined Items

User-defined items are nonstandard items that you can add to parent/child browse forms to perform specialized processing that is not handled by the standard items.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked

Process Flow for Fix/Inspect Forms

A fix/inspect form is used to update and insert single data base records. It is also referred to as a Single Record Maintenance form. This form type can also be used to display static information to the user, as well as prompt the user for information. Sign-on screens, for example, prompt the user to enter sign-on information. The following sections describe the processing flow of a fix/inspect form.

Default Flags

None of the form option flags are set by default.

Dialog Initialization

- Initialize Thread Handling.
- Initialize Error Handling Process.
- Initialize Business View Columns.
- Initialize Form Controls.
- Initialize Static Text.
- Initialize Helps.
- Initialize Event Rules Structures.
- Create Toolbar.
- Load Form Interconnection data into corresponding business view columns.

Note
Form controls and business view columns are sharing internal memory, so copying into the business view is effectively copying into the internal form control memory locations.

- Perform Event Rules: Dialog is Initialized
- If the No Fetch Form Business View is checked, do the following:
  - Perform Event Rules: Post Dialog is Initialized
- If the form is in Add Mode, do the following:
  - Begin Clearing Dialog.
- If the form is in update mode and No Fetch Form Business View is checked, do the following:
  - Change mode to add mode.
  - Display the internal form control values to the screen.
  - Begin Clearing Dialog.
- If the form is in update mode and No Fetch Form Business View is not checked, do the following:
  - Begin Data Retrieval.

Data Retrieval

A request is issued to the JDEKRNL, which performs the actual fetch of the data from the database. The fetch is based on the information passed to the form through its form data structure.

1. Attempt to fetch a record from the database.
2. If a record is fetched, do the following:
   - Copy the data into the business view data structures.

   Note
   Remember that copying into the business view is effectively copying into the internal form control memory locations.

3. If a record is found and the form is in Copy Mode, do the following:
   - Switch to Add Mode.
   - Display the internal form control values to the screen.
   - Begin Clearing Dialog.
4. If a record is found and not in Copy mode, do the following:.
   - Perform Event Rules: Post Dialog is Initialized
5. If no records were fetched, do the following:
   - Switch to Add Mode.
   - Display the internal form control values to the screen.

- Begin Clearing Dialog.

6. Set the default focus based on the resulting data base mode.

Clearing Dialog

1. If the form was called in Copy Mode, do the following:
    - Clear the key (primary index) controls that have the "Do Not Clear After Add" flag unchecked.
2. If the form was not called in Copy Mode, do the following:
    - Clear all form controls that have the "Do Not Clear After Add" flag unchecked.
3. Perform Event Rules: Clear Screen Before Add
4. Perform Event Rules: Post Dialog is Initialized

Closing Form

1. Perform Event Rules: End Dialog
2. Load Form Interconnection data from corresponding business view columns, if any.
3. Terminate Error Handling.
4. Terminate Thread Handling .
5. Terminate Helps.
6. Free all structures for form, including structures for Business View Columns, Form Controls, and Event Rules.
7. Destroy the window.

Menu/Toolbar Items

The following is the process flow for the menu/toolbar items on a fix/inspect Form.

OK

OK is a standard item that is automatically placed on fix/inspect forms. It validates the information on the form and updates or adds to the database through JDEKRNL function calls.

1. If any errors or warnings appear on the form, stop OK processing
2. Perform Event Rules: Button Clicked
3. For each control on the form, do the following:
    - If the current control is a form control and it has not passed validation, do the following:

        Perform Event Rules: Control is Exited

        Perform Event Rules: Control is Exited and Changed - Inline

        Perform Event Rules: Control is Exited and Changed - Async

        Perform Data Dictionary validation.

4. If any errors appear on the form, stop OK processing
5. If the form is in Add mode, do the following:
    - Perform Event Rules: Add Record to Database - Before
6. If the form is in Update mode, do the following:
    - Perform Event Rules: Update Record to Database - Before
7. Perform Event Rules: Post Button Clicked
8. If form is in Add Mode, do the following:
    - If form was called in Copy mode or the flag “End Form On Add” is checked, do the following:

        Begin Closing Form
    - Else

        Begin Clearing Dialog
9. If the form is in Update mode, do the following:
    - If no errors occurred while attempting to update or add to the database, do the following:

        Begin Closing Form

Cancel

Cancel is a standard item that is automatically placed on fix/inspect forms.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked
3. Begin Closing Form

User-Defined Items

User-defined items are nonstandard items that a developer can add to fix/inspect forms to perform specialized processing that is not handled by the standard items.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked

Process Flow for Header Detail Forms

A header detail form is used when a relationship exists between the information in the header and the information in the detail area. The Header portion uses one business view, and the detail portion of the form uses another business view. This form type (as well as the headerless detail form type) is referred to as a transaction form. The following sections describe the processing flow of a header detail form type.

Default Flags

No form option flags are automatically set for this form type. All form option flags can be checked or unchecked by the application developer.

