

CA 2E

Tutorial

Release 8.7



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Documentation Changes

The following documentation updates have been made since the last release of this documentation.

- IBM Limitation - File name is valid system name
 - [View Default Access Paths for COURSE](#) (see page 90)
 - [Adding Virtual Fields to the Retrieval Access Path](#) (see page 92)
 - [Adding New Access Paths for HORSE](#) (see page 95)
 - [Access Path Details](#) (see page 96)
 - [Selection Access Path for Stallions](#) (see page 101)
 - [Modifying the Default RTV Access Path for HORSE](#) (see page 103)
 - [Requesting Batch Generation of the SPN Access Path](#) (see page 343)
 - [Defining the Edit Transaction Function](#) (see page 344)
 - [Specifying a New Access Path](#) (see page 377)
 - [Generating and Compiling the New Access Path](#) (see page 380)
 - [Selecting the Access Path](#) (see page 380)
 - [Specifying a Query Access Path](#) (see page 399)
 - [Compiling the QRY Access Path](#) (see page 401)
 - [Selecting the Access Path for the Function](#) (see page 402)
- DDL Limitation
 - [Selecting All Access Paths for Batch Generation and Compilation](#) (see page 223)
 - [Requesting Batch Generation of the SPN Access Path](#) (see page 343)

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Chapter 1: About this Tutorial

This tutorial provides a navigational guide to the new CA 2E user. It will guide you through the steps required to develop an application using CA 2E. After completing this tutorial, you will have designed a CA 2E working application. The tutorial includes all of the basic facilities of CA 2E as well as some advanced features.

This section contains the following topics:

[Introduction](#) (see page 19)

[Related Information](#) (see page 20)

[CA 2E and the Application Development Life Cycle](#) (see page 22)

[Prerequisites for Using CA 2E](#) (see page 23)

Introduction

This chapter describes the organization of the tutorial, sources for additional information about CA 2E, conventions used in the tutorial, the application development life cycle, guidelines for getting started with the tutorial, and a glossary of terms introduced in the tutorial.

Note: Be sure to read this chapter before beginning the tutorial.

The following sections summarize each chapter of the tutorial.

Chapter 2 Defining Requirements

Determines the business requirements of the application to be developed. Describes how to determine the data required from the business requirements. Applies the rules of normalization and generalization to the list of data elements to develop an entity relationship diagram.

Chapter 3 Data Modeling

Describes how to translate the entity relationship diagram into a CA 2E data model diagram. Describes how to enter files and field details, field validation, and default access paths created by CA 2E. Introduces involution. Describes how to create alternate access paths that use selection criteria and how to join files together.

Chapter 4 Designing Functions

Introduces CA 2E functions (Edit File, Select Record) and how to design these in CA 2E.

Chapter 5 Generating, Compiling, and Executing

Describes how to generate source to implement the access paths and functions created in the first four chapters and how to compile the source to produce executable i OS objects - files and programs.

Chapter 6 Maintaining Your Application

Presents tools to help you maintain a CA 2E generated application, including prototyping, working with model object lists, and creating function versions.

Chapter 7 Advanced Functions

Describes the use of the Edit Transaction function using the Span access path.

Chapter 8 Report Functions

Describes how to produce a basic report program from the CA 2E design model.

Related Information

This module provides only the information about CA 2E that is necessary to complete the Tutorial. Additional information can be found in the following list of CA 2E manuals.

Note: CA 2E panels provide extensive online help; simply press the Help key on your keyboard to display more information for the current panel. Be sure to use this facility as you do the tutorial.

Getting Started

This module describes the libraries that make up CA 2E and the development environment. This module also outlines the installation and upgrade process.

Defining a Data Model

This module provides instructions on using CA 2E to design and maintain a data model.

Building Access Paths

This module provides instruction on how to build, modify, delete and document access paths and how to create arrays.

Building Applications

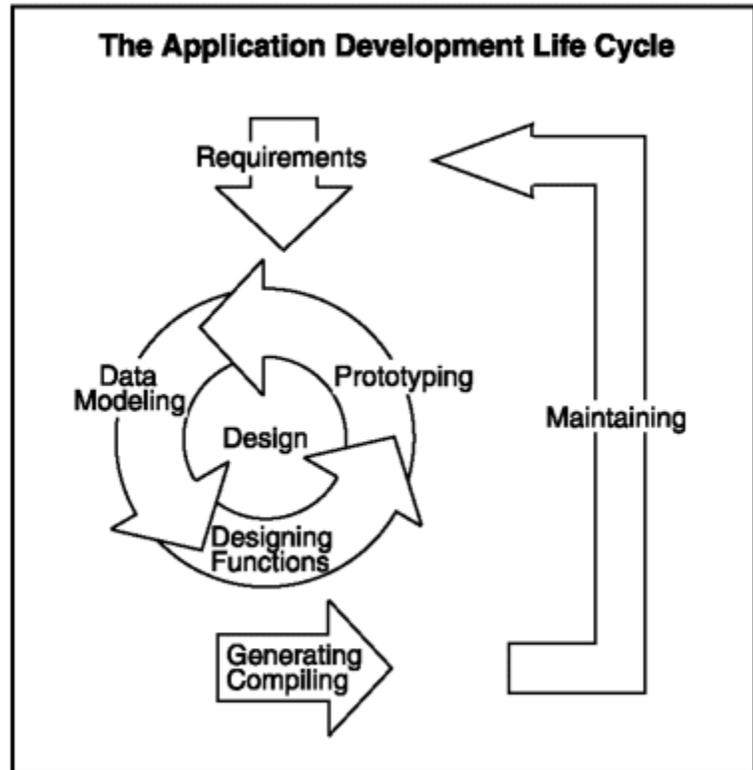
This module provides instructions on building functions in CA 2E. The module tells you how to set up system default values, build functions, edit device designs and action diagrams, and how to generate and compile functions.

Generating and Implementing Applications

This module describes model objects, model object lists, and impact analysis and provides instructions and recommendations to successfully generate, compile and implement a CA 2E application.

CA 2E and the Application Development Life Cycle

CA 2E supports the use of a top down, structured, data-driven application development life cycle. The application development life cycle is illustrated in the following diagram.



The application development life cycle provides direction during the design and generation of a CA 2E application. This tutorial provides instructions to complete each of the stages listed in the diagram.

1. Determine the application requirements.
2. Describe data in the form of a CA 2E data model. The data model is the basis for everything designed within CA 2E.
3. Design the functions that will operate on your data.
4. Prototype your functions to test your design.
5. Return to your design model to specify additional functionality.
6. Generate and compile your application.

Prerequisites for Using CA 2E

Before starting this tutorial, make sure the following conditions are satisfied:

- Installation

CA 2E must be installed on your IBM i. This manual assumes that installation has been successfully completed. If not, please refer to the *Installation Guide* for additional details.

- Authorization

You must be signed on an IBM i with a user profile that is authorized to use CA 2E. You must also be authorized to carry out programming operations such as creating files and RPG or COBOL programs. If you do not have the required profile or authorizations, consult your security officer. Refer to the *Installation Guide* for more details. To begin, you will require access to either the Command entry (QCMD), the Programmer's menu (QPGMMENU), or the CA 2E Main menu.

- Library List

Your library list must include certain libraries before you can create a CA 2E design model; for example, the CA 2E and Toolkit product libraries. Refer to the worksheet that was filled out when CA 2E was installed at your company for a list of the required libraries. The worksheet is in the *Installation Guide*. You can add any missing libraries using the i OS Add Library List Entry (ADDLIBLE) command. For example,

```
ADDLIBLE Y2SY  
ADDLIBLE Y1SY
```

- Creating a CA 2E Design Model

You must have a CA 2E design model library in which to store your CA 2E design model. If you do not already have a design model you may create a new one using the CA 2E Create Model Library (YCRTMDLLIB) command as follows:

```
YCRTMDLLIB MDLLIB(MYMDL) OBJPFX(MY)+  
SYSTEXT('My Model') DSNSTD(*CUATEXT)
```

This command allows you to create your model interactively. You can also do this as a batch process. In this example the design standard, *CUATEXT, has been specified so that all functions that include interactive panel displays will be presented with either Action Bars or Windows. The normal default for the design standard is *CUAENTRY.

Note: If someone else creates your model, be sure they read the above paragraph and set the DSNSTD parameter to *CUATEXT; otherwise, the tutorial will not work properly.

The message "Model library MYMDL created" should appear following successful completion of the command. The use of this command is only necessary when you are creating a new CA 2E design model. The next topic discusses how to access an existing CA 2E design model.

The YCRTMDLLIB command also creates a library to contain the source and application objects that you will generate from your CA 2E design model. The name of this library is given by the GENLIB parameter, which in this case defaults to the name MYGEN. Furthermore it creates a Toolkit Library list with the same name as the CA 2E design model library.

■ Entering the CA 2E Design Model

To enter CA 2E, type the Start CA 2E (YSTRY2) command, specifying the name of your CA 2E design model as the LIBLST parameter from any i OS Command Entry line:

YSTRY2 MYMDL

Type the command as shown.

```
MAIN                               2E Main Menu                               System:      2EDV1
Select one of the following:
  1. User tasks
  2. Office tasks
  3. General system tasks
  4. Files, libraries, and folders
  5. Programming
  6. Communications
  7. Define or change the system
  8. Problem handling
  9. Display a menu
 10. Information Assistant options
 11. PC Support tasks

 90. Sign off

Selection or command
===> ystry2 mymdl

F3=Exit  F4=Prompt  F9=Retrieve  F12=Cancel  F13=Information Assistant
F23=Set initial menu
```

Press Enter.

The CA 2E Main menu appears. The first panel of the CA 2E Main Menu provides a set of Design Model options and access to CA 2E commands grouped according to function.

Type **1** in the command entry line as shown to display the CA 2E Designer (*DSNR) Menu.

```

MAIN                               2E Main Menu
Level . : 1                          System:      2EDV1
Select one of the following:

Design Model          1. Display Designer (*DSNR) menu
                       2. Display Programmer (*PGMR) menu
                       3. Display User (*USER) menu

                       8. Work with Model Object Lists
                       9. Change to work with another model

Commands           50. 2E commands in alphabetical order

                       51. Commands to set up or alter a model
                       52. Commands to copy a model
                       53. Commands to create an application
                       54. Commands to document a model

                       More...

Selection or command
====> 1

F3=Exit  F6=Messages  F9=Prev. request  F10=Cmd Entry  F14=Submitted jobs

```

Press Enter.

The first panel of the CA 2E Designer (*DSNR) Menu displays. This menu provides a list of tasks available to users with *DSNR authority. Type **1** in the command entry line as shown to enter your CA 2E design model for editing.

```

DSNR                               2E Designer (*DSNR) Menu
Level . : 2                          System:      2EDV1
Select one of the following:

Enter Model          1. Edit Database Relations
                       2. Services Menu
                       3. Edit Default Model Object List
                       4. Edit Session List (changed objects)
                       5. Work with Model Objects
                       6. Load model and display command line

                       8. Work with Model Object Lists
                       9. Change to work with another model

Open Access:      ? 10. Change Open Access Model Value
enter with *NO    11. Edit Database Relations
                       12. Services Menu

                       More...

Selection or command
====> 1

F3=Major menu  F6=Messages  F9=Prev. request  F10=Command entry  F24=More

```


Normally when you exit your design model, you will accept the default option and press Enter. However, if you plan to continue with the tutorial, type **3** instead of accepting the default to continue your editing session and press Enter. This returns you to the Edit Database Relations panel.

- **Setting Your Model Profile to Log Changes to Your Model**

Your model profile establishes the basic working environment for your interactive session. CA 2E automatically creates a model profile for each user that is granted access to a model. Before beginning work on your CA 2E model, you need to check, and possibly override, the default settings in your model profile.

Note: You need to do this step before you enter any information for your tutorial design model and you only need to do it once.

This process assumes that the Edit Database Relations panel is displayed on your screen. If not, re-enter your model as explained previously using the Start CA 2E (YSTRY2) command.

- **Accessing the Display Services Menu**

One way to access your model profile is by using the Display Services Menu. This menu is an important CA 2E tool that gives you access to many CA 2E support functions while you are working on a model. From the Edit Database Relations panel, press F17 to access the Display Services Menu This function key is available from many CA 2E panels.

From the Display Services Menu, type **11** in the Option field to Edit your model profile.

```
DISPLAY SERVICES MENU                My model
Generation                          1. Submit model create request (YSBMMDLCRT)
                                      2. Convert model data menu
                                      3. Job list menu
Documentation                         6. Documentation menu
                                      7. Convert model panel designs (YCVTMDLPNL)
Model                                 8. Display all access paths
                                      9. Display all functions
                                      10. Display model values (YDSPMDLVAL)
                                      11. Edit model profile (YEDTMDLPRF)
                                      12. Work with model lists (YWRKMDLLST)
                                      13. Edit model list (YEDTMDLLST *SESSION)
                                      14. Impact analysis menu
Change Control                       21. Go to 2ECM menu
                                      Option: 11 (press F4 to prompt commands)
F3=Exit F6=Messages F8=Submitted jobs F9=Command line F10=Display job log
```

- Editing Your Model Profile

Press Enter to display the first screen of the Edit Model Profile panel.

The model profile lets you define defaults for various processes and file specifications for an interactive session. Notice that the default value for the Session list field is your user profile name. Also, check that the value of the Log changed objects field is **Y**. If it is not, type **Y**.

Edit Model Profile		
Model profile	JAR	
Model	MYMDL	
Session list	JAR	Name, *MDLVAL
Log changed objects	Y	Y=Yes, N=No
Component change processing	N	Y=Yes, N=No
View only	N	Y=Yes, N=No
Model list for commands	JAR	Name, *USER
User option file	QAUDOPT	Name, QAUDOPT
Library name	*LIBL	Name, *LIBL
User option member	QAUDOPT	Name, *FILE
Full screen mode	N	Y=Yes, N=No
		More...
F3=Exit F5=Refresh F12=Cancel		

Press Enter.

Press F3 to return to the Display Services Menu.

- Understanding a Session List

The basic components of a CA 2E model are called *model objects*. CA 2E provides a model object list tool that lets you manipulate logical groups of model objects. One example of a model object list is the *session list*. When the Log changed objects field in your model profile is Y, CA 2E automatically keeps track of each change you make to your CA 2E model and adds the changed model object to your session list. The session list is cumulative and therefore it persists across your interactive sessions.

Notice the Edit model list (YEDTMDLLST *SESSION), option on the Display Services Menu. You can use this option at any time to view and work with the contents of your session list; in other words, you can use this option to view the model objects you changed in your CA 2E model.

You will use the session list again later in the *Maintaining Your Application* chapter of this tutorial.

- Exiting the Display Services Menu

When you finish using the tasks on the Display Services Menu, exit by pressing F3 to return to the Edit Database Relations panel.

- Deleting User-defined Data from your CA 2E Design Model

This step applies only if you wish to delete the data you entered from your CA 2E design model. To do so use the CA 2E Clear Model (YCLRMDL) command as follows:

```
YCLRMDL MDLLIB(MYMDL) GENLIB(*GENLIB)
```

If you run this command, your CA 2E design model will still exist, but everything you have added to the design model will be deleted.

Chapter 2: Defining Requirements

This chapter gives the business requirements and describes the data and functions required to support the Horse Racing application.

This section contains the following topics:

[Introduction to Defining Requirements](#) (see page 31)

Introduction to Defining Requirements

This tutorial demonstrates how to use CA 2E to address all phases of the life cycle in the development and maintenance of a horse race application. A sample horse racing form is illustrated below.

NEWMARKET		11Aug 1995	
1:30	NEWMARKET STEEPLECHASE		
	Going: Heavy 2m 5f		
	Prize of \$6000 for five year olds and older that have never won a race		
	Weight: 135 lbs		
		Age	Lbs
1	500-02	FAITHFUL DOBBIN (11) (Mrs. Monica Hackett)	
		W Harney	7 130 —C F Swan
2	3523/2	PEGASUS (16) (D V Wakefield)	
		Gerard Stack	6 130 —H Rogers
3	2313/OF	LEFT BANK (3) (Mrs. S Lait)	
		Noele Meade	7 130 —D H O'Connor
4	3211-03	BONFIRE (Mr. A Mishie)	
		A Mishie	7 132 —P D Hickey
5	000-02	COOPER TRIP (Mrs. W E Fletcher)	
		W E Fletcher	6 134 —E F Hutton
6	40- 0	LARKSPUR LANDING (Ms Greenbaum)	
		A C Smith	6 128 —C J Reynolds
7	6/3 P	BLUSWAD SHUZ (E A Presley)	
		P Presley	7 135 —A A Memphis
		Seven runners	
		Last year: Gorky Park, 5-11-7, C F Swan, 5-1 (B Hughes) , 11 ran	

Requirements Definition

Initial requirements for the application illustrated in this tutorial include the form from the preceding page. Management requires a system that tracks the horses and jockeys entered in races. In addition, they want to track the parentage and racing results of each horse and require certain reports.

Business Requirements

After analysis of the form and further discussion with management, it is determined that the application requires the following:

- The business objects or entities: Course, Horse, Jockey, and Race. These will become files.
- A record of the Dam (mother) for each horse to ensure that it is female and older than the horse.
- A record of the Sire (father) for each horse to ensure that it is male and older than the horse.
- A record of horses entered in each race.
- The following two reports:
 - A list of all horses including a count and total value
 - A list of the races each horse has entered

Data Requirements

Having identified the business requirements, it is necessary to examine them and determine the data needed to meet the requirements.

Analyze the form carefully to make a list of all the data needed to create the form. Do not be concerned about defining the data as a grouping of data (entity/file) or a property of the group (attribute/field). Some examples are shown here:

- Jockey
- Horse name
- Horse code
- Entry number
- Finishing position
- Race name
- Race distance
- Courses
- Course name
- Race time
- Going conditions
- Prize money
- Race date
- Dam (Horse's mother)
- Sire (Horse's father)
- Horse's date of birth

Having specified the requirements of this application, you can now begin to build the CA 2E data model. This data model will serve as the foundation for the application design in CA 2E. The data modeling process is illustrated in the *Data Modeling* chapter.