Dialog Initialization

- Initialize Thread Handling.
- Initialize Error Handling Process.
- Initialize Business View Columns.
- Initialize Form Controls.
- Initialize Grid Fields.
- Initialize Static Text.
- Initialize Helps.
- Initialize Event Rules Structures.
- Create Toolbar.
- Load Form Interconnection data into corresponding business view columns and filter fields, if any.
- Perform Event Rules: Dialog is Initialized
- If the form option flag "No Fetch On Form Business View" is checked, do the following:
  - If the form is not in Add mode and was not entered with a Copy button, do the following:

    Perform Event Rules: Post Dialog is Initialized
  - Copy the Form Control values to the screen.
- If the form is in Update mode (includes forms entered with a Copy button), do the following:
  - If the form option flag "No Fetch On Form Business View" is checked, do the following:

    Begin Detail Data Selection and Sequencing
  - If the form option flag "No Fetch On Form Business View" is unchecked, do the following:

    Begin Header Data Retrieval
- If the form is in Add mode, do the following:
  - Begin Clearing Dialog

Header Data Retrieval

A key structure is built for the business view of the header based on the header business view columns, or from the filter fields, if any exist. Then a call is made to the database attempting to retrieve the record specified.

1. If the database fetch is successful, do the following:
   - Copy the fetched database record to the header Business View Columns
   - If the form was not opened with a Copy button, do the following:

     Perform Event Rules: Post Dialog is Initialized (note that where form controls and business view columns share memory, the form controls will

have the values from the database during this event, which may mean blanks in the case of strings and characters)

- Copy the Business View Columns to the Form Controls.
- If the grid option "Automatically Find on Entry" is checked, do the following:

  Begin Detail Data Selection and Sequencing
- If the grid option "Automatically Find on Entry" is unchecked, do the following:

  Begin Add Entry to Row to Grid

2. If the database fetch failed, do the following:
   - Begin Clearing Dialog

Detail Data Selection and Sequencing

An internal structure is now created representing the data selection and data sequencing requirements specified by the user for the detail portion. This structure is then passed to the database engine to do the actual database selection and sequencing. The data is retrieved in the next step.

The data used for selection comes from filter fields, if any exist, or from the key business view columns, if no filter fields exist.

1. If the form option flag "No Fetch On Grid Business View" is unchecked, do the following:
   - Select and Sequence
   - Begin Data Retrieval
2. If the form option flag `No Fetch On Grid Business View' is checked, do the following:
   - Begin Add Entry Row To Grid

Data Retrieval

A request is issued to the JDEKRNL, which performs the actual fetch of the data from the database. The system reads one record at a time; and for each record, the system performs the following processing:

1. Attempt to fetch a detail record from the database
2. If a record is fetched, do the following:
   - Copy the data into the detail business view data structures.
   - Perform Event Rules: Grid Record is Fetched
   - If the application developer has not chosen to suppress the writing of this grid record, do the following:

     Copy the business view data into the grid data structures.

     Perform Event Rules: Write Everest Grid Line - Before

     Add the row to the grid. The row now exists in the grid control.

     Perform Event Rules: Write Everest Grid Line - After
   - Clear the grid data structures for reading the next record.
   - Remove the suppress grid line flag.

The previous steps occur for each record read from the database. After all records have been read, the runtime engine will then, do the following:

3. If the form was opened with a Copy button, do the following:
    - Switch to Add mode.
    - Begin Clearing Dialog once Detail Data Retrieval processing is complete.
4. If no records were fetched, do the following:
    - Switch to Add mode.
5. Perform Event Rules: Last Grid Record Has Been Read

    (This event runs regardless if records were actually fetched.)

6. Begin Add Entry Row to Grid.

Clearing Dialog

1. If the form was called in Copy mode, do the following:
    - Clear the key controls that have the "Do Not Clear After Add" flag unchecked.
2. If the form was not called in Copy mode, do the following:
    - Clear all form controls that have the "Do Not Clear After Add" flag unchecked.
3. Perform Event Rules: Clear Screen Before Add
4. Delete any existing rows.
5. Perform Event Rules: Post Dialog is Initialized
6. Begin Add Entry Row to Grid.

Add Entry Row to Grid

1. Clear grid data structures.
2. Perform Event Rules: Add Last Entry Row to Grid
3. Add the row to the grid control.

Closing Form

1. Perform Event Rules: End Dialog
2. Load form interconnection data from corresponding business view columns, if any.
3. Terminate error handling.
4. Terminate thread handling.
5. Terminate Helps.
6. Free all structures for form, including structures for business view columns, form controls, grid columns, and event rules.
7. Destroy the window.

Menu/Toolbar Items

The following is the process flow for the menu/toolbar items on a header detail form:

OK

OK is a standard item that is automatically placed on header detail forms. It validates the information on the form and updates or adds to the database through JDEKRNL function calls.