Chapter 3: Data Modeling

This chapter introduces the following topics:

- Data Model
- CA 2E Relations
- Field Details and Conditions
- Extending Relations
- Virtual Fields
- Access Paths

This section contains the following topics:

[Data Model](#) (see page 35)

[Field Details and Conditions](#) (see page 58)

[Extending Relations](#) (see page 68)

[Virtual Fields](#) (see page 76)

[CA 2E Access Paths](#) (see page 88)

Data Model

In this topic you will build the CA 2E data model that supports the requirements of the horse race application.

New terms introduced:

- Entity
- Relationship
- Entity Relationship Diagram
- Attribute
- Unique Identifier
- Primary key
- Foreign key
- Normalization
- Generalization
- CA 2E Relation
- CA 2E Data Model Diagram

Objectives

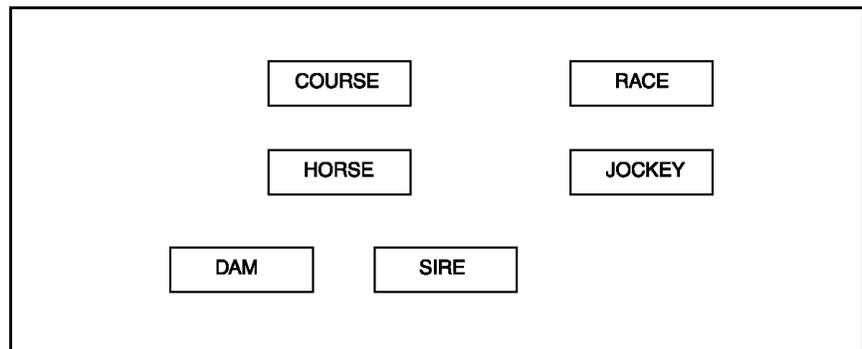
Use an Entity Relationship Diagram (ERD) to design the horse race application data model. Normalize and generalize the entities to refine the ERD. Translate the ERD into CA 2E relations. The following steps explain how to achieve these objectives.

Identify Application Entities

The first step in entity relationship modeling is to identify the entities (files) that are present in your application using the data elements you identified during your requirements analysis. An *entity* is a thing or object of significance for which you need to gather and store information.

Each entity must be uniquely identifiable. This means that each instance (occurrence) of an entity must be separate and distinctly identifiable from all other instances of that entity. For example, for the entity, Horse, each individual horse (instance) must be uniquely identifiable in the data model.

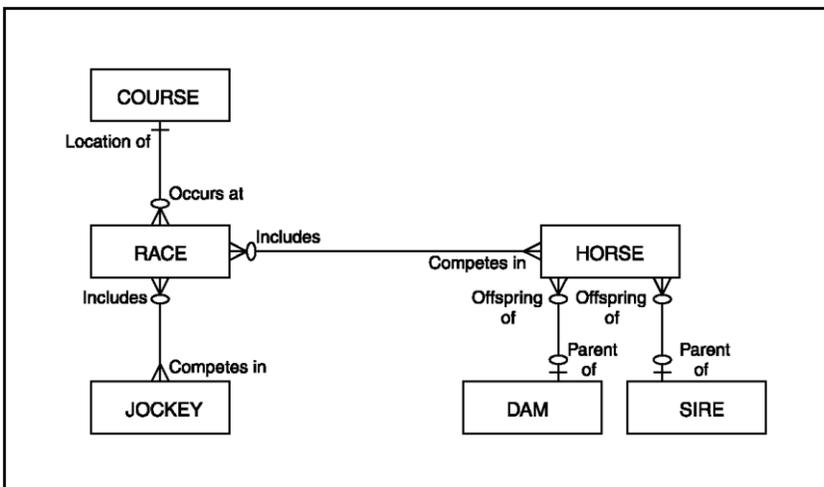
Each entity can be represented in a diagram by a box containing the name of the entity. The name is in singular and shown in all uppercase letters. This tutorial includes the following entities:



Identify Business Relationships Between Entities

The second step in entity relationship modeling is to identify the business relationships that exist between the entities. A business relationship (or *relationship* for short) is a named, significant association between two entities.

The relationships present in the CA 2E data model at this point can be represented as shown.



Identify Attributes and Unique Identifiers for the Entities

The third step of entity relationship modeling involves the following:

- Identifying the attributes (fields) that belong to each entity
- Selecting the attributes that serve as a unique identifier for each entity
- This unique identifier is also known as the primary key for the entity.
- Normalizing the entities
- Generalizing the entities

The following sections discuss each of these in more detail.

Identify the Attributes for Each Entity

An *attribute* is any detail that serves to qualify, identify, classify, quantify, or express the state of an entity. An attribute can also be any description of a thing of significance. The attributes must describe the entity against which they are shown.

Reviewing the data elements you identified during requirements analysis, and taking into consideration the entities you have already identified, it is possible to identify the attributes. List the attributes beside the appropriate entity as in the following table:

Entity	Attribute
COURSE	Course code Course name
HORSE	Horse code Horse name Horse gender Date of birth
JOCKEY	Jockey code Jockey name Jockey gender
SIRE	Sire code Sire name Sire Date of birth
DAM	Dam code Dam name Dam Date of birth
RACE	Course code Course name Race date Race time Race name Going conditions Distance Prize money Horse code Horse name Horse gender Date of birth Jockey code Jockey name Finishing position Handicap Entry status

Select Each Entity's Unique Identifier

Each entity must be uniquely identifiable so that each instance of the entity is separate and distinctly recognizable from all other instances of that entity. The *unique identifier*, also known as the *primary key*, can be any of the following:

- An attribute
- A combination of attributes
- A combination of relationships
- A combination of attributes and relationships

A primary key should consist of the fewest number of attributes necessary to make every instance of the entity unique. Review the attributes of each entity and select the primary key for each entity. Primary keys are identified in the following table:

Entity	Attribute	Primary Key
COURSE	Course code Course name	Course code
HORSE	Horse code Horse name Horse gender Date of birth	Horse code
JOCKEY	Jockey code Jockey name Jockey gender	Jockey code
SIRE	Sire code Sire name Sire Date of birth	Sire code
DAM	Dam code Dam name Dam Date of birth	Dam code

RACE	Course code Course name Race date Race time Race name Going conditions Distance Prize money Horse code Horse name Horse gender Date of birth Jockey code Jockey name Finishing position Handicap Entry status	Course code Race date Race time
------	---	---------------------------------------

Identify Foreign Keys

Note that the RACE entity contains the primary keys of the HORSE (Horse code) and JOCKEY (Jockey code) entities. The Horse code and Jockey code are needed as attributes in the RACE entity to identify the horses and jockeys that competed in each race. However, neither the Horse code nor the Jockey code are needed to identify the RACE entity; in other words, neither Horse code nor Jockey code are primary keys of RACE. Such non-key attributes of an entity that are primary keys of another entity are known as *foreign keys*. In the following table, foreign keys are identified.

Entity	Attribute	Primary Key	Foreign Key
COURSE	Course code Course name	Course code	N/A
HORSE	Horse code Horse name Horse gender Date of birth	Horse code	N/A
JOCKEY	Jockey code Jockey name Jockey gender	Jockey code	N/A
SIRE	Sire code Sire name Sire Date of birth	Sire code	N/A
DAM	Dam code Dam name Dam Date of birth	Dam code	N/A

RACE	Course code	Course code	Horse code
	Course name	Race date	Jockey code
	Race date	Race time	
	Race time		
	Race name		
	Going conditions		
	Distance		
	Prize money		
	Horse code		
	Horse name		
	Horse gender		
	Date of birth		
	Jockey code		
	Jockey name		
	Finishing position		
	Handicap		
	Entry status		

Normalize the Entities

Normalization of data is a procedure that ensures that a data model conforms to some useful standards.

For data and entity relationship models, the following standards have been defined to minimize duplication of data, to provide the flexibility necessary to support different functional requirements, and to enable the data model to be mapped onto a relational database design effectively.

- Eliminate repeating data groups
- Eliminate partial key dependencies
- Eliminate non-key dependencies (attributes that depend upon another non-key attribute in the entity)

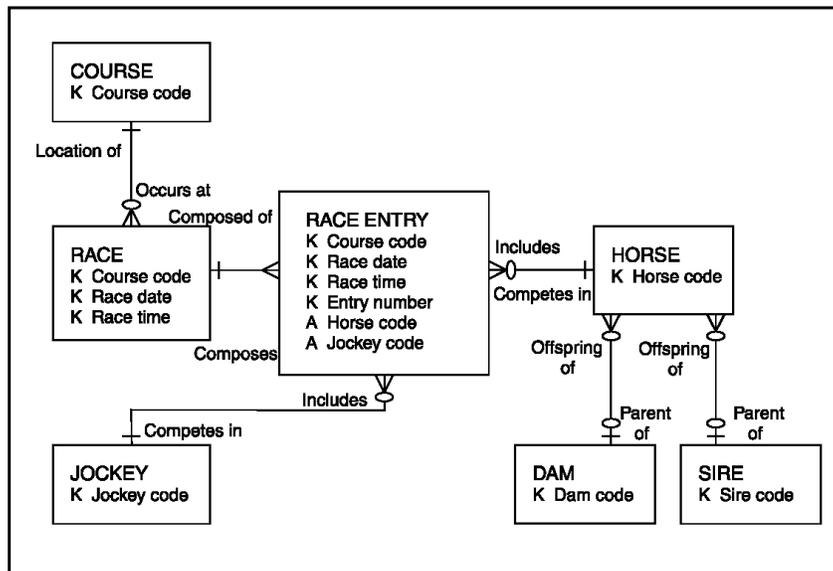
Although the steps are listed and briefly discussed here, you may wish to consult additional sources for a more detailed description.

Applying these steps causes the entities and attributes to be redefined as follows:

Entity	Attribute	Primary Key	Foreign Key
COURSE	Course code Course name	Course code	N/A

HORSE	Horse code Horse name Horse gender Date of birth	Horse code	N/A
JOCKEY	Jockey code Jockey name Jockey gender	Jockey code	N/A
SIRE	Sire code Sire name Sire Date of birth	Sire code	N/A
DAM	Dam code Dam name Dam Date of birth	Dam code	N/A
RACE	Course code Race date Race time Race name Going conditions Distance Prize money	Course code Race date Race time	N/A
RACE ENTRY	Course code Race date Race time Entry number Horse code Jockey code Finishing position Handicap Entry status	Course code Race date Entry number	Horse code Jockey code

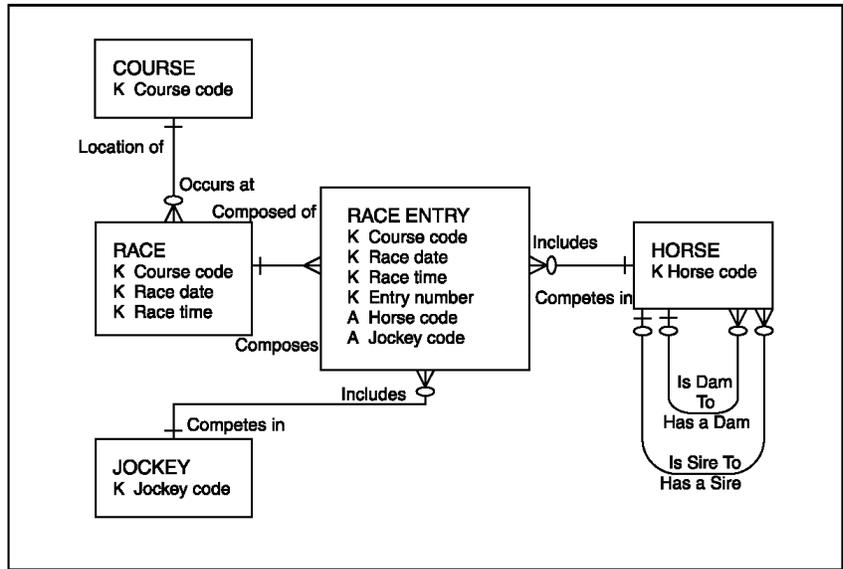
This process has resulted in the creation of another entity named RACE ENTRY. Now our Entity Relationship Diagram looks like this. Note that K indicates a key attribute and A indicates a foreign key (non-key attribute).



Generalize the Entities

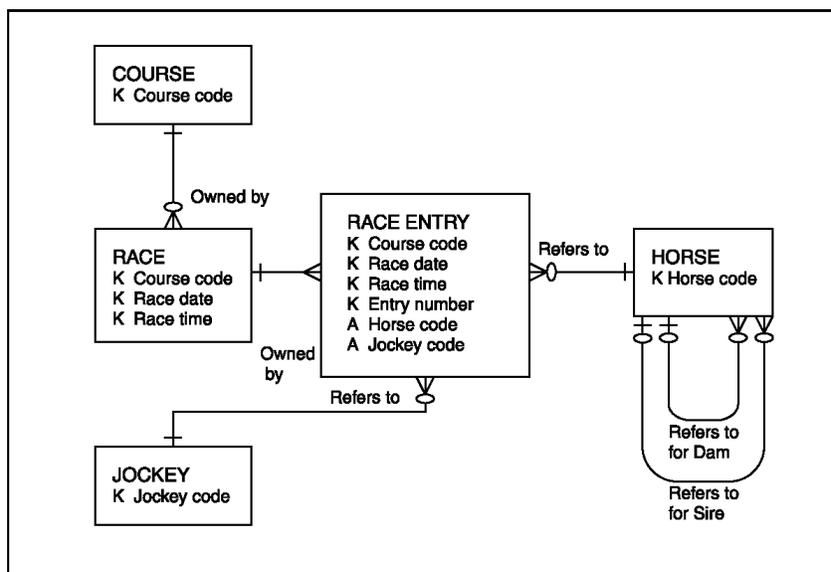
At this point, there is another source of redundant data, namely, the HORSE, DAM, and SIRE entities. A horse could appear in two of these three entities since a horse could both compete in races and also be a Dam or Sire. This situation can be resolved by combining these three entities into just one: HORSE. This process is called *entity generalization*.

The entity relationship diagram now looks like this:



CA 2E Data Model Diagram

The relationships that are identified in the entity relationship diagram can be translated to CA 2E relations. There are eight different CA 2E relations, four of which are commonly required. The purpose of the basic relations will be explained in the course of this tutorial, and more details may be obtained from the CA 2E manuals. The CA 2E Data Model Diagram for this horse race application looks like this:



Having identified the entities (files), attributes (fields), and relationships (relations), we are ready to specify and define them within the data model. This process is illustrated in the following topics.

CA 2E Relations

In this topic you will enter simple relations, define new CA 2E objects for use in the relations, and display the CA 2E entries arising from the relations.

New terms introduced:

- CA 2E relation
- Has relation
- Known by relation
- Owned by relation
- Refers to relation
- CA 2E model object
- File, file attribute
- Field, field attribute (data type)
- File entry

New panels are introduced:

- Edit Database Relations
- Define Objects
- Edit File Entries

Objectives

You will specify relations to define the HORSE, COURSE, JOCKEY, RACE, and RACE ENTRY entities.

Based on the relation statements you entered, each new object is automatically assigned one of the following types:

- FIL (for files)
- FLD (for fields)

In addition, fields are assigned a usage as follows:

- CDE (key fields)
- ATR (non-key fields)

Press Enter to display the Edit File Entries panel. This panel shows the file entries CA 2E automatically created for the COURSE file based on the relations you entered for the file.

EDIT FILE ENTRIES		My model					
File : Course							
? Field	Type	Ocr	Et	Ksq	GEN name	Length	Renamed
█ Course code	CDE			K	1 ABCD	6	
_ Course name	TXT			A	ABTX	25	

SEL: Z-Details, R-Replace field, U-Usage, M-Mapped field parameters, L-Locks.
F3=Exit

For each file entry, this panel displays the field names, the field type, whether the field is a key field (K) or an attribute (A), the CA 2E generated implementation name, and the field length. Note that CA 2E assigned the implementation name and default length based on the data type you specified; for example, for fields of type CDE, CA 2E assigns a 4-character implementation name ending in CD and a default length of 6.

Note: You cannot update fields on this panel.

Press F3 to return to the Edit Database Relations panel.

File Entries for RACE

You can examine the entries in the RACE file as you did for the COURSE file. From the Edit Database Relations panel, type E against the RACE file.

EDIT DATABASE RELATIONS		My model			
=>		Rel lvl:			
? Typ	Object	Relation	Seq	Typ	Referenced object
—	FIL Course	Known by	—	FLD	Course code
—	FIL Course	Has	—	FLD	Course name
█	FIL Race	Owned by	—	FIL	Course
—	FIL Race	Known by	—	FLD	Race date
—	FIL Race	Known by	—	FLD	Race time
—	FIL Race	Has	—	FLD	Race name
—	FIL Race	Has	—	FLD	Going conditions
—	FIL Race	Has	—	FLD	Distance
—	FIL Race	Has	—	FLD	Prize money
—					
—					
—					
—					
—					
—					

Z(n)=Details F=Functions E(n)=Entries S(n)=Select Bottom
F10=Define object F17=Services F23=More options
F24=More keys

Declaring More Files

You can define the RACE ENTRY, HORSE, and JOCKEY files using the Known by, Has, and Owned by relations as you did for the COURSE and RACE files.

In addition, since RACE ENTRY requires references to the HORSE and JOCKEY files, you will also use the Refers to relation. The Refers to relation specifies a relationship between two files. It causes the key entries of the referenced file (HORSE and JOCKEY) to become foreign keys of the referencing file (RACE ENTRY).

Note that a file may reference another file more than once, as shown later in this tutorial.