1. If any errors or warnings appear on the form, stop OK processing.
2. Perform Event Rules: Button Clicked
3. For each control on the form, do the following:
    - If the current control is a form control and it has not passed validation, do the following:

        Perform Event Rules: Control is Exited

        Perform Event Rules: Control is Exited and Changed - Inline

        Perform Event Rules: Control is Exited and Changed - Asynch

        Perform Data Dictionary validation.
    - If the current control is a grid control, do the following:

        For each grid row, do the following:

            If the current grid row needs to have Leave Row processing run and the row is updatable, do the following:

                Perform Event Rules: Row is Exited and Changed - Inline for current row

                Perform Event Rules: Row is Exited and Changed - Asynch for current row
4. If any errors appear on the form, stop OK processing.
5. Delete from the database any grid rows that are in the delete stack. For each grid row in the delete stack, do the following:
    - Copy the information from the delete stack into the grid data structures.
    - Copy the grid data structures into the Business View structures.
    - Perform Event Rules: Delete Grid Record from DB – Before.
    - If the database delete has not been suppressed, do the following:

        Delete the record in the Business View from the database.

        Delete the grid row from the grid control.

        Perform Event Rules: Delete Grid Record from DB - After
6. Perform Event Rules: All Grid Recs Deleted from DB
7. If the form option flag `No Update On Form Business View' is unchecked, do the following:
    - If the form is in Add mode, do the following:

        Perform Event Rules: Add Record to Database - Before

        If the database add has not been suppressed, do the following:

            Add the header business view record to the database.

- Perform Event Rules: Add Record to Database - After
- If the form is in Update mode, do the following:

    Perform Event Rules: Update Record to Database - Before

    If the database Update has not been suppressed, do the following:

        Update the record to the database.

        Perform Event Rules: Update Record to Database - After

8. If the form option flag “No Update On Grid Business View” not unchecked, do the following:
    - For each grid row that was changed or added, do the following:

        Clear the business view data structures.

        Reset the original key values for this row in the business view data structures.

        Copy grid data structures to the business view data structures.

        Copy all non-filter database form controls to the business view data structures.

        Copy all equal filters to the business view data structures.

        If form is in Add mode, do the following:

            Perform Event Rules: Add Grid Rec to DB - Before

            Add the record in the business view data structure to the database.

            Perform Event Rules: Add Grid Rec to DB - After

        If form is in Update mode, do the following:

            Perform Event Rules: Update Grid Rec to DB - Before

            Update the record in the business view data structure to the database.

            Perform Event Rules: Update Grid Rec to DB - After
    - If form is in Add mode, do the following:

        Perform Event Rules: All Grid Recs Added to DB
    - If form is in Update mode, do the following:

        Perform Event Rules: All Grid Recs Updated to DB
9. Perform Event Rules: Post Button Clicked
10. If form is in Add mode, do the following:
    - If form was called in Copy mode or if the flag `End Form On Add' is checked, do the following:

        Begin Closing Form

    Else

        Begin Clearing Dialog
11. If the form is in Update mode and if no errors were encountered while attempting to update or add to the database, do the following:
    - Begin Closing Form.

Cancel

Cancel is a standard item that is automatically placed on header detail forms.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked
3. Begin Closing Form.

Delete

Delete is a standard item that can be added to header detail forms. The delete applies to the grid record(s) selected. The actual delete from the database does not happen at this point, so that if the user clicks cancel, the records are not deleted from the database. The delete verification happens when the delete is pressed, and the actual database delete happens when OK is pressed.

1. Perform Event Rules: Button Clicked
2. For each selected grid row that is deletable, do the following:
    - Remove Suppress Delete flag.
    - Perform Event Rules: Delete Grid Rec Verify - Before
    - If the Suppress Delete flag is not set, do the following:

        Display Delete Confirmation dialog.

        If the user clicks NO or CANCEL the rest of this processing is skipped.

        Perform Event Rules: Delete Grid Rec Verify - After

        If the Suppress Delete flag is not set, do the following:

        If the record was read from the database, do the following:

        Add this record to the delete stack (records to be deleted when the user presses OK)

        Delete the grid row from the grid control.

Find

Find is a standard item that can be added to header detail forms. When clicked by the user, it is the signal to the runtime engine to call the database and reload the grid based on the selections in the filter fields.

1. Perform Event Rules: Button Clicked
2. If there no errors in any filter fields, do the following:
    - Switch to Update mode.
    - Begin Detail Data Selection and Sequencing.
    - Perform Event Rules: Post Button Clicked

User-Defined Items

User-defined items are nonstandard items that a developer can add to header detail forms to perform specialized processing not handled by the standard items.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked

Process Flow for Headerless Detail Forms

A headerless detail form is used to update and enter records that have information that is common to all records in a selected group. This form type and the header detail form type are referred to as Transaction forms. The following sections describe the processing flow of a headerless detail form type.

Default Flags

The following form option flags are automatically checked for headerless detail forms and should not be unchecked:

- No Update On Form Business View
- No Fetch On Form Business View

Other form option flags can be checked or unchecked by the application developer.

Dialog Initialization

- Initialize Thread Handling.
- Initialize Error Handling Process.
- Initialize Business View Columns.
- Initialize Form Controls.
- Initialize Grid Fields.
- Initialize Static Text.
- Initialize Helps.
- Initialize Event Rules Structures.
- Create Toolbar.
- Load Form Interconnection data into corresponding business view columns and filter fields, if any.
- Perform Event Rules: Dialog is Initialized
- If the form is not in Add mode, do the following:
  - If the form is not in Copy mode

    Perform Event Rules: Post Dialog is Initialized (note that this event is run immediately after Dialog is Initialized when in Update mode, so the FC values are still at their NULL or zero value).
  - If the grid option "Automatically Find on Entry" is checked, do the following:

Begin Data Selection and Sequencing.