Type the **RACE ENTRY**, **HORSE**, and **JOCKEY** relations.

```

EDIT DATABASE RELATIONS                               My model
=> _____ Rel lvl: _____
? Typ Object _____ Relation _____ Seq Typ Referenced object
-----
Race Entry _____ Owned by _____ Race
***** Known by _____ Entry number
***** Has _____ Finishing position
***** ***** Handicap
***** ***** Entry Status
***** ***** Refers to _____ Horse
***** ***** ***** Jockey
Horse _____ Known by _____ Horse code
***** Has _____ Horse name
***** ***** Horse gender
***** ***** Horse value
***** ***** Date of birth
Jockey _____ Known by _____ Jockey code
***** Has _____ Jockey name
***** ***** Jockey gender
-----
                                           Bottom
Z(n)=Details  F=Functions  E(n)=Entries  S(n)=Select  F23=More options
F10=Define object  F17=Services          F24=More keys
    
```

Press F10 to define the new objects.

Defining Objects

The Define Objects panel displays with the object attribute column blank.

File Attributes

Specify the appropriate object attributes, in order to define the new objects to CA 2E. This requires the following two additional attributes:

CPT—Database capture file

NBR—Pure numeric field value

Type the object attributes.

DEFINE OBJECTS		My Model		
Object type	Object name	Object attr	Referenced field	Field Edit usage
FILE	Race Entry	CPT		-
FLD	Entry number	CDE		-
FLD	Finishing position	NBR		-
FLD	Handicap	QTY		-
FLD	Entry Status	STS		-
FILE	Horse	REF		-
FILE	Jockey	REF		-
FLD	Horse code	CDE		-
FLD	Horse name	TXI		-
FLD	Horse gender	STS		-
FLD	Horse value	VAL		-
FLD	Date of birth	DTI		-
FLD	Jockey code	CDE		-
FLD	Jockey name	TXI		-
FLD	Jockey gender	STS		- +

F3=Exit

Press Enter.

If all the object attributes you specified were valid, CA 2E automatically exits the Define Objects panel and returns to the Edit Database Relations panel. You have now finished the top-level definition of your data model.

Deleting Relations

You can delete a relation from the data model by typing **D** against the relation. Once deleted, retyping them can reinstate relations.

Documenting Relations

To obtain a listing of the relations that you have entered, use the Document Model Relations (YDOCMDLREL) command. First press F17 from the Edit Database Relations panel to display the Display Services Menu. Then do either of the following.

- Press F9 to display a command entry line, type the **YDOCMDLREL** command, and press Enter
- Select the Documentation menu option to display a list of documentation commands and select Document model relations

When you finish, press F3 until you return to the Edit Database Relations panel.

Field Details and Conditions

Having entered relations to define your data model, you must now add more detailed information about the fields. This includes defining simple validation rules and specifying any required overrides to the defaults CA 2E assigned for field properties; for example, field length.

This topic describes the field details and how to add field condition information to your data model.

New terms introduced:

- Field condition
- VAL condition type
- LST condition
- Check condition
- Selection line

New panels introduced:

- Edit Field Details
- Edit Field Conditions
- Edit Field Condition Details

Objectives

You will define conditions to specify the allowed values for the Horse gender field.

Overview of Field Details

Field details specify the properties of a given field, such as length, text, validation, and implementation name.

Overview of Field Conditions

Field conditions define allowed values for fields. Conditions record both the values that a field may take and the meaning that the values represent.

Conditions can be used in a number of ways. The most common uses of conditions are:

- Validating the entry of data
- Specifying selection or omission of data from a logical view of the data
- Specifying the processing conditions in a program that operates on the data

Field Details

To obtain the field details for a field, you will select the appropriate relation statement line on the Edit Database Relations panel and type **Z2** against this object. The details of the referenced object will be displayed. Note that the Subfile selector options, Z1 and Z, both give details of the first object in the relation.

Field Detail Display for Horse Gender

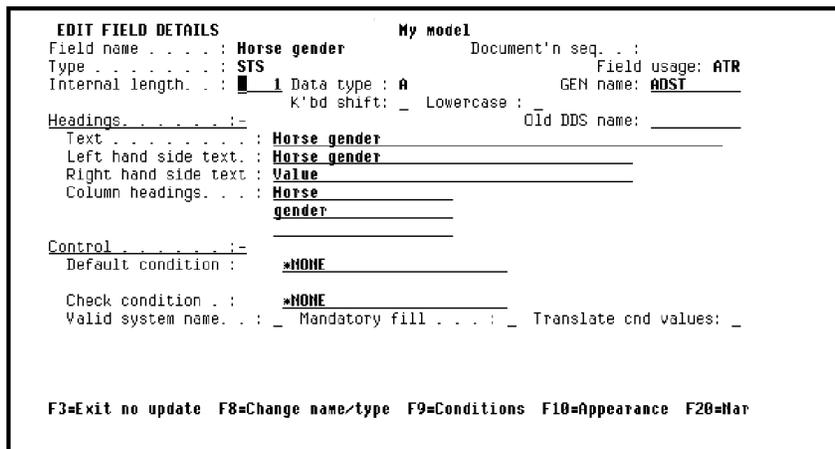
In this case, the Horse gender field of the HORSE file will be used to illustrate conditions. Type **Z2** against the HORSE Has Horse gender relation.

EDIT DATABASE RELATIONS		My model	
?	Rel lvl:	Seq	Typ
Typ	Object	Relation	Referenced object
—	FIL Course	Known by	FLD Course code
—	FIL Course	Has	FLD Course name
—	FIL Horse	Known by	FLD Horse code
—	FIL Horse	Has	FLD Horse name
Z2	FIL Horse	Has	FLD Horse gender
—	FIL Horse	Has	FLD Horse value
—	FIL Horse	Has	FLD Date of birth
—	FIL Jockey	Known by	FLD Jockey code
—	FIL Jockey	Has	FLD Jockey name
—	FIL Jockey	Has	FLD Jockey gender
—	FIL Race	Owned by	FIL Course
—	FIL Race	Known by	FLD Race date
—	FIL Race	Known by	FLD Race time
—	FIL Race	Has	FLD Race name
—	FIL Race	Has	FLD Going conditions

More...

Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
 F10=Define object F17=Services F24=More keys

Press Enter to display the Edit Field Details panel for Horse gender.



The Edit Field Details panel shows information for the field. Most of the details, for example, field length, default appropriately according to the field's data type.

It is possible to override the default values if required. We will discuss how to change the field name at a later stage in this tutorial.

Field Conditions

One use of field conditions is to check that the value entered for a field is valid during data entry. This is done by specifying a Check condition. By default, no field validation takes place. This is indicated by *NONE for the Check condition field on the Edit Field Details panel.

A horse's gender can only be one of two values: male or female. Conditions to check for these values can be attached to the Horse gender field of the HORSE file as follows.

Adding a Field Condition

From the Edit Field Details panel for the Horse gender field, press F9 to display the Edit Field Conditions panel. This panel shows the available conditions for the field. Initially, there are none.

```

EDIT FIELD CONDITIONS           My model
Field name . . . . . : Horse gender      Attr. : STS
Enter condition . . . :  and type to add new condition.
                       type . . . :  (Type: LST, VAL)

? Condition                Type Op File/From value      Display/To value  MN

SEL: Z-Details, D-Delete, U-Where used, H-Narrative.
F3=Exit

```

To add a field condition, type the name and type of the condition. In this tutorial, one value the Horse gender field can take is Stallion.

You defined Horse gender as a status field (field type STS). Status fields may only take discrete values, so the only condition types allowed for this type of field are single values (VAL) or a list of values (LST). Stallion is a single value so it is of type VAL.

Type the condition name **Stallion** with a type of **VAL**.

```

EDIT FIELD CONDITIONS           My model
Field name . . . . . : Horse gender      Attr. : STS
Enter condition . . . : Stallion and type to add new condition.
                       type . . . : VAL (Type: LST, VAL)

? Condition                Type Op File/From value      Display/To value  MN

SEL: Z-Details, D-Delete, U-Where used, H-Narrative.
F3=Exit

```

Press Enter to display the Edit Field Condition Details panel.

Adding Another Condition

In this step you will add another condition value for mares. You can overwrite the displayed values in order to enter this additional field condition.

In this case, you can overwrite Stallion with Mare, and M with F. Type the details of the next condition.

```
EDIT FIELD CONDITION DETAILS          My model
Field name . . . . . : Horse gender      Attr. : STS   Mode : *ADD
Length on file . . . . : 1

Condition . . . . . : Mare
Type . . . . . : VAL

Status value . . . . : File value          Mnemonic
                     F                     -

F3=Exit
Condition 'Stallion' added.
```

Press Enter to redisplay the panel with the message "Condition 'Mare' added."

Press F3 to exit and return to the Edit Field Conditions panel.

Viewing Field Conditions

On the Edit Field Conditions panel for the Horse gender field, you should now see a list of the conditions that you have just added. Note that a special condition has been added automatically. This is the condition called *ALL values, shown at the top of the list of conditions. The *ALL values condition can be used when you wish to specify that a field may take any one of the individual values listed.

```
EDIT FIELD CONDITIONS                               My Model
Field name . . . . . : Horse gender                Attr. : STS
Enter condition . . . :                 and type to add new condition.
                    type . . . : (Type: LST, VAL)

? Condition          Type Op File/From value      Display/To value  MN
- *ALL values        LST **
- Mare               VAL  F                      F
- Stallion           VAL  M                      M

SEL: Z-Details, D-Delete, U-Where used, N-Narrative.
F3=Exit
```

Press F3 to return to the Edit Field Details panel.

Specifying a Check Condition

Notice the Check condition field on the Edit Field Details panel. This field indicates the values that are allowed for the Horse gender field. Initially the Check condition is *NONE, indicating that any value is allowed for the field. If you specify the list condition *ALL values, it indicates that the field must satisfy one of the particular value conditions that you have defined; in other words, it provides validation during data entry. If you specify one of the conditions that you have just defined, it imposes specific validation on the field.

You can type ? in the Check condition field, to view a selection list of existing conditions. In this tutorial, all horses must be either mares or stallions. The check condition *ALL Values is appropriate.

Type ***ALL values** for the Check condition field.

```

EDIT FIELD DETAILS                               My Model
Field name . . . . . : Horse gender              Document'n seq. . . :
Type . . . . . : STS                            Field usage: ATR
Internal length. . . : 1 Data type : A          GEN name: ADST
                                     K'bd shift: _ Lowercase : _
Headings. . . . . :-
Text . . . . . : Horse gender
Left hand side text. : Horse gender
Right hand side text : Value
Column headings. . . : Horse
                       gender

Control . . . . . :-
Default condition : *NONE

Check condition . . : *ALL values
Valid system name. . : _ Mandatory fill . . . . : _ Translate cnd values: _

F3=Exit no update  F8=Change name/type  F9=Conditions  F10=Appearance  F20=Mar

```

Press Enter.

```

EDIT FIELD DETAILS                               My Model
Field name . . . . . : Horse gender              Document'n seq. . . :
Type . . . . . : STS                            Field usage: ATR
Internal length. . . : 1 Data type : A          GEN name: ADST
                                     K'bd shift: _ Lowercase : _
Headings. . . . . :-
Text . . . . . : Horse gender
Left hand side text. : Horse gender
Right hand side text : Value
Column headings. . . : Horse
                       gender

Control . . . . . :-
Default condition : *NONE
Prompt function . . : Condition Value Displayer (*CVD, *DDL)
Check condition . . : *ALL values
Valid system name. . : _ Mandatory fill . . . . : _ Translate cnd values: _

F3=Exit no update  F8=Change name/type  F9=Conditions  F10=Appearance  F20=Mar

```

Note that a Prompt function field now displays. As a result, when the end user of the compiled application positions the cursor on the Horse gender field and either enters ? or presses F4, a selection list of the conditions you defined will be displayed.

Press F3 to return to the Edit Database Relations panel.

Exercises

Before continuing with the rest of the tutorial, complete the following exercises using the same process you used to define conditions for Horse gender.

1. Add conditions to define the allowed values for the Jockey gender field.
2. Add conditions to define the allowed values for the Going conditions field on the RACE file; for example, Firm, Good, and Soft.
3. Add conditions to define the allowed values for the Entry Status field on the RACE ENTRY file; for example, Not yet run, Finished, Scratched, and Disqualified.

Displaying Selected Relations

Now that you have specified the relations, you can use the features of the Edit Database Relations panel to display selected objects.

On the top of the Edit Database Relations panel are fields that let you position the display at the part of the model you want to view, and let you control which CA 2E relations are displayed. The line that contains these fields is referred to as the *selection line*. Type ? in any section of the line to display the values available for selection. If you enter a letter (or string of letters) followed by an asterisk (*) in the Object or Referenced object columns, only those CA 2E objects whose names begin with that letter (or letters) will be selected and displayed.

In the next topic, you will work with the HORSE file. You can simplify the display by selecting and displaying only those relations that define the HORSE file. Do this by typing the file name followed by an asterisk on the selection line. You will use this technique often in this tutorial.

Type **Horse*** in the Object column of the selection line.

EDIT DATABASE RELATIONS		My model	
=> ___	Horse*	Rel lvl:	___
? Typ	Object	Relation	Seq Typ Referenced object
— FIL	Course	Known by	— FLD Course code
— FIL	Course	Has	— FLD Course name
— FIL	Horse	Known by	— FLD Horse code
— FIL	Horse	Has	— FLD Horse name
— FIL	Horse	Has	— FLD Horse gender
— FIL	Horse	Has	— FLD Horse value
— FIL	Horse	Has	— FLD Date of birth
— FIL	Jockey	Known by	— FLD Jockey code
— FIL	Jockey	Has	— FLD Jockey name
— FIL	Jockey	Has	— FLD Jockey gender
— FIL	Race	Owned by	— FLD Course
— FIL	Race	Known by	— FLD Race date
— FIL	Race	Known by	— FLD Race time
— FIL	Race	Has	— FLD Race name
— FIL	Race	Has	— FLD Going conditions

More...

Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
 F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys

Overview of Relation Extension

As discussed previously, one file can be associated with another by means of the Refers to relation. For example, our data model contains the RACE ENTRY Refers to HORSE, and RACE ENTRY Refers to JOCKEY relations. Note that since the referenced file in these two relations are different, there is no difficulty in distinguishing between them.

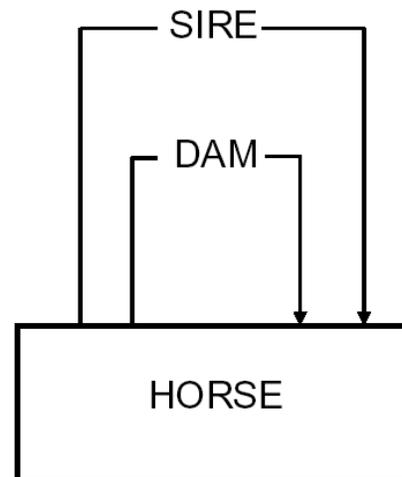
A file can also reference another file more than once. In order to distinguish among multiple references to the same file, CA 2E provides an extended form of the Refers to relation that lets you specify differences among the relations using For text.

In addition, a file can refer to itself. This is known as *involution* or a *self-referencing relation*.

Involution and the Horse Pedigrees

One of the purposes of this application is to record details of each horse's parents (Dam and Sire). To do so you will need to use both the extended form of the Refers to relation and involution.

Since a horse's parents are also horses, to record the horse's parents requires two HORSE Refers to HORSE relations, one for each parent. This is shown in the following diagram.



Because the HORSE file refers to itself more than once, you will need to use the extended form of the Refers to relation in order to distinguish between the two relations.

Virtual Fields

This topic discusses the purpose of virtual fields and how to specify them within CA 2E.

New terms introduced:

- Virtual field
- Virtual field entry

New panel introduced:

- Edit Virtual Field Entries

Overview of Virtual Fields

A good database design eliminates redundancy; in other words, each item of data should be stored in only one place, rather than having multiple copies on different files. The i OS join logical file is a mechanism for building views that assemble data from different files.

In CA 2E you will use virtual fields to design such views. A *virtual field* is a field that is logically, but not physically, present on a file. CA 2E virtual fields are implemented through i OS join logical files.

Note that there are some limitations as to how virtual fields may be used in functions.

Sequence of Relations and Virtual Fields

With a self-referencing file such as HORSE, the sequence numbers you entered previously against the database relations are significant when specifying virtual fields.

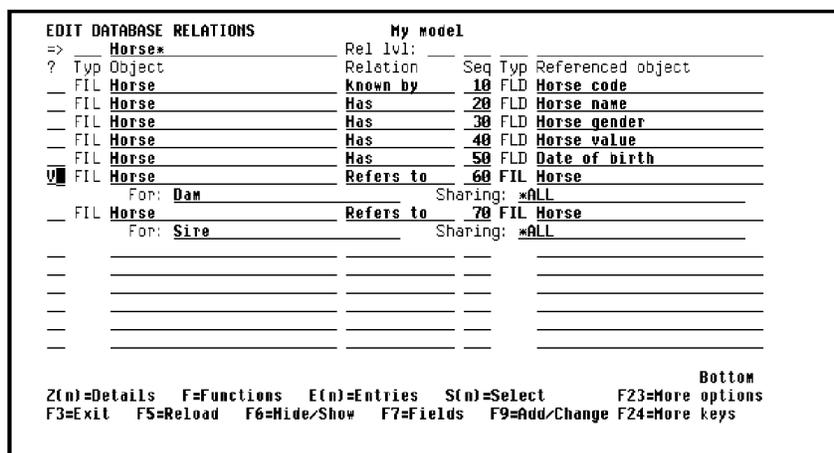
CA 2E uses a single-pass algorithm to resolve entries on a file. When CA 2E looks for virtual fields, it resolves all the relations for the referenced file in the order that they appear on the Edit Database Relations panel. The following figure shows both the default relation order for the HORSE file and the order determined by the sequence numbers you entered earlier in this tutorial.

Default Relation Order (no sequence numbers)		User-defined Relation Order (with sequence numbers)	
Known by	Horse code	Known by	Horse code
Refers to	Horse For Dam	Has	Horse name
Refers to	Horse For Sire	Has	Horse gender
Has	Horse name	Has	Horse value
Has	Horse gender	Has	Date of birth
Has	Horse value	Refers to	Horse For Dam
Has	Date of birth	Refers to	Horse For Sire

Because the HORSE file refers to itself, any relations that occur after the Refers to HORSE relations will not have been resolved at the time CA 2E attempts to resolve the virtual fields for the Refers to relations. In other words, if you had not inserted sequence numbers for the HORSE file relations, the Has relations would not have been resolved at the time CA 2E needed to resolve the Refers to relations. As a result, CA 2E could not have created the virtual entries for the Horse name and Date of birth fields.

Adding Virtual Fields

You can now add the Dam's name and date of birth to the list of fields for the HORSE file by specifying virtual fields. Type **V** next to the HORSE Refers to HORSE For Dam relation.



Press Enter to display the Edit Virtual Field Entries panel.

Virtual Field Entries

The Edit Virtual Field Entries panel shows all the fields on the referenced file. Since the HORSE file refers to itself, these are the same as the fields on the referencing file. From this list, you can select any field as a virtual field.

Selecting Virtual Fields for Dam

The Horse name and Date of birth fields will become virtual fields for the Refers to For Dam relation on the HORSE file. Type + against Horse name and Date of birth.

EDIT VIRTUAL FIELD ENTRIES		My model						
File : Horse								
? V	Field	Type	Ocr	Etp	Ksq	GEN name	Length	Renamed
	Horse code	CDE	K	1	ADCD		6	
±	Horse name	TXT	A		ADTX		25	
-	Horse gender	STS	A		ADST		1	
-	Horse value	VAL	A		ABVA		11.2	
+	Date of birth	DT#	A		ACDZ		10	
█	Dam Horse code	REF	A		AFCD		6	
-	Sire Horse code	REF	A		AGCD		6	

SEL: '+' Add virtual field, '-' Remove virtual field.
F3=Exit

Press Enter.

Confirming Virtual Fields for Dam

The virtual fields are indicated by an asterisk (*) in the V column of the panel confirming that CA 2E has created the virtual fields.

EDIT VIRTUAL FIELD ENTRIES		My model						
File : Horse								
? V	Field	Type	Ocr	Etp	Ksq	GEN name	Length	Renamed
	Horse code	CDE	K	1	ADCD		6	
*	Horse name	TXT	A		ADTX		25	
	Horse gender	STS	A		ADST		1	
	Horse value	VAL	A		ABVA		11.2	
*	Date of birth	DT#	A		ACDZ		10	
	Dam Horse code	REF	A		AFCD		6	
	Sire Horse code	REF	A		AGCD		6	

SEL: '+' Add virtual field, '-' Remove virtual field.
F3=Exit

Press F3 to return to the Edit Database Relations panel.

Adding More Virtual Fields

The procedure for adding virtual fields for the horse's Sire is the same as for the horse's Dam. Type V against the HORSE Refers to HORSE For Sire relation.

EDIT DATABASE RELATIONS		My model					
=>	Horse*	Rel lvl:					
? Typ	Object	Relation	Seq	Typ	Referenced object	Object	
FIL	Horse	Known by	10	FLD	Horse code		
FIL	Horse	Has	20	FLD	Horse name		
FIL	Horse	Has	30	FLD	Horse gender		
FIL	Horse	Has	40	FLD	Horse value		
FIL	Horse	Has	50	FLD	Date of birth		
FIL	Horse	Refers to	60	FIL	Horse		
	For: Dam			Sharing:	>ALL		
V FIL	Horse	Refers to	70	FIL	Horse		
	For: Sire			Sharing:	>ALL		

Bottom

Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys

Press Enter to display the Edit Virtual Field Entries panel. This panel now includes the entries Dam Horse name and Dam Date of birth you specified earlier. Note that to assign unique names for these entries, CA 2E prefixed the original field names with the For text you specified in the Refers to relation.

Selecting Virtual Fields for Sire

Select Horse name and Date of birth as virtual fields for the Sire. Type + to select Horse name and Date of birth.

EDIT VIRTUAL FIELD ENTRIES		My model						
File : Horse								
? V	Field	Type	Ocr	Etp	Ksq	GEN name	Length	Renamed
	Horse code	CDE	K	1	ADCD		6	
±	Horse name	TXT	A		ADTX		25	
-	Horse gender	STS	A		ADST		1	
-	Horse value	VAL	A		ABVA		11.2	
+	Date of birth	DT#	A		ACDZ		10	
█	Dam Horse code	REF	A		AFCO		6	
-	Dam Horse name	REF	V		AFTX		25	V
-	Dam Date of birth	REF	V		ADDZ		10	V
-	Sire Horse code	REF	A		AGCO		6	

SEL: '+' Add virtual field, '-' Remove virtual field.
F3=Exit

Press Enter.

Confirming Virtual Fields for Sire

CA 2E has confirmed your selection of virtual fields, as indicated by the asterisks.

EDIT VIRTUAL FIELD ENTRIES		My model						
File : Horse								
? V	Field	Type	Ocr	Etp	Ksq	GEN name	Length	Renamed
	Horse code	CDE	K	1	ADCD		6	
█	* Horse name	TXT	A		ADTX		25	
-	Horse gender	STS	A		ADST		1	
-	Horse value	VAL	A		ABVA		11.2	
-	* Date of birth	DT#	A		ACDZ		10	
-	Dam Horse code	REF	A		AFCO		6	
-	Dam Horse name	REF	V		AFTX		25	V
-	Dam Date of birth	REF	V		ADDZ		10	V
-	Sire Horse code	REF	A		AGCO		6	

SEL: '+' Add virtual field, '-' Remove virtual field.
F3=Exit

Press F3 to return to the Edit Database Relations panel.

Renaming Fields

You can change the names that CA 2E has given the virtual fields to make them more explicit or compact. For example, you could change Dam Horse name to Dam name, and Sire Horse name to Sire name.

To select the fields to be renamed you will zoom against the relevant fields on the Edit File Entries panel. Type **Z** to select the fields to be renamed.

EDIT FILE ENTRIES		My model					
File : Horse							
? Field	Type	Ocr	Et	Ksq	GEN name	Length	Renamed
_ Horse code	CDE		K	1	ADCD	6	
_ Horse name	TXT		A		ADTX	25	
_ Horse gender	STS		A		ADST	1	
_ Horse value	VAL		A		ABVA	11.2	
_ Date of birth	DT#		A		ACDZ	10	
_ Dam Horse code	CDE REF		A		AFCD	6	
Z Dam Horse name	TXT REF		V		AFTX	25	Y
_ Dam Date of birth	DT# REF		V		ADDZ	10	Y
_ Sire Horse code	CDE REF		A		AGCD	6	
Z Sire Horse name	TXT REF		V		AGTX	25	Y
█ Sire Date of birth	DT# REF		V		AEDZ	10	Y

SEL: Z-Details, R-Replace field, U-Usage, M-Mapped field parameters, L-Locks.
F3=Exit

Press Enter to display the Edit Field Details panel for the first field you selected.

Field Details

The Edit Field Details panel lets you view details for the field, Dam Horse name. Some of the attributes of the field, such as the name, are initially protected. The F8 key unprotects the field name so it can be changed.

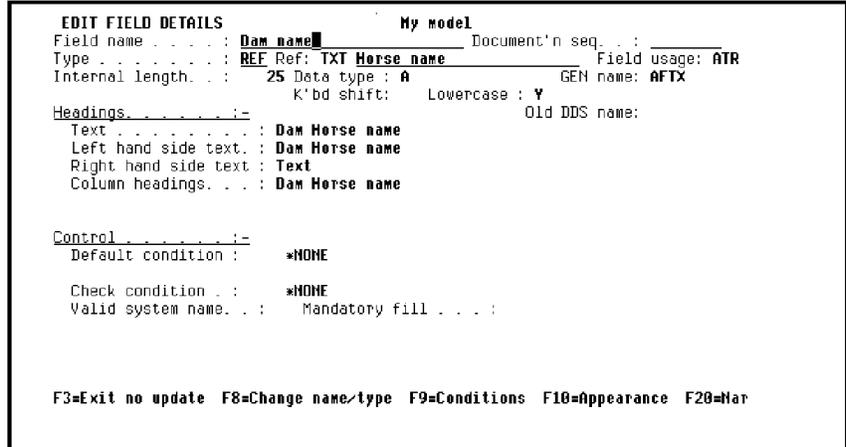
EDIT FIELD DETAILS		My model	
Field name	Dam Horse name	Document'n seq.	
Type	REF Ref: TXT Horse name	Field usage: ATR	
Internal length.	25 Data type : A	GEN name: ATR	
	K'bd shift: Lowercase : Y		
Headings :-		Old DDS name: _____	
Text	Dam Horse name		
Left hand side text.	Dam Horse name		
Right hand side text	Text		
Column headings.	Dam Horse name		
Control :-			
Default condition :	*NONE		
Check condition	*NONE		
Valid system name.	Mandatory fill		

F3=Exit no update F8=Change name/type F9=Conditions F10=Appearance F20=Har

Press F8 to change the field name.

Entering a New Field Name

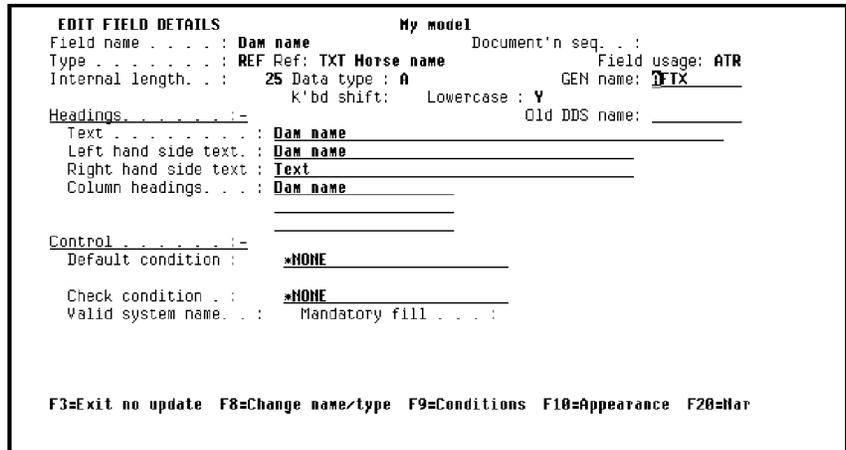
The cursor will now be on the Field name entry on the Edit Field Details panel. Rename the field by typing the new name over the existing name. Type **Dam name** over Dam Horse name.



Press Enter.

Field Details After Renaming

The Edit Field Details panel will be displayed with the new field name inserted throughout. You can rename any field in this way, and the new name will be reflected throughout your design model.



Renaming Other Fields

Press Enter to redisplay the Edit Field Details panel for the Sire horse name field. Recall that this was the second field you selected for renaming on the Edit File Entries panel.

Exercise

Change Sire Horse name to **Sire name** following the same steps as shown previously.

Displaying File Entries Again

When you have renamed the selected fields, press Enter to return to the Edit File Entries panel. The panel has been updated to show the new field names.

EDIT FILE ENTRIES		My model					
File : Horse							
? Field	Type	Ocr	Et	Ksq	GEN name	Length	Renamed
█ Horse code	CDE		K	L	ACCD	6	
- Horse name	TXT		A		ADTX	25	
- Horse gender	STS		A		ADST	1	
- Horse value	VAL		A		ABVA	11.2	
- Date of birth	DT#		A		ACDZ	10	
- Dam Horse code	CDE REF		A		AFCO	6	
- Dam name	TXT REF		V		AFIX	25	Y
- Dam Date of birth	DT# REF		V		ADDZ	10	Y
- Sire Horse code	CDE REF		A		AGCO	6	
- Sire name	TXT REF		V		AGIX	25	Y
- Sire Date of birth	DT# REF		V		AEDZ	10	Y

SEL: Z-Details, R-Replace field, U-Usage, M-Mapped field parameters, L-Locks, F3=Exit

Press F3 to return to the Edit Database Relations panel.

Adding More Virtual Entries

The allowed virtual field entries from the COURSE file are displayed. Type + against Course name to add it as a virtual entry to the RACE file.

```

EDIT VIRTUAL FIELD ENTRIES          My model
File . . . . . : Course
? V Field                          Type Ocr Etp Ksq GEN name Length Renamed
- - - - -
+ Course code                       CDE   K   1 ABCD      6
- Course name                       TXT   A   ABTX       25

SEL: '+' Add virtual field, '-' Remove virtual field.
F3=Exit

```

Press Enter. The Edit Virtual Field Entries panel redisplay to confirm the creation of the virtual field as indicated by the '*' in the V column.

Press F3.CA 2E displays the Edit Virtual Field Entries panel for the HORSE file. Recall that you typed V against the RACE ENTRY Refers to HORSE relation on the Edit Database Relations panel.

```

EDIT VIRTUAL FIELD ENTRIES          My model
File . . . . . : Horse
? V Field                          Type Ocr Etp Ksq GEN name Length Renamed
- - - - -
- Horse code                       CDE   K   1 ABCD      6
+ Horse name                       TXT   A   ADTX       25
- Horse gender                     STS   A   ADST        1
- Horse value                       VAL   A   ABVA     11.2
- Date of birth                     DT#   A   ACDZ        10
- Dam Horse code                   REF   A   AFCD        6
- Dam name                         REF   V   AFTX       25      V
- Dam Date of birth                REF   V   ADDZ        10      V
- Sire Horse code                  REF   A   AGCD        6
- Sire name                        REF   V   AGTX       25      V
- Sire Date of birth               REF   V   AEDZ        10      V

SEL: '+' Add virtual field, '-' Remove virtual field.
F3=Exit

```

Exercise

Add Horse name and Jockey name as virtual fields to the RACE ENTRY file. Use the same method you just used to add Course name as a virtual field to the RACE file. When you finish, press F3 to return to the Edit Database Relations panel.

CA 2E Access Paths

This topic introduces CA 2E access paths and presents some of their features such as access path selection and access path relations. You are also shown how to generate source code for the database files to implement CA 2E access paths.

New terms introduced:

- Access path
- Retrieval (RTV) access path
- Based-on file
- Access path selection
- Select/omit set
- Access path relation
- Referenced access path

New panels introduced:

- Edit File Details
- Edit Access Path Details
- Edit Access Path Select/Omit
- Edit Access Path Conditions
- Edit Access Path Relations
- Display File Access Paths
- Virtualize Access Path

Objectives

In this topic you will:

- Accept the default access paths for the COURSE file.
- Add virtual fields to the default Retrieval access path for the HORSE file.
- Add two access paths to the HORSE file to select either female horses (Mares) or male horses (Stallions).
- Modify the default Retrieval access path for the HORSE file to ensure that Dams are female and Sires are male.

Overview of Access Paths

The next stage in defining your design model is to define the required access paths. Access paths specify views of the files in the data model. The views define how data is to be presented to the functions. Functions specify the processes that operate on the data, see the chapter "Designing Functions" for more information.

Access paths control three different aspects of how data is presented to a function. An access path determines:

- Which fields will be available to the function
- Which records will be selected or omitted from the file (select/omit)
- The order in which records are presented (key sequence) to the function

Default Access Paths

CA 2E uses the relations in the data model to create a default set of access paths for each file. In many cases these will be sufficient. You may override the defaults or define additional access paths.

Three default access paths are automatically created for every file:

- A physical (PHY) access path (un-keyed). It contains the address of all data stored physically within a file and stored in the order in which the data was written to the file.
- An update (UPD) access path (logical view). It is used to update the file and contains all fields defined for the file. It cannot be altered.
- A retrieval (RTV) access path (logical view). It specifies a view of the data that CA 2E generated programs use to retrieve records from a file. Each file has at least one.

Press Enter to display the Edit File Details panel.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Course
Attribute . . . . . : REF                      Field reference file. : *NONE
Documentation sequence. . . . . :              Source library. . . . : MYGEN
GEN format prefix . . . . . : AB              Distributed . . . . . : N (Y,N)
Assimilated physical. . . . . :              Enhance SQL Naming. : N (Y,N)
Record not found message. : Course           NF Msgid. : USR0001
Record exists message . . : Course           EX Msgid. : USR0002

? Typ Access path          Source mbr Key   Index options   Auto add
- - - - -
█ PHY Physical file       MYABREP  NONE          ATR ONLY
- UPD Update index       MYABREL0 UNIQUE IMMED  ATR ONLY
- RTV Retrieval index    MYABREL1 UNIQUE IMMED  ATR ONLY
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
SEL: Z=Details, G/J=Generate, E-STASEU, D-Delete, L-Locks, O=Overrides
      H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
      F3=Exit F5=Reload F7=Functions F8=Change name F17=Services F20=Narrative
    
```

This panel shows the three default access paths that CA 2E automatically created for the COURSE file.

Press F3 to return to the Edit Database Relations panel.

Access Paths for the HORSE File

Display the relations for the HORSE file from the Edit Database Relations panel by typing **Horse*** on the selection line and pressing Enter. To display the access paths for the HORSE file, zoom into one of the relations for the file on the Edit Database Relations panel. Type **Z** against one of the relations.

```

EDIT DATABASE RELATIONS                         My model
=> Horse*                                     Rel lvl:
? Typ Object                                     Relation   Seq Typ Referenced object
Z █ FIL Horse                                   Known by   10 FLD Horse code
- FIL Horse                                   Has        20 FLD Horse name
- FIL Horse                                   Has        30 FLD Horse gender
- FIL Horse                                   Has        40 FLD Horse value
- FIL Horse                                   Has        50 FLD Date of birth
- FIL Horse                                   Refers to  60 FIL Horse
  For: Dam                                     Sharing: *ALL
- FIL Horse                                   Refers to  70 FIL Horse
  For: Sire                                     Sharing: *ALL
- - - - -
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Bottom
Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys
    
```

Press Enter to display the default access paths for the HORSE file.

Press Enter to validate the addition of the virtual fields to the Retrieval index access path for the HORSE file.

```

VIRTUALIZE ACCESS PATH                My model
File name . . . . . : Horse                Attribute. : REF
Access path . . . . . : Retrieval index      Type . . . : RTV

  Field                Type      Occr  Et Ksq  GEN name  Length  Renamed
  -----
Dam name             TXT REF   V    AFTX   25     Y
Dam Date of birth   DT# REF   V    ADDZ   10     Y
Sire name           TXT REF   V    AGTX   25     Y
Sire Date of birth DT# REF   V    AEDZ   10     Y

F3=Exit, no update  ENTER=Validate

                                           CONFIRM:  (Y,N)
  
```

Press Enter again to respond to the Confirm prompt in the lower right-hand corner of your screen and return to the Edit File Details panel.

To view the entries for the default Retrieval access path, type Z in the Subfile selector for the Retrieval index.