- If the grid option "Automatically Find on Entry" is unchecked, do the following:

  Begin Add Entry Row to Grid.

- If the form is in Add mode, do the following:

  Begin Clearing Dialog.

Data Selection and Sequencing

An internal structure is now created representing the data selection and data sequencing requirements specified by the user. This is then passed to the database engine to do the actual database select and sequencing. The data is then held until the data is retrieved in the next step.

The data used for selection is pulled from filter fields if any exist, or from the key business view columns if there are no filter fields.

1. If the form option flag "No Fetch On Grid Business View" is not checked, do the following:
   - Select and Sequence
   - Begin Data Retrieval
2. If the form option flag "No Fetch On Grid Business View" is checked, do the following:
   - Begin Add Entry Row To Grid.

Data Retrieval

A request is issued to the JDEKRNL, which performs the actual fetch of the data from the database. It will read one record at a time and for each record, perform the following processing:

1. Attempt to fetch a record from the database.
2. If a record is fetched.
   - Copy the data into the business view data structures.
   - Perform Event Rules: Grid Record is Fetched
   - If the application developer has not chosen to suppress the writing of this grid record, do the following:

     Copy the business view data into the grid data structures.

     Perform Event Rules: Write Grid Line - Before

     Add the row to the grid. The row now exists in the grid control.

     Perform Event Rules: Write Grid Line - After
   - Clear the grid data structures for reading the next record.
   - Remove the suppress grid line flag.

The previous steps occur for each record read from the database. After all records have been read, the runtime engine does the following:

3. If the form is in Copy mode, do the following:
   - Switch to Add mode.

- Begin Clearing Dialog once Data Retrieval processing is complete.

4. If no records were fetched, do the following:
    - Switch to Add mode.
5. Perform Event Rules: Last Grid Record Has Been Read

> **Note**
> This event is run, regardless of whether records were actually fetched.

6. Begin Add Entry Row to Grid.

Clearing Dialog

1. If the form was called in Copy mode, do the following:
    - Clear the key controls that do not have the "Do Not Clear After Add" flag checked.
2. If the form was not called in Copy mode, do the following:
    - Clear all form controls that do not have the "Do Not Clear After Add" flag checked.
3. Perform Event Rules: Clear Screen Before Add
    - Delete any existing grid rows.
4. Perform Event Rules: Post Dialog is Initialized
    - Begin Add Entry Row to Grid.

Add Entry Row to Grid

1. Clear grid data structures.
2. Perform Event Rules: Add Last Entry Row to Grid
3. Add the row to the grid control.

Closing Form

1. Perform Event Rules: End Dialog
2. Load Form Interconnection data from corresponding business view columns, if any.
3. Terminate Error Handling.
4. Terminate Thread Handling.
5. Terminate Helps.
6. Free all structures for form, including structures for Business View Columns, Form Controls, Grid Columns, and Event Rules.
7. Destroy the window.

Menu/Toolbar Items

The following is the process flow for the menu/toolbar items on a headerless detail Form.

OK

OK is a standard item that is automatically placed on headerless detail forms. It validates the information on the form and updates or adds to the database through JDEKRNL function calls.

1. If any errors/warnings exist on the form, stop OK processing.
2. Perform Event Rules: Button Clicked
3. For each control on the form:
    - If the current control is a form control and it has not passed validation, do the following:

        Perform Event Rules: Control is Exited

        Perform Event Rules: Control is Exited and Changed - Inline

        Perform Event Rules: Control is Exited and Changed - Asynch

        Perform Data Dictionary validation.
    - If the current control is a grid control, perform the following for each grid row:

        Perform Event Rules: Row is Exited and Changed - Inline for current row

        Perform Event Rules: Row is Exited and Changed - Asynch for current row
4. If errors are on the form, stop OK processing.
5. Delete from the database any grid rows that are in the delete stack. See Delete for details. For each grid row in the delete stack:
    - Copy the grid row data into the Business View structures.
    - Copy the grid data structures into the business view data structures.
    - Perform Event Rules: Delete Grid Record from DB - Before
    - If the database delete has not been suppressed, do the following:

        Delete the record in the Business View from the database.

        Delete the grid row from the grid control.

        Perform Event Rules: Delete Grid Record from DB - After
6. Perform Event Rules: All Grid Recs Deleted from DB
7. If the form option flag “No Update On Grid Business View” is not checked, do the following:
    - For each grid row that was changed or added, do the following:

        Clear the business view data structures.

        Reset the original key values for this row in the business view data structures.

        Copy grid data structures to the business view data structures.

        Copy all non-filter database form controls to the business view data structures.

        Copy all equal filters to the business view data structures.

        If form is in Add mode, do the following:

            Perform Event Rules: Add Grid Rec to DB - Before

Add the record in the business view data structure to the database.

Perform Event Rules: Add Grid Rec to DB - After

If form is in Update mode, do the following:

Perform Event Rules: Update Grid Rec to DB - Before

Update the record in the business view data structure to the database.

Perform Event Rules: Update Grid Rec to DB - After

- If form is in Add mode, do the following:

  Perform Event Rules: All Grid Recs Added to DB

- If form is in Update mode, do the following:

  Perform Event Rules: All Grid Recs Updated to DB

8. Perform Event Rules: Post Button Clicked
9. If form is in Add mode, do the following:
   - If form was called in Copy mode or if the flag “End Form On Add” is checked, do the following:

     Begin Closing Form

   - Else

     Begin Clearing Dialog

10. If the form is in Update mode, do the following:
    - If no errors exist for attempting to update/add to the database, do the following:

      Begin Closing Form

Cancel

Cancel is a standard item that is automatically placed on headerless detail forms.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked
3. Begin Closing Form.

Delete

Delete is a standard item that can be added to headerless detail forms. The actual delete from the database does not happen at this point, so that if the user clicks cancel, the records are not deleted from the database. The delete verification happens when delete is pressed, and the actual database delete happens when OK is pressed.

1. Perform Event Rules: Button Clicked
2. For each selected grid row that is deletable, do the following:
   - Remove Suppress Delete flag.
   - Perform Event Rules: Delete Grid Rec Verify - Before
   - If the Suppress Delete flag is not set, do the following:

     Display Delete Confirmation dialog.

If the user clicks No or Cancel, the rest of this processing is skipped.

Perform Event Rules: Delete Grid Rec Verify - After

If the Suppress Delete flag is not set, and if the record was read from the database, do the following:

Add this record to the delete stack (records to be deleted if the user presses OK)

- Delete the grid row from the grid control.

Find

Find is a standard item that can be added to headerless detail forms. When clicked by the user, it is the signal to the runtime engine to call the database and reload the grid based on the selections in the Filter Fields.

1. Perform Event Rules: Button Clicked
2. If no errors exist in any filter fields, do the following:
    - Switch to Update mode.
    - Begin Data Selection and Sequencing.
    - Perform Event Rules: Post Button Clicked

User-Defined Items

User-defined items are nonstandard items that a developer can add to headerless detail forms to perform specialized processing not handled by the standard items.

1. Perform Event Rules: Button Clicked
2. Perform Event Rules: Post Button Clicked

Process Flow for Search/Select Forms

A search/select form is used to select a single predetermined field from a record in a predetermined file.

Important

Search/select forms return only one value to the calling form, based on the dictionary alias. If no data dictionary alias matches the value, the first value from the data structure will be returned.

The following sections describe the processing flow of a search/select form type. A search/select form should be attached as a visual assist only to data items that have the same data type as the form data structure element.

Default Flags

No form option flags are automatically set for this form type, but application developers often check the Grid option flag called Automatically Find on Entry. The only form option flag that this form type affects is the No Fetch on Grid Business View flag. Checking any of the other form option flags does not affect form processing.

Dialog Initialization

- Initialize Thread Handling.
- Initialize Error Handling Process.
- Initialize Business View Columns.
- Initialize Form Controls.
- Initialize Grid Fields.
- Initialize Static Text.
- Initialize Helps.
- Initialize Event Rules Structures.
- Create Toolbar.
- Load Form Interconnection data into corresponding business view columns and filter fields, if any.
- Perform Event Rules: `Dialog is Initialized`
- Perform Event Rules: `Post Dialog is Initialized`
- If the grid option "Automatically Find On Entry' is checked, do the following:
  - Begin Detail Data Selection and Sequencing

Header Data Retrieval

Header records do not exist on search/select forms.

Detail Data Selection and Sequencing

The system creates an internal structure that represents the data selection and data sequencing requirements specified by the user. This structure is then passed to the database engine to do the actual database selection and sequencing. The data is then held until the data is retrieved in the next step.

The data used for selection is determined from filter fields.

If the form option flag "No Fetch On Grid Business View" is not checked, do the following:

- Select and Sequence
- Begin Data Retrieval

Data Retrieval

A request is issued to the JDEKRNL, which performs the actual fetch of the data from the database. It reads one record at a time, and, for each record, performs the following processing:

1. Attempt to fetch a record from the database
2. If a record is fetched, do the following:
    - Copy the data into the business view data structures.
    - Perform Event Rules: `Grid Record is Fetched`
    - If the application developer has not chosen to suppress the writing of this grid record, do the following:
    - Copy the business view data into the grid data structures.
    - Perform Event Rules: `Write Grid Line - Before`
    - Add the row to the grid. The row now exists in the grid control.
    - Perform Event Rules: `Write Grid Line - After`
        - Clear the grid data structures for reading the next record.
        - Remove the suppress grid line flag.

The previous steps occur for each record read from the database. The following occurs only once.

- Perform Event Rules: `Last Grid Record Has Been Read`

Clearing Dialog

Clearing Dialog does not apply to this form type.

Closing Form

1. Perform Event Rules: `End Dialog`
2. Load Form Interconnection data from corresponding business view columns, if any.
3. Terminate Error Handling.
4. Terminate Helps.
5. Free all structures for form, including structures for business view columns, form controls, grid columns, and event rules.
6. Destroy the window.