```

EDIT FILE DETAILS                My model
File name . . . . . : Horse
Attribute . . . . . : REF          Field reference file. : *NONE
Documentation sequence. . . . . :          Source library. . . . : MYGEN
GEN format prefix . . . . . : AE       Distributed . . . . . : N (Y,N)
Assimilated physical. . . . . :          Enhance SQL Naming. . : N (Y,N)
Record not found message. : Horse      NF Msgid. . . . . : USR0007
Record exists message . . : Horse      EX Msgid. . . . . : USR0008

? Typ Access path      Source nbr  Key      Index options      Auto add
- PHY Physical file    MYAREP    NONE
Z RTV Retrieval index MYAREL0  UNIQUE IMMED    ATR ONLY
- RTV Retrieval index MYAREL1  UNIQUE IMMED    ATR ONLY
- _____
- _____
- _____
- _____

SEL: Z-Details, G/J-Generate, E-STRSEU, D-Delete, L-Locks, O-Overrides
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F7=Functions F8=Change name F17=Services F20=Narrative
  
```

Press Enter to display the Edit Access Path Details panel.

Type Z again as shown to view entries for the Retrieval index access path.

```

EDIT ACCESS PATH DETAILS          My model
File name . . . . . : Horse          Attribute . : REF
Access path name . . . . . : Retrieval index  Type . . . . . : RTV
Unique or duplicate order : U (U-Unique,F-FIFO,L-LIFO,C-FCFO,''-Undefined)
Index maintenance option : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . . . : _ (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . . . : MYARELL
Source member text . . . . . : Horse          Retrieval index

      Format      GEN  Format text          Associated
? Seq name      pfx  (Based on file)    Update access path
Z 1 30EREAK     AE  Horse                Update index

SEL: Z-Entries, R-Relations, S-Select/omit, A-Assoc.acps, T-Trin, V-Virtualize
F3=Exit F8=Rename F20=Narrative
    
```

Press Enter to display the Edit Access Path Format Entries panel.

```

EDIT ACCESS PATH FORMAT ENTRIES  My model
File name . . . . . : Horse          Attribute . : REF
Access path name . . . . . : Retrieval index  Type . . . . . : RTV
Format text . . . . . : Horse
Based on . . . . . : Horse          Format No . . . : 1

? Field              GEN      key   Altcol Ref
                   Name     no.  Dsc  seq  cnt
█ Horse code         CDE     ADCD  K     1     1
- Horse name         TXT     ADTX  A     1     1
- Horse gender       STS     ADST  A     1     1
- Horse value        VAL     ABVA  A     1     1
- Date of birth      DT#     ACDZ  A     1     1
- Dam Horse code     CDE REF AFCO  A     1     1
- Dam name           TXT REF AFTX  V     1     1
- Dam Date of birth  DT# REF ADDZ  V     1     1
- Sire Horse code    CDE REF AGCD  A     1     1
- Sire name          TXT REF AGTX  V     1     1
- Sire Date of birth DT# REF AEDZ  V     1     1

SEL: Z-Field details, L-Locks.
F3=Exit F7=Relations
    
```

Verify that the virtual fields you specified are listed. Virtual fields are indicated by a V in the Type column. Press F13 to return to the Edit File Details panel.

Adding New Access Paths for HORSE

In this step you will add some new access paths as well as update the default Retrieval (RTV) access path. This will demonstrate some of the more sophisticated capabilities of access paths.

For example, you can define an access path to select only certain relations from the file or to include selection criteria based on conditions specified for certain fields. In this tutorial, you will specify new access paths that select only mares or only stallions from the HORSE file. Call these new RTV access paths Mares and Stallions.

Type the names of the new RTV access paths, **Mares** and **Stallions**.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Horse                      Field reference file. : #NONE
Attribute . . . . . : REF                        Source library. . . . : MYGEN
Documentation sequence. . . . . :                 Distributed . . . . . : N (V,N)
GEN format prefix . . . . . : AE                 Enhance SQL Naming. . : N (V,N)
Assimilated physical. . . . . :                 Record not found message. : Horse
Record exists message . . . . . : Horse          HF Msgid. : USR0007
                                                EX Msgid. : USR0008

? Typ Access path          Source mbr Key   Index options      Auto add
- PHY Physical file       MYAREP   NONE
- UPD Update index       MYARELB  UNIQUE IMMED      ATR ONLY
- RTV Retrieval index    MYARELL  UNIQUE IMMED      ATR ONLY
- RTV Mares
- RTV Stallions
-
-
-
-
SEL: Z=Details, G=J-Generate, E=STRSEU, D=Delete, L=Locks, O=Overrides
      M=Hold/Release, T=Trim, V=Virtualize, U=Usage, F=Func refs., N=Narrative
      F3=Exit F5=Reload F7=Functions F8=Change name F17=Services F20=Narrative

```

Press Enter.

Confirming Addition of Access Paths

You have now added the two new access paths. CA 2E immediately assigns a source member name and default properties to the new access paths.

Access Path Details

The RTV type access path for Mares must select only female horses from the HORSE file. To specify this condition, type **Z** against the Mares Retrieval access path.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Horse
Attribute . . . . . : REF                      Field reference file. : *NONE
Documentation sequence. . . . . :              Source library. . . . : MYGEN
GEN format prefix . . . . : AE                 Distributed . . . . . : N (Y,N)
Assimilated physical. . . . :                 Enhance SQL Naming. . : N (Y,N)
Record not Found message. : Horse             NF Msgid. : USR0007
Record exists message . . : Horse             EX Msgid. : USR0008

? Typ Access path      Source mbr Key  Index options  Auto add
- PHV Physical file    MYAERE0 NONE      IMMED          ATR ONLY
- UPD Update index     MYAERE1 UNIQUE IMMED  ATR ONLY
- RTV Retrieval index  MYAERE2 UNIQUE IMMED  ATR ONLY
Z RTV Mares            MYAERE3 UNIQUE IMMED  ATR ONLY
- RTV Stallions
-
-
-
SEL: Z-Details, G/J-Generate, E-STRSEU, D-Delete, L-Locks, O-Overrides
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., M-Narrative
F3=Exit F5=Reload F7=Functions F8=Change name F17=Services F20=Narrative
    
```

Press Enter to display the Edit Access Path Details panel.

```

EDIT ACCESS PATH DETAILS                       My model
File name . . . . . : Horse                    Attribute . . : REF
Access path name . . : Mares                   Type . . . . : RTV
Unique or duplicate order : U (U-Unique,F-FIFO,L-LIFO,C-FCFO,' '-Undefined)
Index maintenance option : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . . : _ (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNIX)
Source member name . . : MYAERE2
Source member text . . : Horse                 Mares

Format      GEN  Format text      Associated
? Seq name  pfx  (Based on file)  Update access path
- 1 FAEREAS AE  Horse           Update index

SEL: Z-Entries, R-Relations, S-Select/omit, A-Assoc.acps, T-Trim, V-Virtualize
F3=Exit F8=Rename F20=Narrative
    
```

This panel supplies the parameters that control the i OS options for that access path. In this tutorial, we will discuss only those options you need to define conditions; namely, Select/Omit Sets and Static and Dynamic Selection. See your IBM manuals for details about the other options.

Select/Omit Sets

A *select/omit set* lets you select or omit records from a view based on data values in specified fields. Specifying a select/omit set for an access path is a two-level process.

You can specify none, one, or many select/omit sets for a given access path. Multiple select/omit sets are joined with a logical OR; in other words, once a record satisfies a select/omit set, other sets are not relevant.

Within each select/omit set, you define one or more conditions. Multiple conditions are joined with a logical AND; in other words, all conditions need to be true for the entire set to be true.

In this tutorial, there is only one select/omit set for each access path and only one condition attached to each.

Static and Dynamic Selection

There are two kinds of access path selection available under i OS: static and dynamic.

Static selection is permanently built into the access path of the i OS logical file so that the logical file only contains the records that meet the selection criteria.

Dynamic selection is not stored in the access path, but is applied to each record as it is retrieved.

You will use dynamic selection in this tutorial.

Selection Conditions for the Mares Access Path

To specify the condition that mares must be female for the Mares access path, create a select/omit set for the access path, and attach conditions to this set. Type **D** in the Allow select/omit field to select Dynamic i OS selection and type **S** in the Subfile selector to define the select/omit criteria.

```

EDIT ACCESS PATH DETAILS           My model
File name . . . . . : Horse           Attribute . : REF
Access path name. . . . . : Mares       Type . . . . : RTV
Unique or duplicate order : U (U-Unique,F-FIFO,L-LIFO,C-FCFO,''-Undefined)
Index maintenance option  : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . . . : D (S-Static, D-Dynamic, ''-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNK)
Source member name . . . : MYAREL2
Source member text . . . : Horse         Mares

      Format      GEN  Format text           Associated
? Seq name      pfx  (Based on file)       Update access path
S 1 FAEREAS   AE Horse                 Update index

SEL: Z-Entries, R-Relations, S-Select/omit, A-Assoc.acps, T-Trim, V-Virtualize
F3=Exit F8=Rename F20=Narrative
    
```

Press Enter to display the Edit Access Path Select/Omit panel.

Specifying the Conditions for the Select/Omit Set

Type the conditions to be attached to the select/omit set Female horses only on this panel. In this case, the condition for the select/omit set will be based on the conditions you already specified for the Horse gender field of the HORSE file. In other words, this view of the HORSE file is to contain only records that have a value of Mare (represented by an F) for the Horse gender field. To enter this condition, type the following:

Horse gender in the Field column to specify the field on which the condition is to be based.

Mare in the condition column to indicate the value the Horse gender field must contain for the record to be selected.

```
EDIT ACCESS PATH CONDITIONS          My model
File name . . . . . : Horse           Attribute . . : REF
Access path name. . . . . : Mares      Type. . . . . : RTV
Format text . . . . . : Horse         Format No . . : 1
Based on. . . . . : Horse
Sel/Omit set. . . . . : S Female horses only

   Seq  Field                Condition
   ----  ----                -
   1     Horse gender        Mare
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Access Path Relations

The entries to be included on the record format for an access path are defined by the access path relations. Access path relations can include all the file relations, or be a subset of them. The key level relations, however, must be present on every access path.

Modifying the Default RTV Access Path for HORSE

In this step you will modify the default Retrieval access path for the HORSE file to ensure that Dams are female and Sires are male.

First display the access path details by zooming into the default Retrieval index. Type **Z** against the default RTV access path.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Horse
Attribute . . . . . : REF                      Field reference file. : *NONE
Documentation sequence. . . . . :              Source library. . . . : MYGEN
GEN format prefix . . . . . : AE              Distributed . . . . . : N (Y,N)
Assimilated physical. . . . . :              Enhance SQL Naming. . : N (Y,N)
Record not found message. . . . . :          HF MsgId. . . . . : USR0007
Record exists message . . . . . : Horse      EX MsgId. . . . . : USR0008

? Typ Access path      Source mbr Key      Index options      Auto add
- PHY Physical file    MYAREP  NONE
- UPD Update index     MYAREL0 UNIQUE IMMED     ATR ONLY
Z RTV Retrieval index  MYAREL1 UNIQUE IMMED     ATR ONLY
- RTV Mares            MYAREL2 UNIQUE IMMED  DVNSLT     ATR ONLY
- RTV Stallion        MYAREL3 UNIQUE IMMED  DVNSLT     ATR ONLY
-
-
-
SEL: Z-Details, G/J-Generate, E-STRSEU, D-Delete, L-Locks, O-Overrides
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F7=Functions F8=Change name F17=Services F20=Narrative

```

Press Enter to display the Edit Access Path Details panel for the default retrieval access path.

Displaying Access Path Relations

You are now ready to view the list of access path relations for the HORSE Retrieval index access path. Type **R** in the Subfile selector.

```

EDIT ACCESS PATH DETAILS                       My model
File name . . . . . : Horse                      Attribute . . . : REF
Access path name. . . . . : Retrieval index      Type . . . . . : RTV
Unique or duplicate order : U (U-Unique,F-FIFO,L-LIFO,C-FCFO, ' '-Undefined)
Index maintenance option : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . . . : _ (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . : MYAREL1
Source member text . . . : Horse                  Retrieval index

          Format      GEN  Format text          Associated
? Seq name  pfx (Based on file)  Update access path
R 1 3AREAK  AE  Horse                  Update index

SEL: Z-Entries, R-Relations, S-Select/omit, A-Assoc.acps, T-Trim, V-Virtualize
F3=Exit F8=Rename F20=Narrative

```

Press Enter to display the Edit Access Path Relations panel.

```

EDIT ACCESS PATH RELATIONS      My model
File name . . . . . : Horse      Attribute . . : REF
Access path name. . . . . : Retrieval index  Type . . . . : RTU
Format text . . . . . : Horse
Based on. . . . . : Horse      Format No . . : 1
? D Verb      File/for      Access path/function
█ * Known by   Horse code
_ * Has       Horse name
_ * Has       Horse gender
_ * Has       Horse value
_ * Has       Date of birth
_ * Refers to Horse          Retrieval index
                Dem
_ * Refers to Horse          Retrieval index
                Sire
A-Ref Accepts, S-Select F4, T-Default F4, '+'/'-'-Add/Rmv relation, V-Virtual
F3=Exit F7=Entries
    
```

Access Path Relations for the Retrieval Index

The default Retrieval index access path includes all the relations that define a file; in other words, it contains all the fields in the file. The included relations are indicated by * in the D column. You can drop non-key relations in order to include a subset of fields in your logical view of the data. You can later reinstate a dropped relation.

Note that each of the two Refers to access path relations involves a reference to another access path. Any reference to another file by an access path relation is by means of an access path of the referenced file known as the *referenced access path*. By default this is the Retrieval index of the referenced file.

Involution and Access Path Relations

Because the HORSE file Refers to itself in your model (involution), you need to change the default referenced access path for these relations. Otherwise the same access path will be called more than once in functions that use the file. Note that you need to change the default referenced access path only when involution takes place.

The following sections describe how to change the referenced access path for the two Refers to access path relations.

Changing a Referenced Access Path

To change the referenced access path used by the HORSE Refers to HORSE For Dam relation, type **A** against the relation.

```

EDIT ACCESS PATH RELATIONS           My model
File name . . . . . : Horse           Attribute . . : REF
Access path name. . . . . : Retrieval index  Type . . . . . : RTV
Format text . . . . . : Horse
Based on. . . . . : Horse           Format No . . . : 1
? D Verb      File/for      Access path/Function
_ * Known by   Horse code
_ * Has       Horse name
_ * Has       Horse gender
_ * Has       Horse value
_ * Has       Date of birth
A * Refers to Horse           Retrieval index
                Dam
█ * Refers to Horse           Retrieval index
                Sire
A-Ref Accpths, S-Select F4, T-Default F4, '+'/'-'-Add/Rmv relation, U-Virtual
F3=Exit  F7=Entries

```

Press Enter to view access paths for the referenced file.

Selecting an Access Path for Mares

Select the access path that is to be used in place of the default referenced access path. In this case, select the Mares access path by typing **X** against Mares.

```

DISPLAY FILE ACCESS PATHS           My model
File name . . . . . : Horse           Attribute . . : REF

Access path
? Typ Access path      <== Position display
X RTV Mares            MYAEREL2
█ RTV Retrieval index  MYAEREL1
_ RTV Stallions       MYAEREL3

SEL: X-Select access path, N-Narrative.
F3=Exit

```

Press Enter to select the access path and return to the Edit Access Path Relations panel.

Selecting an Access Path for Stallions

Repeat this process for the HORSE Refers to HORSE For Sire access path relation. In other words, change the referenced access path for HORSE Refers to HORSE For Sire from Retrieval index to Stallions.

Type **A** against the HORSE Refers to HORSE For Sire relation.

```

EDIT ACCESS PATH RELATIONS           My model
File name . . . . . : Horse           Attribute . : REF
Access path name. . . . : Retrieval index   Type . . . : RTV
Format text . . . . . : Horse
Based on. . . . . : Horse               Format No . : 1
? D Verb      File/for      Access path/function
█ * Known by   Horse code

_ * Has        Horse name
_ * Has        Horse gender
_ * Has        Horse value
_ * Has        Date of birth

_ * Refers to  Horse           Mares
                Dam
@ * Refers to  Horse           Retrieval index
                Sire
^-Ref accepts, S-Select F4, T-Default F4, '+/-'-Add/Rmv relation, U-Virtual
F3=Exit F7=Entries
    
```

Press Enter to view the access paths available for selection from the referenced file.

Type **X** against the Stallions access path.