Menu/Toolbar Items

The following is the process flow for the menu/toolbar items on a search/select Form.

Select

Select is a standard item that is automatically placed on search/select forms. It returns a value to the form interconnection and closes the form.

1. Copy the selected grid row into the business view column.

2. Perform Event Rules: `Button Clicked`
3. Perform Event Rules: `Post Button Clicked`
4. Begin Closing Form.

Close

Close is a standard item that is automatically placed on search/select forms.

1. Perform Event Rules: `Button Clicked`
2. Perform Event Rules: `Post Button Clicked`
3. Begin Closing Form.

Find

Find is a standard item that can be added to search/select forms. When clicked by the user, it is the signal to the runtime engine to call the database and reload the grid based on the selections in the filter fields.

1. Perform Event Rules: `Button Clicked`
2. Begin Data Selection and Sequencing.
3. Perform Event Rules: `Post Button Clicked`

User-Defined Items

User-defined items are nonstandard items that a developer can add to search/select forms to perform specialized processing not otherwise handled by the standard buttons.

1. Perform Event Rules: `Button Clicked`
2. Perform Event Rules: `Post Button Clicked`

Process Flow for Message Forms

The message form type is a form that appears as a secondary window to inform the user of something or to ask a question. It parallels the behavior of a Windows message box. The form does not have a toolbar or a status bar and can only contain static text and buttons. It is the only form type for which standard buttons can appear on the form instead of the toolbar.

Dialog Initialization

- Initialize Form Controls.
- Initialize Static Text.
- Initialize Helps.
- Initialize Event Rules Structures.
- Perform Event Rules: `Dialog is Initialized`

Closing Form

1. Terminate Helps.
2. Free all structures for Controls and Event Rules.
3. Destroy the window.

Buttons

The form includes an OK button by default. Other options include Cancel, Yes, and No. All of these buttons cause the dialog to close, and result in no other default processing.

J.D. Edwards Standards

Message forms can have only static text and buttons. Event rules are limited to `Dialog is Initialized` and any button events. This event rule cannot contain any Form Interconnection calls.

Process Flow for Edit Controls

An edit control is a text field on a form. All form types can contain edit controls except message forms. Two types of edit controls are available. The first type is commonly referred to as a database field. It is associated with an item in the business view and through that connection to a specific data dictionary item. Database fields represent a field in a database record. The second type of edit control is commonly referred to as a data dictionary field, and it also has a connection to a specific data dictionary item.

Within the realm of database fields an additional distinction between filter fields and nonfilter fields. Database fields are nonfilter fields by default. Filter fields are used to alter the selection criteria of a database fetch. A filter can have a comparison type of equal, not equal, less than, less than or equal to, greater than, or greater than or equal to. A filter can be marked such that a wildcard (*) displays when the filter is not included in the selection.

The storage for the value of the edit control is based on the type of its associated data dictionary item (such as numeric, string, character). An edit control is affected by the properties of the associated data dictionary item. For example, if an edit control is associated with a data dictionary item of type string with a length of thirty, the edit control will not allow more than thirty characters to be typed into the field.

Properties and Options

The following properties and options are available for edit controls. These properties are available on all form types and for both database fields and data dictionary fields. Only properties that affect processing are discussed here. The properties that are exclusively interface-related are either not discussed, or are only discussed as they relate to control processing.

Disable	Controls with this property appear gray and cannot be changed by the user. You can use event rules to change the value of disabled fields. When a control is disabled, the associated text (static text to the left) is also disabled. Controls do not have this property by default.
Visible	Controls with this property can be seen. Without this property, the control cannot be seen. You can use event rules to change the value of hidden controls.
Do not clear after add	This option applies only when a form is in add mode and is being cleared. Controls with this option retain their value. Controls do not have this option by default.
Required entry field	This option requires that a value be entered in the control before the record is saved (OK processing). This option does not accept null or blank. Controls do not have this option by default.
Default cursor on add/update mode	This option specifies where the cursor is placed in add/update mode. You can assign this option to only one control on a form. Otherwise, the system cannot determine where to place the cursor. Controls do not have this option by default.
No display if currency is Off	This option causes the control to be hidden when Multicurrency Conversion is off. Controls do not have this option by default.

Control is Entered

33. Perform event rules: `Control is Entered`

On a Windows client, when a user presses the tab key or otherwise causes focus to move from one control to another, the control that receives focus actually receives the Control is Entered message before the control that loses focus receives the Control is Exited message. This is due to the sequence of Windows messages and cannot be altered.

Control is Exited

1. If the focus is going to another window, stop processing.

   The focus returns to this control when this window again receives focus.

2. Copy the text from the screen to the internal storage.

   Conversion from string to the appropriate type happens during this step.