```

DISPLAY FILE ACCESS PATHS           My model           Attribute . : REF
File name . . . . . : Horse

Access path
█ _____ <== Position display
? Typ Access path      Source mbr
_ RTV Mares            MYAREL2
_ RTV Retrieval index  MYAREL1
X RTV Stallions        MYAREL3

SEL: X-Select access path, N-Narrative.
F3=Exit
    
```

Press Enter.

Press F13 to return to the Edit File Details panel. Press F3 to return to the Edit Database Relations panel.

Chapter 4: Designing Functions

This chapter introduces the following topics:

- Functions
- Device Designs
- Action Diagrams
- Function Options
- Linking Functions
- Function Parameters

This section contains the following topics:

[Introduction to Functions](#) (see page 107)

[Device Designs](#) (see page 115)

[Action Diagrams](#) (see page 149)

[Function Options](#) (see page 187)

[Linking Functions](#) (see page 190)

[Function Parameters](#) (see page 202)

Introduction to Functions

This topic introduces you to CA 2E functions.

New terms introduced:

- Function
- External function
- Internal function
- Function type
- Edit File (EDTFIL) function type
- Select Record (SELRCD) function type

New panels introduced:

- Edit Functions
- Edit Function Details

Objectives

You will design interactive panels for the four following functions:

- Edit the COURSE file
- Select records from the COURSE file
- Edit the HORSE file
- Select records from the HORSE file

You will also define two additional functions:

- Select Stallions
- Select Mares

Overview of Functions

A *function* defines a list of processes that will operate on the files and fields in your database. CA 2E provides a variety of standard functions to which you can add your own unique processing. CA 2E uses the information contained in your data model to provide all of the default processing for the standard functions.

The set of standard functions consist of database functions, device functions, and user functions. Note that only the first two will be covered in this tutorial. The standard functions consist of a variety of *function types*, each of which performs a specific process. For example, the Edit File (EDTFIL) function type retrieves data from a file and lets the end user update that data using an interactive panel. The Print File (PRTFIL) function type prints a report of the data from a file. The Create Object (CRTOBJ) database function creates a record in your database.

A function can be implemented either as a separate program or as a subroutine within a program as follows:

- An *external function* is implemented as a separate high-level language (HLL) program. Each external function is attached to an access path. In general, the standard device functions are external functions; for example, the Edit File function. The only exception is the Print Object (PRTOBJ) function that is covered in a later chapter of this tutorial.
- An *internal function* is implemented as source code within that of the calling program; in other words, it is implemented as a subroutine. All the standard database functions are internal functions; for example, the Create Object function.

There need not be a one-to-one correspondence between a function and the program that implements it. You can link functions together to create larger processes that become the building blocks of your applications; namely, several internal functions may be implemented as a single program. In other words, a function is a unit of specification, not implementation.

The standard functions may have the following components. Note that not all function types have all four components.

- **Device design**—Specifies the layout of the panel or report used by the function
- **Action diagram**—Specifies the processing steps that make up the function (includes default processing and processing that you define)
- **Function options**—Specifies default features of a function
- **Function parameters**—Specifies fields to be passed into the function and returned from the function at run time

Each of these components is discussed in this chapter.

In addition to the standard functions, CA 2E provides message functions, function fields, and built-in functions, which perform low-level processing such as arithmetic operations. These will all be discussed in this and the following chapters.

Default Functions

CA 2E automatically creates five default functions for each reference file (REF) you declare: two external functions (Edit File and Select Record), and three internal functions (Change Object, Create Object, and Delete Object). Note that for capture files (CPT), CA 2E automatically creates only the three internal functions.

Default External Functions

The two external functions CA 2E automatically creates are:

- An *Edit File* (EDTFIL) function

This type of function maintains multiple records on the file. An example in this tutorial will be the Edit Course function.

- A *Select Record* (SELRCO) function

This type of function provides a display of the records on the file, and allows the selection of one record for return to a calling program. An example in this tutorial will be the Select Course function.

Both of these external functions are interactive device functions. Note that CA 2E does not automatically create these device functions for capture files (CPT).

Default Internal Functions

The three internal functions CA 2E automatically creates are Change Object (CHGOBJ), Create Object (CRTOBJ), and Delete Object (DLTOBJ). These functions are used to update the database and are called by external functions as required. They are implemented as subroutines within the generated source code for an external function. Internal functions are specified separately to give you the capability to add additional processing for updating the database. This additional processing is made available to all the functions that call the internal functions.

Understanding Function Details

Each interactive external function will be implemented by means of:

- A High Level Language (HLL) program
- A DDS display file
- A file containing Help text

An appropriate source member is created to contain each type of generated source. CA 2E supplies default names for the source members. You can change the default source member names using the Edit Function Details panel.

The implementation language is controlled by the target HLL (higher level language). You may generate in RPG, COBOL, UNIX, or Client Server Applications depending on your version of CA 2E.

The default implementation language for new functions is controlled by the YHLLGEN model value.

Displaying Function Details

You will now display the details of the Edit Horse function. Type **Z** against the Edit Horse function.

EDIT FUNCTIONS		My model	** 1ST LEVEL **
File name. . . : Horse			
? Function	Function type	Access path	
- Change Horse	Change object	Update index	
- Create Horse	Create object	Update index	
- Delete Horse	Delete object	Update index	
Z Edit Horse	Edit file	Retrieval index	
█ Select Horse	Select record	Retrieval index	
- Select Mares	Select record	Mares	
- Select Stallions	Select record	Stallions	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
			More...
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Marr, O-Open, T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock. F3=Exit F5=Reload F7=File details F9=Add functions F17=Services			

Press Enter to view function details for the Edit Horse function. Note the program (RPG), display file (DDS), and the help text file (UIM).

EDIT FUNCTION DETAILS		My model	
Function name . . .	Edit Horse	Type :	Edit file
Received by file. :	Horse	Acpth:	Retrieval index
Workstation . . . :	HPT		
Source library. . . :	MYGEN		
Object	Source	Target	
? Type	Name	HLL	Text
█ PGM	MYAEEFR	RPG	Edit Horse Edit file
— DSP	MYAEEFRD	DDS	Edit Horse Edit file
— HLP	MYAEEFRH	UIM	Edit Horse Edit file
SEL: E-STRSEU, O-Compiler Overrides.			
F3=Exit F7=Options F8=Change name F9=Scr/rpt layout F20=Narrative			

Device Designs

CA 2E automatically creates a default interactive panel design for each interactive device function. You can modify the default designs to meet the requirements of your application. This topic describes how to use the CA 2E Device Design Editor to modify the device design associated with your Edit Horse and Select Horse functions.

The Edit Horse function will show the use of an action bar (pull-down menu) as part of the panel design. The Select Horse function will show the use of a window.

New terms introduced:

- CA 2E device design
- Usage

New panel introduced:

- Edit Function Devices

Overview of Device Designs

When you declare a function, CA 2E supplies a default panel design. You can modify it to meet your requirements using an interactive panel design tool.

A device design specifies the following:

- The selection of fields present on a device panel and the accompanying text for each field
- The display of both fields and text may be conditional.
- The order in which the fields are displayed on the device panel and how they are edited
- The display attributes for the fields
- The use of each field

All of the above are defaulted from the design model. You may override most of these default values.

Displaying the Device Design for Edit Horse

The Edit Function Details panel for the Edit Horse function should be displayed on your screen. If it is not, follow the steps at the end of the preceding topic.

There is only one panel design for the Edit Horse function. You can view the default device design from the Edit Function Details panel by pressing F9.

```
EDIT FUNCTION DETAILS                               My model
Function name . . : Edit Horse                      Type : Edit file
Received by file. : Horse                          Acpth: Retrieval index
Workstation . . . : HPT
Source library. . : MYGEN

Object Source Target
? Type Name HLL Text
■ PGM MYAEEFR RPG Edit Horse Edit file
_ DSP MYAEEFRD DDS Edit Horse Edit file
_ HLP MYAEEFRH UIM Edit Horse Edit file

SEL: E-STRSEU, O-Compiler Overrides.
F3=Exit F7=Options F8=Change name F9=Scr/rpt layout F20=Narrative
```


Design Standards and Subfile Selector Options

When the function type includes a subfile, descriptions for the Subfile selector options are included as part of the default device design. These can be

- Part of the footer along with standard function key descriptions
 - Placed above the subfile record as part of the subfile control format
- This is the CUA ENTRY design standard.
- Listed as actions in the Selector Choice menu that is part of the action bar at the top of the panel

This is the CUA TEXT design standard.

The default design standard for CA 2E design models on the IBM i is CUA ENTRY. However, when you created your design model at the beginning of this tutorial using the Create Model Library (YCRTMDLLIB) command, you were told to specify *CUATEX as the design standard for your model.

When the design standard is set to CUA TEXT, CA 2E automatically creates all Edit File functions with an action bar on the panel design. Note the action bar at the top of the panel design for the Edit Horse function. An action bar provides a set of choices that give the end users access to various actions available on the panel. CA 2E automatically provides a default set of choices depending on the function type. Later in this tutorial you will define a new choice and action on the Edit Horse function's action bar.

Subfile Control Default

The key field of the HORSE file (Horse code) is placed on the subfile control format as well as on the subfile record. This field is a positioning field that causes the subfile record to begin at a particular record when a value is entered into this field.

Subfile Record Default

To determine the default panel design for an Edit File function, CA 2E places all the fields from the access path side-by-side on a subfile record, with the field names as column headings. If the fields total more than 80 characters, the design continues into a work area on the right. It is up to you, the designer, to adjust the design until the fields are all displayed on the panel. In this tutorial, the fields exceed the panel display. CA 2E alerts you to this fact and displays the message "Design exceeds device size limits for function Edit Horse" at the bottom of the panel.

F9	Moves the field on which the cursor is located and all fields to its right to the next line
F10	Adds a space before the field on which the cursor is positioned; in other words, moves text one column to the right
F15	Moves device design to the left margin
F16	Moves device design to the right margin
F17	Displays a list of device formats
F18	Displays the Edit Screen Field Attributes panel for the field on which the cursor is positioned
F19	Adds a function field to the device design
F20	Edits a function field on the device design
F22	Removes a space before the field on which the cursor is positioned; in other words, moves text one column to the left

Reducing the Width of the Device Design Layout

You can reduce the width of the device design by folding the subfile records that make up the device design. This way the fields in each record are arranged over several lines rather than in one long line. You will use the F9 key to do this.

The following steps in this tutorial show how to split the information about each horse into three lines that give:

- Information about the horse itself
- Information about the horse's Dam
- Information about the horse's Sire

The change in position of the fields on the device design is determined by the position of the cursor when you press the function key. To begin the second line with *Dam Horse code*, you will simply place the cursor on this field and press F9. The subfile record format will split into two lines. The device design is updated to reflect the change.

Position cursor.

```
File  fUnction  Selector  Help
-----
*PROGRAM  *PGMMDD                                DD/MM/YY  HH:MM:SS
                                Edit Horse
Horse code .  _____
Select items, then select an action.
Opt Horse Horse name Horse Horse value Date of Dam Hors
code gender birth code
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
- _____ - _____ - _____ - _____ - _____
F3=Exit  F5=Reset  F9=Open  F10=Actions
Design exceeds device size limits for function Edit Horse
```

Press F9. The subfile record format now displays only two HORSE records.

Folding the Device Design Layout Again

Next, repeat the process to move the fields relevant to the Sire to a separate line from those for the Dam. Place the cursor on the Sire Horse code.

```

File  fUnction  Selector  Help
-----
*PROGRAM  *PGMMOD                                DD/MM/YY HH:MM:SS

                                Edit Horse
Horse code . _____

Select items, then select an action.

Opt  Horse  Horse name                Horse  Horse value  Date of
code code                                gender

Dam Horse  Dam name                Dam Date  Sire Horse  Sire name
code code                                of birth  code
_____  000000000000000000000000  66/66/66  █ _____  000000000000000000000000

Dam Horse  Dam name                Dam Date  Sire Horse  Sire name
code code                                of birth  code
_____  000000000000000000000000  66/66/66  _____  000000000000000000000000

F3=Exit  F5=Reset  F9=Open  F10=Actions
Design exceeds device size limits for function Edit Horse
    
```

Press F9. The subfile record format now displays only one HORSE record.

Panel Format Details

You can view a list of all the fields available on any particular format using the Edit Screen Format Details panel. To access this panel for the Subfile record format, place the cursor on any field of the first subfile record.

```

File  fUnction  Selector  Help
-----
*PROGRAM  *PGMMOD                                DD/MM/YY HH:MM:SS

                                Edit Horse
Horse code . _____

Select items, then select an action.

Opt  Horse  Horse name                Horse  Horse value  Date of
code code                                gender

Dam Horse  Dam name                Dam Date  Sire Horse  Sire name
code code                                of birth  code
█ _____  000000000000000000000000  66/66/66

Sire Horse  Sire name                Sire Date  Sire Date
code code                                of birth  of birth
_____  000000000000000000000000  66/66/66

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press F5.

```

EDIT SCREEN FORMAT DETAILS                               My model
Format . . . . . : Subfile record.                      Type: RCD

Blank lines before fmt . . . . . : 1 or Fixed start line no . . . . . : _
Blank lines after column headings: _ Blank line between records . . . . . : _
Subfile page . . . . . : _

? Field                               Func Typ  Usg Ovr  Length  GEN name  Etp  Rqd LL
- *SFLSEL                             ACT STS  I  I    1    *SFLSEL  U    C
- Horse code                           DTA CDE  I  I    6     ACD    K  Y  C
- Horse name                           DTA TXT  I  I   25    ADTX    A    C
- Horse gender                         DTA STS  I  I    1     ADST    A    C
- Horse value                           DTA VAL  I  I  11.2   ABVA    A    C
- Date of birth                         DTA DT#  I  I    6.0   ACDZ    A    C
- Dam Horse code                       DTA REF  I  I    6     AFCO    A    C
- Dam name                             DTA REF  O  O   25    AFTX    V    C
- Dam Date of birth                    DTA REF  O  O    6.0   ADDZ    V    C
- Sire Horse code                      DTA REF  I  I    6     AGCO    A    C +

SEL: Z-Details, A,B,C,D-Text position, I,O,H,'-'-Field usage.
F3=Exit F7=Fmt rel F10=Sequence F19=Add function field F23=Add constant
    
```

Edit Screen Format Details

The Edit Screen Format Details panel shows all the fields in the Subfile record format. The details shown for each field on the format include the name and type of the field. This panel also allows you to control the positioning of the format with respect to other formats on the device design.

You can also use this panel to specify a field's *usage*; in other words, whether the field is input capable (I), output only (O), or hidden (H). This applies to any field other than the Subfile selector field (*SFLSEL). For example, you could hide a field by typing **H** against the field or you could change an input capable field to output only by typing **O** against the field.

Note: Some restrictions exist when changing an output only field to an input capable field.

Editing the Panel Format

In this step you will use the Edit Screen Format Details panel to make the following two changes to improve the appearance of the Edit Horse panel.

1. Separate the individual subfile records with a blank line by typing **Y** (yes) against the Blank line between records field.
2. Place field labels before the fields on the second and third lines of the record, rather than above them, to clarify the information. CA 2E has four options for positioning the label associated with a field.
 - Above (A) - on the line above a field
 - Before (B) - on the same line as the field
 - Column heading (C) - above a column of instances of the field; this value applies only to a subfile record format
 - Drop (D) - omit the label

To reposition the labels on the second and third lines, you will type **B** against each of the Dam and Sire fields. Note that later in this tutorial you will use the Edit Screen Entry Details panel to overwrite the wording of the field labels.

Specify **Y** for the Blank line between records field and type **B** against each of the Dam and Sire fields.

```

EDIT SCREEN FORMAT DETAILS          My model
Format . . . . . : Subfile record.      Type: RCD
Blank lines before fmt . . . . . : 1 or Fixed start line no . . . . . : __
Blank lines after column headings: __  Blank line between records . . . : Y
Subfile page . . . . . : __

? Field                Func Typ  Usg Ovr  Length  GEN name  Etp  Rqd  LL
- *SFLSEL              ACT  STS  I  I    1      *SFLSEL  U    Y  C
- Horse code           DTA  CDE  I  I    6      ADCC      K    Y  C
- Horse name           DTA  TXT  I  I   25      ADTX      A    C  C
- Horse gender         DTA  STS  I  I    1      ADST      A    C  C
- Horse value          DTA  VAL  I  I  11.2    ABVA      A    C  C
- Date of birth        DTA  DT#  I  I    6.0     ACDZ      A    C  C
B Dam Horse code      DTA  REF  I  I    6      AFCD      A    C  C
B Dam name            DTA  REF  0  0   25      AFTX      V    C  C
B Dam Date of birth   DTA  REF  0  0    6.0     ADDZ      V    C  C
B Sire Horse code     DTA  REF  I  I    6      AGCD      A    C  C +

SEL: Z=Details, A,B,C,D=Text position, I,O,H,'-'=Field usage.
F3=Exit F7=Fmt rel F10=Sequence F19=Add function field F23=Add constant

```

Press Roll Up to display more fields. Type **B** as shown to position the labels for the Sire name and Sire Date of birth before the field on the same line.

```

EDIT SCREEN FORMAT DETAILS           My model
Format . . . . . : Subfile record.      Type: RCD

Blank lines before fmt . . . . . : 1 or Fixed start line no . . . . . : __
Blank lines after column headings: __ Blank line between records . . . . : Y
Subfile page . . . . . : __

? Field                               Func Typ  Usg Ovr  Length  GEN name  Etp  Rqd LL
B Sire name                           DTA REF  0  0    25     AGTX      V    C
B Sire Date of birth                   DTA REF  0  0    6.0     AEDZ      V    C

SEL: Z-Details, A,B,C,D-Text position, I,O,H,'-'-Field usage.
F3=Exit F7=Fmt rel F10=Sequence F19=Add function field F23=Add constant
    
```

Press Enter to confirm the changes. Note that the value in the LL (Label Location) column for each of the Dam and Sire fields has changed from **C** to **B**. Press Roll Down to view the preceding panel.

```

EDIT SCREEN FORMAT DETAILS           My model
Format . . . . . : Subfile record.      Type: RCD

Blank lines before fmt . . . . . : 1 or Fixed start line no . . . . . : __
Blank lines after column headings: __ Blank line between records . . . . : Y
Subfile page . . . . . : __

? Field                               Func Typ  Usg Ovr  Length  GEN name  Etp  Rqd LL
- *SFLSEL                             ACT STS  I  I     1     *SFLSEL   U    C
- Horse code                           DTA CDE  I  I     6     ADCD      K  Y  C
- Horse name                           DTA TXT  I  I    25     ADTX      A    C
- Horse gender                         DTA STS  I  I     1     ADST      A    C
- Horse value                           DTA VAL  I  I    11.2    ABVA      A    C
- Date of birth                         DTA DT#  I  I     6.0     ACDZ      A    C
- Dam Horse code                       DTA REF  I  I     6     AFCD      A    B
- Dam name                             DTA REF  0  0    25     AFTX      V    B
- Dam Date of birth                     DTA REF  0  0    6.0     ADDZ      V    B
- Sire Horse code                       DTA REF  I  I     6     AGCD      A    B +

SEL: Z-Details, A,B,C,D-Text position, I,O,H,'-'-Field usage.
F3=Exit F7=Fmt rel F10=Sequence F19=Add function field F23=Add constant
    
```

Press F3 to return to the Device Design Editor.

Effect of Screen Format Changes on Device Design

The updates you have made are displayed immediately when you press F3 on the Edit Screen Format Details panel. The new panel layout is clearer, with a blank line between each subfile record and the field labels shown before the fields. However, because the field labels are now on the same line as the fields, the second and third lines of the subfile record are too long to fit on the panel.

Removing Field Label for Dam Name

Notice the value of B (Before) in the Label location field; this caused the LHS text to appear as a label before the Dam name field. To remove the label, change the Label location field from B to blank.

```

EDIT SCREEN ENTRY DETAILS          My model
Field name . . . . . : Dam name          Display length . . . : 25
GEN name . . . . . : AFTX              Override length. . . :
Label location . . . : _ (Above,Before,Column,blank) Label spacing. : _
Lines before . . . . :                   Screen text. . . . . : F (M, L, F)
Spaces before. . . . : 2                 Column Headings. . . :
Column Headings. . . : Dam name
Left hand side text. : Dam name
Right hand side text : Text
Display RHS text . . : RHS spaces . . . : 1 Fill LHS text. . . . : Y
I/O Usage. . . . . : 0
Check condition . . : *NONE
Allow blank. . . . . :                   Field exit option. . : _

F3=Exit, no update  F7=Relations  F18=Screen attributes
    
```

Press Enter.

Removing Field Label for Sire Name

Remove the field label for the Sire name field in the same way. Position the cursor on the Sire name field.

```

File  fUnction  Selector  Help
-----
*PROGRAM  *PGMMOD                      DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code . . . . .
Select items, then select an action.
Opt  Horse  Horse name          Horse  Horse value  Date of
code code          gender
Dam  _____  00000000000000000000000000000000  Dam Date of birth 66/66/66
Sire _____  Sire name 00000000000000000000000000000000  Sire Date of birth 66/66/66
Dam  _____  00000000000000000000000000000000  Dam Date of birth 66/66/66
Sire _____  Sire name 00000000000000000000000000000000  Sire Date of birth 66/66/66
Dam  _____  00000000000000000000000000000000  Dam Date of birth 66/66/66
Sire _____  Sire name 00000000000000000000000000000000  Sire Date of birth 66/66/66
F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press Enter.

Notice the value of B (Before) in the Label location field; this caused the LHS text to appear as a label before the Sire name field. To remove the label, change the Label location field from B to blank.

```

EDIT SCREEN ENTRY DETAILS           My model
Field name . . . . . : Sire name           Display length . . . : 25
GEN name . . . . . : AGTX                 Override length. . . :
Label location . . . : _ (Above,Before,Column,blank) Label spacing. : █
Lines before . . . . :                     Screen text. . . . : E (M, L, F)
Spaces before. . . . : 2                   Column Headings. . . : Sire name
Column Headings. . . :
Left hand side text. : Sire name
Right hand side text : Text
Display RHS text . . : RHS spaces . . . . : 1 Fill LHS text. . . . : Y
I/O Usage. . . . . : 0
Check condition . . : *NONE
Allow blank. . . . . : Field exit option. . : _

F3=Exit, no update F7=Relations F18=Screen attributes
    
```

Press Enter.

After removing field labels for the Dam name and Sire name fields, the resulting panel will look like the following screen.

```

File  Function  Selector  Help
-----
*PROGRAM  *PGMMOD                               DD/MM/YY HH:MM:SS
                               Edit Horse
Horse code . . . . .
Select items, then select an action.
Opt  Horse  Horse name           Horse  Horse value  Date of
code code          gender
-----
Dam  _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66

Dam  _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66

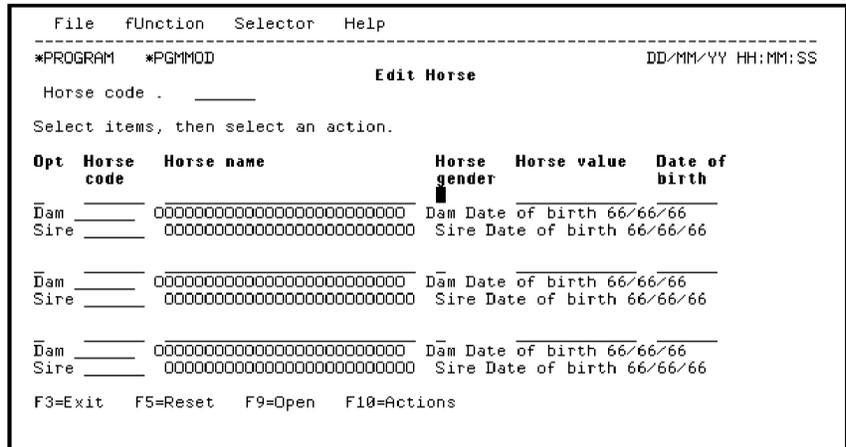
Dam  _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Centering a Field with Respect to its Label

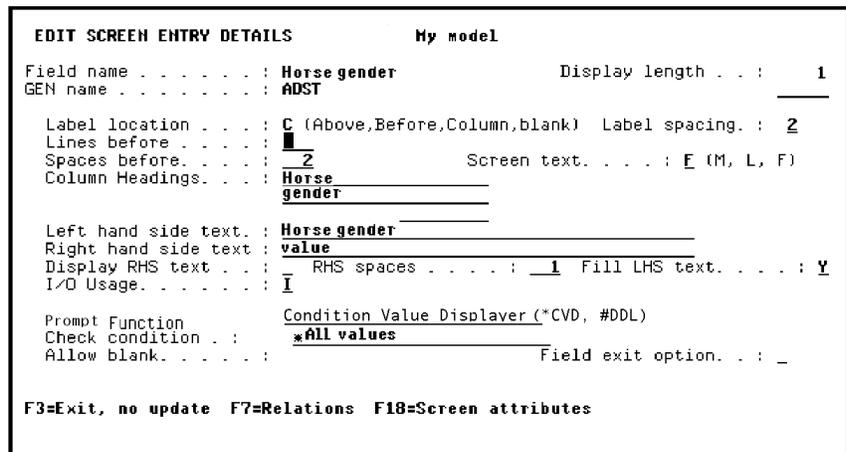
The Label spacing field on the Edit Screen Entry Details panel lets you position a field with respect to its label. This applies to fields on the same line as their label as well as to fields positioned below their label. One use of the Label spacing field is to center a field whose length is shorter than the label length; for example, the Horse gender field.

In this step you will center the Horse gender field below its label. To do this, access the Edit Screen Entry Details panel for the Horse gender field. Position the cursor.



Press Enter.

Type 2 in the Label spacing field to move the field two positions to the right and press Field Exit.



Press Enter to return to the Device Design Editor.

Note that the Horse gender field is now centered below its label.

Moving Fields to Right and Left

Field positioning within a device design is relative. For example, each field is positioned with respect to the previous field in the format. You can adjust the position of a field by inserting or removing spaces before it using either function keys or the Edit Screen Entry Details panel.

Using Function Keys

For example, F10 inserts one space before the field label of the field where the cursor is positioned, causing the field and all fields to the right of it to be moved to the right. F22 removes one space before the field and moves the entire line to the left.

Position the cursor on the Dam field.

```

File  fFunction  Selector  Help
-----
*PROGRAM  *PGMMOD                               DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code .  _____
Select items, then select an action.
Opt  Horse  Horse name                Horse  Horse value  Date of
code                gender
-----
Dam █ _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66
-----
Dam _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66
-----
Dam _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66
-----
F3=Exit  F5=Reset  F9=Open  F10=Actions
  
```

Press F10 five times to indent the line beginning with Dam by five spaces.

You have just moved the Dam field to the right so that the second row begins below the Horse code field.

Using the Edit Screen Entry Details Panel

You can also move fields by changing the value in the Spaces before field on the Edit Screen Entry Details panel. Position the cursor on the Sire field.

```

File  fUction  Selector  Help
-----
*PROGRAM  *PGMMOD                      DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code . _____
Select items, then select an action.

Opt Horse Horse name           Horse Horse value  Date of
  code code                    gender        Date of birth
-----
-   Dam _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire █ _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66
-   Dam _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66
-   Dam _____ 00000000000000000000000000000000 Dam Date of birth 66/66/66
Sire _____ 00000000000000000000000000000000 Sire Date of birth 66/66/66

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press Enter to display the Edit Screen Entry Details panel. Change the Spaces before field to 6 as shown and press Field Exit.

```

EDIT SCREEN ENTRY DETAILS           My model
Field name . . . . . : Sire Horse code           Display length . . . : 6
GEN name . . . . . : AGCD
Label location . . . : B (Above,Before,Column,blank) Label spacing. : _
Lines before . . . . : 1
Spaces before . . . . : 6                      Screen text. . . . : █ (M, L, F)
Column Headings. . . : Sire Horse _____
                           code _____
Left hand side text. . : Sire _____
Right hand side text : Code _____
Display RHS text . . . : _ RHS spaces . . . . : 1 Fill LHS text. . . . : Y
I/O Usage. . . . . : I
Check condition . . . : *NONE
Allow blank. . . . . : _ Check numeric. . . : _ Field exit option. . . : Y

F3=Exit, no update  F7=Relations  F18=Screen attributes
    
```

Press Enter.

Adjusting the Label Spacing of the Dam Field

The above steps will line up the field labels for Dam and Sire. The entry fields can now be aligned by placing the cursor on the Dam field.

```

File  fUction  Selector  Help
-----
*PROGRAM  *PGMMOD                               DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code . _____
Select items, then select an action.

Opt  Horse  Horse name                Horse gender  Horse value  Date of
code                                     birth

-   Dam █  00000000000000000000000000000000  Dam Date of birth 66/66/66
    Sire _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66

-   Dam _____ 00000000000000000000000000000000  Dam Date of birth 66/66/66
    Sire _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66

-   Dam _____ 00000000000000000000000000000000  Dam Date of birth 66/66/66
    Sire _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press Enter.

Change the Label spacing to 1 as shown and press Field Exit.

```

EDIT SCREEN ENTRY DETAILS                My model
Field name . . . . . : Dam Horse code      Display length . . . : 6
GEN name . . . . . : AFCD
Label location . . . : B (Above,Before,Column,blank) Label spacing. : 1
Lines before . . . . : 1
Spaces before. . . . : 6                Screen text. . . . : E (M, L, F)
Column Headings. . . : Dam Horse
                   : code
Left hand side text. : Dam
Right hand side text : Code
Display RHS text . . :   RHS spaces . . . . : 1 Fill LHS text. . . . : Y
I/O Usage. . . . . : I
Check condition . . : *NONE
Allow blank. . . . . :   Check numeric. . . :   Field exit option. . . : Y

F3=Exit, no update  F7=Relations  F18=Screen attributes
    
```

Press Enter.

Editing Panel Format Relations

Change the validation of a relation to optional by typing **O** against the relevant relation. In this tutorial, the check condition for the two Refers to relations and the check condition for HORSE Has Horse value should be optional.

Type **O** against the first Refers to relation and the Has Horse value relation.

```

EDIT SCREEN FORMAT RELATIONS      My model
File name . . . . . : Horse      Attribute . : REF
Access path name. . . . . : Retrieval index  Type. . . . : RTV
Format text . . . . . : Horse      Format No . . : 1
Based on. . . . . : Horse
? Verb      File/for      Access path/Function  Check
Known by   Horse code           REQUIRED
■ Has      Horse name           REQUIRED
_ Has      Horse gender         REQUIRED
O Has      Horse value           REQUIRED
_ Has      Date of birth        REQUIRED
O Refers to Horse           Mares           REQUIRED
      Dam
R-Required, O-Optional, N-No error, U-User, S-Select F4, T-Default F4
F3=Exit
    
```

Press Roll Up to display the second HORSE Refers to HORSE relation and type **O** in the Subfile selector.

```

EDIT SCREEN FORMAT RELATIONS      My model
File name . . . . . : Horse      Attribute . : REF
Access path name. . . . . : Retrieval index  Type. . . . : RTV
Format text . . . . . : Horse      Format No . . : 1
Based on. . . . . : Horse
? Verb      File/for      Access path/Function  Check
O Refers to Horse           Stallions       REQUIRED
      Sire
R-Required, O-Optional, N-No error, U-User, S-Select F4, T-Default F4
F3=Exit
    
```

Press Enter to confirm. Note that the value in the Check column for the selected relations changed from REQUIRED to OPTIONAL.

Press F3 to return to the device design.

Completed Device Design

The Edit Horse device design is now complete and should look like this:

```

File  fFunction  Selector  Help
-----
*PROGRAM  *PGMMOD                      DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code .  _____
Select items, then select an action.

  Opt  Horse code  Horse name                Horse gender  Horse value  Date of birth
  ---  -
  -    █          00000000000000000000000000000000  Dam Date of birth 66/66/66
      Dam _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66
      Sire _____ 00000000000000000000000000000000

  -    █          00000000000000000000000000000000  Dam Date of birth 66/66/66
      Dam _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66
      Sire _____ 00000000000000000000000000000000

  -    █          00000000000000000000000000000000  Dam Date of birth 66/66/66
      Dam _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66
      Sire _____ 00000000000000000000000000000000

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press F3 to save and exit the device design. The Edit Function Devices panel displays.

Exiting the Device Design

From the Edit Function Devices panel you can change the panel title, display the action diagram for the function, display all open functions (CA 2E allows you to have multiple functions open), return to the device design, or exit and save the device design.

```

EDIT FUNCTION DEVICES                My model
Function name. . . : Edit Horse      Type : Edit file
Received by file : Horse             Acpth: Retrieval index

? Title
Screen title. .... █ Edit Horse

SEL: Z=Scr/rpt design, H=Narrative, A=Animate
F3=Exit F5=Action diagram F15=Open Functions
    
```

Press F3 to exit and display the Exit Function Definition panel.

Exit Function Definition

The Exit Function Definition panel lets you optionally save any changes to the device design. You can also change the name of the function, access path, or file. From this panel you can also print the function details, return to editing the device design, or submit the function for generation.

```

EXIT FUNCTION DEFINITION                My model
Type choices, press Enter.
Change/create function. . . . Y           Y=Yes, N=No
  Function name . . . . . Edit Horse       Name
  Access path name. . . . . Retrieval index Name
  File name . . . . . Horse             Name
  Function type . . . . . Edit file

Print function. . . . . N                 Y=Yes, N=No
Return to editing . . . . . N             Y=Yes, N=No
Submit generation . . . . . N           Y=Yes, N=No

F5=Refresh  F12=Cancel  F15=Open Functions
    
```

Accept the defaults and press Enter to save the device design.

Function Confirmation

When the save process is complete, CA 2E automatically returns to the Edit Function Details panel; the message "Function 'Edit Horse' has been saved," appears at the bottom of the panel. Press F3 to return to the Edit Functions panel.

Window Device Design

In this step you will edit a function that has a window for its default display file. When the design standard is set to CUA TEXT, CA 2E automatically creates all Select Record functions with a window defined for the display file. Recall that you specified *CUATEXT on the Create Model Library (YCRTMDLLIB) command when you created your model at the beginning of this tutorial.

The following steps in this tutorial illustrate how to use the Device Design Editor to modify the default window designs associated with the Select Record (SELRCO) function.

Modifying the default window design involves two basic steps. Both of these steps can be accomplished with the Device Design Editor.

1. Arrange the fields on the panel, hiding any that are unnecessary.
2. Adjust the window dimensions to surround the fields present on the device design.

Invoking the Device Design

You can access the default device design for a function directly from the Edit Functions panel. Compare this to the way you accessed the device design for the Edit Horse function in the tutorial topic you just completed. In that case you typed **Z** to display the Edit Function Details panel and then pressed **F9** to access the device design.

Select the Select Horse function by typing an **S** in the ? column (Subfile selector).

EDIT FUNCTIONS		
File name. . . : Horse	My model	** 1ST LEVEL **
? Function	Function type	Access path
- Change Horse	Change object	Update index
- Create Horse	Create object	Update index
- Delete Horse	Delete object	Update index
- Edit Horse	Edit file	Retrieval index
S Select Horse	Select record	Retrieval index
█ Select Mares	Select record	Mares
- Select Stallions	Select record	Stallions
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
		More...
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Marr, O-Open, T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock. F3=Exit F5=Reload F7=File details F9=Add functions F17=Services		

Press Enter to display the default device design.

Default Device Design for Select Horse

A default window device design displays. The subfile control format shows only the key fields and the subfile record format shows all fields on the HORSE file. You can use any of the procedures shown in the previous section to modify the device design. In addition, in this step, you will hide all of the fields in the HORSE file other than Horse code, Horse name, Horse gender, and Date of birth in the subfile record format.

Position cursor on any field in the first subfile record.

```
.....
:                                     Select Horse                                     :
: Horse                               :                                           :
: code                               :                                           :
: _____                         :                                           :
:                                     :                                           :
: 1=Select                            :                                           :
:                                     :                                           :
: Opt  Horse   Horse name            Horse  Horse value   Date of   am   :
:      code    :                    gender  :        birth  : od  :
: █  000000  0000000000000000000000  0   6666666666.66CR  66/66/66 : 00 :
: -  000000  0000000000000000000000  0   6666666666.66CR  66/66/66 : 00 :
: -  000000  0000000000000000000000  0   6666666666.66CR  66/66/66 : 00 :
: -  000000  0000000000000000000000  0   6666666666.66CR  66/66/66 : 00 :
: -  000000  0000000000000000000000  0   6666666666.66CR  66/66/66 : 00 :
: -  000000  0000000000000000000000  0   6666666666.66CR  66/66/66 : 00 :
: -  000000  0000000000000000000000  0   6666666666.66CR  66/66/66 : 00 :
:                                     :                                           :
: F3=Exit  F4=Prompt                 :                                           :
:                                     :                                           :
:                                     :                                           :
:                                     :                                           :
.....
Design exceeds device size limits for function Select Horse
```

Press F5 to display a list of all available fields for the Select Horse device design window.

Hiding Fields in the Subfile Record Format

The Edit Screen Format Details panel contains a list of all fields associated with this function. You may not want to show all of the fields on your panel. You can hide fields you do not want displayed by typing **H** in the Subfile selector of the Edit Screen Format Details panel.

In this step you will hide the following non-key fields: Horse value, Dam Horse code, Dam name, Dam Date of birth, Sire Horse code, Sire name, and Sire Date of birth. Type **H** next to these fields.