3. If this control is marked as a required entry field and does not contain a value, then set the field in error.
4. Perform event rules: `Control is Exited`.
5. If this is the first time this control has been exited or if this control has changed in value since the last time the control was exited, then do the following:
   - `Begin Control is Exited and Changed (Inline)`

Control is Exited and Changed (Inline portion)

1. Perform event rules: `Control is Exited and Changed Inline`

2. If the form is not closing, do the following:
    - Attempt to execute `Control is Exited and Changed (Asynchronous)` on a thread.
3. If the form is closing or if the attempt to execute asynchronously was unsuccessful, do the following:
    - Begin `Control is Excited and Changed (Asynchronous)` as an inline function.

Control is Exited and Changed (Asynchronous portion)

1. Perform event rules: `Control is Exited and Changed Asynch`
2. If no errors were set during event rules processing, do the following:
    - If this is not a filter field, or if it is an equal filter field (validation takes place only on filter fields with a comparison type of equal), perform Data Dictionary Validation.
    - If an associated description field for this control exists, populate it (if errors were present, this clears the associated description).
    - If no errors occurred during validation, then copy the value to the control.

J.D. Edwards Standards

All filter fields are marked with Display Wildcard. Only index fields are marked as filter fields (for performance considerations). If reasonable, an event rule should be placed on `Control is Exited and Changed Asynch` instead of on one of the inline events (for performance considerations).

Process Flow for Grid Controls

A grid control is similar to a spreadsheet on a form. Form types that can contain grid controls are as follows:

- Find/browse
- Search/select
- Header detail
- Headerless detail

Grid controls contain columns. The columns are specified at design time and are either of the following two types:

- Database columns
- Data dictionary columns

A database column is associated with an item in the business view and through that connection to a dictionary item. Database columns represent a field in a database record.

Although only one type of column is referred to as a data dictionary column, both types have a connection to a specific data dictionary item. The difference is that a database column has the additional connection to a business view field.

A grid can either be a browse grid or an update grid. You can use a browse grid for viewing only, and you cannot select individual cells. The find/browse form and the search/select form have browse grids.

You can use an update grid to add or update records. Cells in an update grid can be selected individually. The header detail form and the headerless detail form have update grids.

Grid controls can also have a query by example (QBE) line. The QBE columns have a one-to-one correspondence with the grid columns. You use a QBE value to change the selection criteria of a database fetch. Only database columns allow entry in the QBE columns because the purpose of the QBE is to affect the selection and only database columns are in the business view. A QBE column can have one of the following comparison types:

- Equal
- Not equal
- Less than
- Less than or equal to
- Greater than
- Greater than or equal to

The comparison type is *equal* unless you specify otherwise. You can specify the comparison type in the QBE column or by using system functions. You can use wildcards (* or %) for an inexact search on a string field.

The values contained on a grid row act as a logical unit. You must validate a grid row prior to accepting a record, but validating the individual columns is not required. Edit control validation and grid row validation are parallel, but edit control validation and grid column validation are not parallel. The *Column is Exited* events are executed only if the user physically exits the cell. The Data Dictionary Validation for a cell executes when the cell is exited after a change or the first time that the row is exited after it has been added. If you change a cell programmatically, then the *Row is Exited* events execute prior to accepting a record, but the column events and validation do not execute unless focus is physically set on the column.

The vendor spreadsheet stores the grid cell values as a tab delimited string (one per row). The values can be retrieved on a cell-by-cell basis or on a row-by-row basis. Internal storage for the grid columns also exists in the interactive engine. The actual storage for the grid column value is based on the type of the associated dictionary item (for example, math numeric, string, character), and it is distinct from the screen representation of the value. Only one row of data can be acted upon at any given time. Each event executes in the context of a specific row.

A grid column is affected by the properties of the associated dictionary item. For example, if a grid column is associated with a dictionary item of type string with a length of 30, that grid column will not allow more than 30 characters to be typed into the cell.

Properties and Options

The following properties and options are available for grid controls. Except where noted, these properties are available on all grids. Only those properties that affect processing are listed here. Those properties that are exclusively related to the interface are either not discussed, or are discussed only as they relate to grid processing.

Disable	Grids with this property appear gray and cannot be changed by the user. The application developer can change the value of disabled fields through event rules (ER). Grids do not have this property by default.
Visible	Grids with this property can be seen. Without this property, the grid cannot be seen. The application developer can cause hidden grids to change value through ER.
Hide Query By Example	Grids with this property do not have a QBE line. QBE is neither available to the user nor the ER. Browse grids do not have this property by default. Update grids have this property by default.
Update Mode	This property is only available on update grids, but does not have any effect on the grid during runtime.
Multiple Select	This property allows for multiple grid rows to be selected at once. This can affect ER execution and deleting. Grids do not have this option by default.
Automatically Find On Entry	This option determines whether grid records will be fetched when the form is opened. Grids without this option will open with no grid rows. Grids do not have this property by default.
Auto Find On Changes	This option determines whether grid records will be fetched after a child form that has changed records closes. This option should be used only on forms that have no modeless form interconnects. Grids do not have this property by default.
No Adds on Update Grid	This property applies to updates only. It determines whether an entry row appears in the grid. Without an entry row, records cannot be added. With this property turned on, only existing records can be altered. (Records can be updated only). Grids do not have this option by default.
Disable Page-At-A-Time Processing	This option causes all available grid records to be fetched when Find is pressed. Without this option, only the first page of grid records is fetched until the user scrolls down to see additional records. Each time that more records are requested, a page of data is returned. This provides a substantial performance benefit for large files and it is not recommended that this option be checked without careful consideration. Grids do not have this option by default.
Clear Grid After Add	There is currently no reference to this field during runtime. The presence or absence of this flag has no effect on the grid.
Refresh Grid After Update	Currently, no reference to this field exists during runtime. The presence or absence of this flag has no effect on the grid.
Process All Rows In Grid	This option causes each row in the grid to perform the three Row is Exited events (*Row is Exited*, *Row is Exited and Changed* (Asynchronous portion), and *Row is Exited Validation*) on all of the grid rows at least once before updating or adding the database records.

Set Focus on Grid

Perform event rules: *Set Focus on Grid*

Kill Focus on Grid

Perform event rules: *Kill Focus on Grid*

Row is Entered

1. Update the status bar with the current row number.
2. If this row is not the entry row (last row on update grids), do the following:
    - Perform event rules: *Row is entered*

Row is Exited

1. If the form is not losing focus:
    - Perform event rules: *Row is exited*
    - If this is an update grid and the row has been changed since the last time the row was exited, do the following:

        Perform event rules: *Row is Exited and changed - Inline*

        If you are not leaving the grid (exiting one row, entering another), do the following:

            Attempt to execute *Row is Exited and Changed* (Asynchronous portion) on a thread.
    - If you are leaving the grid or the attempt to execute asynchronously was unsuccessful, do the following:

        Begin *Row is Exited and Changed* (Asynchronous portion) as an inline function.

Row is Exited and Changed (Asynchronous portion)

1. Set a bitmap on the grid row header to indicate that this row is being processed.
2. Perform event rules: *Row is Exited and Changed - Asynch*
3. If this is the first time that this row has been exited since it was added, do the following:
    - Begin *Row is Exited Validation*

Row is Exited Validation

For each grid cell in this row that has not already performed data dictionary validation, do the following:

1. If this database item is also in the header portion of the form, the grid column is populated from that value, so skip this validation and go to the next grid cell.

Note
Filter fields are populated in the grid column only if they are equal filters.

2. If the text contained in the cell can be stored (for example, no alphas in numerics and no out-of-range data parameters):

    - Begin *Data Dictionary Validation* for this cell.

      If an associated description column for this cell exists, populate it with the information returned from *Data Dictionary Validation*.

Cell is Exited after a Change

On update grids when the contents of a cell have changed (via user keying or visual assist) and the cell has been exited, do the following:

1. Clear any errors set on this cell before calls to *Row is Exited Validation* and *Column is Exited* events.
2. If the text contained in the cell can be stored (no alphas in numerics, no our of range date parameters), do the following:

    - Perform *Data Dictionary Validation*
    - If an associated description column exists for this cell, populate it with the information returned from *Data Dictionary Validation*.

Double-Click a Grid Row

On browse grids, double-clicking on the grid row causes the Select button to be pressed.

Key Pressed

On update grids, when a key is pressed on the entry row (last row in the grid), a new row is added to the grid.

J.D. Edwards Standards

The event *Row is Exited and Changed - Asynch* is equivalent to validating the contents of the row. It is often used for the Edit Line master business function. For performance reasons, ER should be placed on *Row is Exited and Changed - Asynch* instead of on one of the inline events.

Date Reference Scan

You can run date scan programs to search for date references in event rules or business functions. J.D. Edwards provides two date-reference scanning programs. One program scans business functions and the other program scans event rules. When you scan business functions for references to dates, the scanning program also scans for system date references.

Business Function Date Reference Scan

You can run a business function date reference scan to check business functions for date references. This scan also reports references to system date functions. You can then review the reports that the system creates during this process. You can use the following J.D. Edwards software date reference scans:

- Business function date references scan
- Event rule date references scan

► To run the Business Function Date Reference Scan Report (R9000085)

1. On Object Management Workbench, check out the following objects to transfer the required specifications to your workstation:
   - B9000085 - Business Function Date Reference Scan Report
   - D9000085 - Data Structure for Date Reference Scan
   - R9000085 - Business Function Date Reference Scan Report
2. Choose B9000085 and click the Design button.
3. Click the Design Tools tab, and then click Build Business Function.
4. Choose the version that you want to run and click Select.
5. On Data Selection and Sequencing, choose the options that you want to use and click Submit.
6. Check your PDF report and the text log file in the default print directory, which is usually the B9\PrintQueue directory.

When you run the Business Function Date Reference Scan Report (R9000085), the system generates two versions of the report. One version indicates the number of date references that the scan program detected. The other version provides detailed information about the date references.

Event Rule Date Reference Scan

You can scan event rules to verify event rules for date references. You can then review the reports that the system generates during this process.

The process to scan event rules is the same as the process to scan business functions. Use the following objects:

- B9000085 - Business Function Date Reference Scan Report
- D9000085 - Data Structure for Date Reference Scan
- R9000085 - Business Function Date Reference Scan Report

When you run the Business Function Date Reference Scan Report (R9000085), the system creates two reports. One report indicates the number of date references that the scan program detected. The other report provides detailed information about the date references.