```

EDIT SCREEN FORMAT DETAILS          My model
Format . . . . . : Subfile record.      Type: RCD

Blank lines before fmt . . . . . : 1  or Fixed start line no . . . . . : _

Blank lines after column headings: _  Blank line between records . . . . . : _
Subfile page . . . . . : _

? Field                               Func Typ  Usg Ovr  Length  GEN name  Etp  Rqd LL
- *SFLSEL                             ACT  STS  I  I    1    *SFLSEL  U    C
- Horse code                           DTA  CDE  0  0    6    ADCD    K  Y  C
- Horse name                            DTA  TXT  0  0   25    ADTX    A    C
- Horse gender                          DTA  STS  0  0    1    ADST    A    C
H Horse value                           DTA  VAL  0  0   11.2  ABVA    A    C
- Date of birth                         DTA  DT#  0  0    6.0    ACDZ    A    C
H Dam Horse code                        DTA  REF  0  0    6    AFCD    A    C
H Dam name                              DTA  REF  0  0   25    AFTX    V    C
H Dam Date of birth                     DTA  REF  0  0    6.0    ADDZ    V    C
H Sire Horse code                       DTA  REF  0  0    6    AGCD    A    C +

SEL: Z-Details, A,B,C,D-Text position, I,O,H,'-'-Field usage.
F3=Exit F7=Fmt rel F10=Sequence F19=Add function field F23=Add constant
    
```

Press Roll Up to display more fields. Type **H** next to Sire Name and Sire Date of Birth.

```

EDIT SCREEN FORMAT DETAILS          My model
Format . . . . . : Subfile record.      Type: RCD

Blank lines before fmt . . . . . : 1  or Fixed start line no . . . . . : _

Blank lines after column headings: _  Blank line between records . . . . . : _
Subfile page . . . . . : _

? Field                               Func Typ  Usg Ovr  Length  GEN name  Etp  Rqd LL
H Sire name                             DTA  REF  0  0   25    AGTX    V    C
H Sire Date of birth                     DTA  REF  0  0    6.0    AEDZ    V    C

SEL: Z-Details, A,B,C,D-Text position, I,O,H,'-'-Field usage.
F3=Exit F7=Fmt rel F10=Sequence F19=Add function field F23=Add constant
    
```

Press Enter. Note that the value of the Ovr (Override) column for the selected fields changed from O to H.

Press F3 to return to the Device Design Editor.

Modified Subfile Control Format

Note that the hidden fields are no longer shown on the subfile record format of the device design for the Select Horse function.

```

:-----Select Horse-----:
: Horse                      :
: code                       :
: _____                 :
:                             :
: I=Select                   :
:                             :
: Opt  Horse   Horse name   Horse   Date of :
:  █   code   name          gender   birth  :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:                             :
: F3=Exit   F4=Prompt       :
:-----:

```

Exercise

Complete the following exercise to modify the device design for the Select Horse function. Use function keys as you did for the Edit Horse function previously in this tutorial.

Modify the device design for the Select Horse function so that it reflects the design that follows.

```

:-----Select Horse-----:
: Horse                      :
: code                       :
:  █_____                 :
:                             :
: I=Select                   :
:                             :
: Opt  Horse   Horse name   Horse   Date of :
:  _   code   name          gender   birth  :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:  _   000000  000000000000000000000000  0   65/65/65 :
:                             :
: F3=Exit   F4=Prompt       :
:-----:

```

Window Options Editor

In this step you will reduce the dimensions of the Select Horse window so that it just surrounds all remaining fields as part of the device design. You can access the Window Options Editor from the function title. Position the cursor on the function title.

```

.....
:                                     Select Horse
: Horse
: code
: _____
:
: 1=Select
:
: Opt   Horse   Horse           Horse   Date of
: code  code    name                gender  birth
: -    -    -    -                -    -
: 000000 000000000000000000000000 0 66/65/66
: 000000 000000000000000000000000 0 66/65/66
: 000000 000000000000000000000000 0 66/65/66
: 000000 000000000000000000000000 0 66/65/66
: 000000 000000000000000000000000 0 66/65/66
: 000000 000000000000000000000000 0 66/65/66
: 000000 000000000000000000000000 0 66/65/66
: 000000 000000000000000000000000 0 66/65/66
:
: F3=Exit  F4=Prompt
:
: .....

```

Press Enter.

The Edit Function's Window Options panel contains the parameters that control the size and location of a window on a panel. You can change the default values and value limits for the window depth, width, and position as needed. In this tutorial, you will modify the depth and width of the window.

Changing Window Dimensions

Change the width and depth of the window to include just the fields on the device design. You can feel free to experiment by trying several combinations until you achieve a panel layout that meets your needs. For this tutorial, change the window so that the depth is 17 and the width is 62.

```

EDIT FUNCTION'S WINDOW OPTIONS      My model
File Name . . . . : Horse
Function name . . : Select Horse

Size. . . . :-
  Depth. . . . . : 17 5-22
  Width. . . . . : 62 5-76

Location. . . . . : A A=*Auto, U=*User

Position corner at:-
  Row. . . . . : 1 1-21
  Column . . . . : 1 1-74
  Corner to be positioned. . . . : TL TL, TR, BL, BR

F3=Exit
    
```

Press Enter and press F3 to return to the Device Design Editor.

Completed Device Design

When you return to the Device Design Editor, the window's borders should surround all of the fields. The device design for the Select Horse window is now complete.

```

.....
: Select Horse :
: Horse :
: code :
: _____ :
: :
: I=Select :
: :
: Opt Horse Horse Horse Date of :
: code name gender birth :
: _ 000000 000000000000000000000000 0 66/66/66 :
: _ 000000 000000000000000000000000 0 66/66/66 :
: _ 000000 000000000000000000000000 0 66/66/66 :
: :
: F3=Exit F4=Prompt :
: :
: .....
    
```

To exit the Device Design Editor, press F3.

```

EDIT FUNCTION DEVICES                                My model
Function name. . . : Select Horse                    Type : Select record
Received by file : Horse                             Acpth: Retrieval index

? Title
Screen title..... Select Horse

SEL: Z-Scr/rpt design, N-Narrative, A-Animate
F3=Exit F5=Action diagram F15=Open Functions

```

Exiting the Device Design

Exit this function the same way as you exited from the Edit Horse function. Press F3 to return to the Exit Function Definition panel.

```

EXIT FUNCTION DEFINITION                            My model
Type choices, press Enter.
Change/create function. . . . Y                    Y=Yes, N=No
Function name . . . . . Select Horse                Name
Access path name. . . . . Retrieval index           Name
File name . . . . . Horse                          Name
Function type . . . . . Select record

Print function. . . . . N                            Y=Yes, N=No
Return to editing . . . . . N                       Y=Yes, N=No
Submit generation . . . . . N                       Y=Yes, N=No

F5=Refresh F12=Cancel F15=Open Functions

```

To save the function, accept the default of Y and press Enter. After your device design is saved, you will be returned to the Edit Function panel.

Exercises

Before continuing with the rest of the tutorial, complete the following exercises.

1. Create the default functions for the RACE and JOCKEY files as you did for the COURSE and HORSE files. You will create the default functions for RACE ENTRY later in this chapter.

Note: Remember that CA 2E automatically creates the default functions for a file the first time you type **F** against any relation for the file on the Edit Database Relations panel.

2. Check the device design for each of the following external functions to improve its appearance and to ensure that the device design does not exceed the size of the panel: Edit Course, Select Course, Edit Race, Select Race, Edit Jockey, Select Jockey, Select Stallions, and Select Mares. Note that a device design that exceeds the size of the panel will cause errors when you generate the functions in the *Generating, Compiling, and Executing* chapter.

Note: You access the device design for a function by typing **S** against it on the Edit Functions panel or by pressing F9 from the Edit Function Details panel. To edit the device design, use the function keys you just used to edit the device designs for the Edit Horse and Select Horse functions. Press Help or refer to the table earlier in this topic for a list of function keys.

Action Diagrams

This topic introduces action diagrams and the CA 2E Action Diagram Editor.

New terms introduced:

- CA 2E action diagram
- Action diagram action
- Sequential construct
- Iterative construct
- Conditional construct
- Hidden construct
- User point
- Context
- CA 2E message function
- CA 2E function parameter

New panels introduced:

- Edit Action Diagram
- Edit Action Condition
- Edit Action
- Edit Message Function
- Edit Function Parameters
- Edit Message Function Details

Overview of Action Diagrams

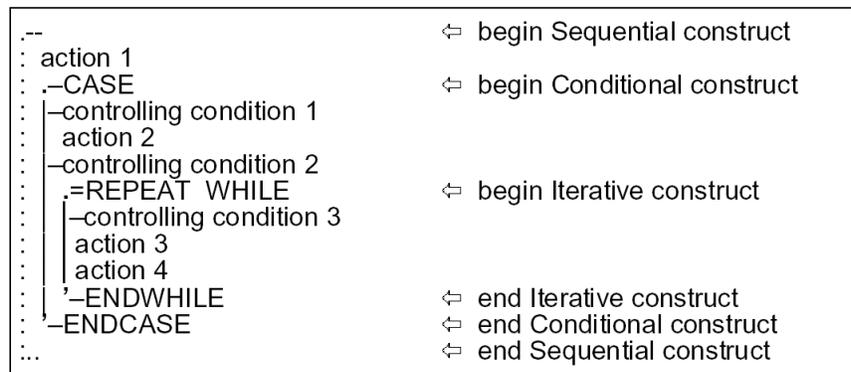
An *action diagram* contains the processing steps that make up a function. Each action diagram consists of a list of *actions*, where each action may be either a call to another function or one of a number of low level built-in functions; for example, *ADD.

The sequence in which actions are executed is controlled by three simple constructs: sequential, conditional, and iterative. The constructs specify a list of actions, and optionally, when and how to execute those actions. Constructs are the basic building blocks of an action diagram. They are always executed from top to bottom. In addition, constructs may be nested; in other words, an action within a construct may be another construct.

Following are brief descriptions of each of the three constructs and the way in which each is shown on the action diagram. Refer to the diagram following these descriptions as you read.

- **Sequential construct**—A sequential construct is the simplest construct. It is a list of actions or other constructs to be executed in the order in which they appear in the action diagram. It is shown on the action diagram enclosed by a bracket of dots (:).
- **Conditional construct**—A conditional construct specifies a condition and a series of actions to be taken if the condition is true. It is equivalent to an IF THEN ELSE logic statement or a SELECT set. This construct appears on the action diagram between CASE and ENDCASE statements and is enclosed by a bracket of broken vertical bars (|). You can specify several mutually exclusive conditions in a single conditional construct.
- **Iterative construct**—An iterative construct includes a list of actions that are to be executed while an initial condition is true. It is equivalent to a DO WHILE logic statement. An iterative construct appears on the action diagram between REPEAT WHILE and ENDWHILE statements. It is indented and enclosed by a bracket of solid vertical bars (|). The controlling condition is specified at the beginning of the bracket.

The following diagram shows the general structure of a CA 2E action diagram and the three constructs.



Default Action Diagram

CA 2E supplies a default action diagram for each function. In this step you will view and edit the default action diagram for the Edit Horse function.

From the Edit Function panel type **F** in the Subfile selector for the Edit Horse function.

EDIT FUNCTIONS		My model	** 1ST LEVEL **
File name. . . : Horse			
? Function	Function type		Access path
- Change Horse	Change object		Update index
- Create Horse	Create object		Update index
- Delete Horse	Delete object		Update index
F Edit Horse	Edit file		Retrieval index
█ Select Horse	Select record		Retrieval index
- Select Mares	Select record		Mares
- Select Stallions	Select record		Stallions
-			
-			
-			
-			
-			
-			
-			
-			
-			
			More...
SEL: 2-Details, P-Parms, F-Action diagram, S-Device design, N-Narr, O-Open, T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock. F3=Exit F5=Reload F7=File details F9=Add functions F17=Services			

Press Enter to view the action diagram for the Edit Horse function.

EDIT ACTION DIAGRAM		Edit	MYMDL	Horse
FIND=>				
█	> Edit Horse			Edit Horse

	...Initialize			<--
	...=REPEAT WHILE			
	...- *ALWAYS			
	...Load first subfile page			<--
	PGM.*Reload subfile = CHD.*NO			
	> Conduct screen conversation			
	...=REPEAT WHILE			
	...-PGM.*Reload subfile is *NO			
	...Display screen			
	...Process response			<--
	...-ENDWHILE			
	...-ENDWHILE			
	...Closedown			<--

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys				

The Action Diagram Editor's Subfile selector provides options for editing an action diagram, including options for inserting and manipulating user-defined actions. This topic demonstrates many of these options. You can type **?** in the Subfile selector to view a list of all allowed values.

Hidden Constructs and User Points

The action diagram is initially shown at a summary level, with many *hidden constructs*. This allows you to see the entire action diagram in outline form on a single panel. The names of hidden constructs are preceded by three dots (for example, ...Initialize). The name of a complete construct is preceded by an angle bracket (for example, >Edit Horse).

You can alter or add to the default processing by editing the action diagram. Only certain parts of the action diagram may be altered. The areas that you can modify are called *user points* and are indicated by an angle bracket (<—) in the right margin of the panel. The rest of the default action diagram is protected to ensure that you do not accidentally change essential function processing.

You can display a selection list of all the user points for a function by pressing F5. You will use this feature later in this tutorial.

Within a user point, each user-defined action is indicated by three chevrons (<<<) in the right margin of the panel. In addition, if you press F5 to view the list of all user points, user points containing user-defined actions are indicated by three chevrons in the right margin.

Edit Horse Action Diagram

Apart from initialization, the action diagram for the Edit Horse function consists essentially of an iteration of two steps. The first step displays a panel to the user. The second processes the response that is entered. We will examine the second step in more detail. It includes validation and update processing.

The basic validation the default Edit Horse function performs is derived from the definition of the HORSE file relations, fields, and conditions you specified in the data model. In this tutorial, you will add extra validation routines to check that a horse is younger than its parents. To do this, you will need to find the relevant part of the action diagram to edit.

Displaying Hidden Constructs in a Action Diagram

You can view the contents of a hidden construct by typing **S** (show) against any line indicated by three dots (...) and pressing Enter. This expands the selected hidden construct. Note that when you expand a hidden construct the three dots change to > to indicate that the entire construct is displayed. You can hide the construct again with a Subfile selector value of **H** (hide).

When hidden constructs are displayed, the whole action diagram occupies more than one panel. To simplify editing an action diagram, you can display hidden constructs individually by typing **Z** (zoom) in the Subfile selector. You will use this in the next step.

As you will see in the following steps you can zoom into hidden constructs at continually deeper levels of the action diagram. At any point you can reverse the effect of the last **Z** you typed by typing **U** (unzoom) in the Subfile selector. To return to the topmost level, type **T** (top) in the Subfile selector.

Adding Extra Validation to Edit Horse

To add extra validation conditions to the Edit Horse function, you must access the part of the action diagram that processes the data keyed into the displayed subfile page. This is the hidden ...Process response construct. Note the arrow in the right margin (<--). This indicates that this construct contains one or more user points where you can add user-defined validation.

To display this construct, type **Z** against ...Process response.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse
___ > Edit Horse
___ .---
___ . ...Initialize <--
___ . .REPEAT WHILE
___ . .-ALWAYS
___ .   ...Load first subfile page <--
___ .   PGM.*Reload subfile = CND.*NO
___ .   > Conduct screen conversation
___ .   .REPEAT WHILE
___ .   | -PGM.*Reload subfile is *NO
___ .   |   Display screen
___ .   |   ...Process response <--
___ .   |   -ENDWHILE
___ .   -ENDWHILE
___ .   ...Closedown <--
___ . ---
___ . ---

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter.

The Process Response Construct

The Process response construct is now displayed. It is made up of four mutually exclusive actions based on which function key was pressed. For example, the Exit key exits the program, the Next page key loads another subfile page, and the Reset key reloads the subfile page to process the input data. In this case, you will zoom into the hidden ...Process screen construct.

Type **Z** against ...Process screen.

```
EDIT ACTION DIAGRAM      Edit      MYMDL      Horse
FIND=>
-----
> Process response
.-CASE
.-CTL.*CMD key is *Exit
...Exit program
.-CTL.*CMD key is *Next page
...Load next subfile page ==>
.-CTL.*CMD key is *Reset
PGM.*Reload subfile = CHD.*YES
.-CTL.*CMD key is *Help
...Process help request
.-*OTHERWISE
Z  ...Process screen      <--
.-ENDCASE

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
```

Press Enter.

The Process Screen Construct

The device design for the Edit Horse function is made up of two parts: a subfile control format and a repeating subfile record format. Default processing for this function involves validation of the subfile control and subfile record before updating the database file.

Zoom into the ...Validate subfile construct by typing **Z** against it.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > Process screen
___ .--
___ . ...Validate subfile control <--
___ <--QUIT if errors
___ Z . ...Validate subfile <--
___ <--QUIT if errors
___ . Display confirm prompt
___ . -CASE
___ . | -PGH.*CONFIRM is Do not confirm
___ . | <--QUIT
___ . | -ENDCASE
___ . ...Update DBF from subfile <--
___ . <--QUIT if errors
___ . Request subfile reload if necessary
___ . ...Process function keys <--
___ . --

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter.

The Validate Subfile Record Construct

Note the hidden ...Validate subfile record construct that results when you expanded the ...Validate subfile construct. Validation of subfile record input is carried out on any subfile records that have been changed by the end user. Subfile record fields and relations are automatically validated according to the specifications declared in the design process. This is summarized as follows:

- Fields must satisfy their data types; for example,
Date of birth must be a valid date.
Horse value must be numeric. Note that zero is valid because it is an optional relation.
Horse name must be present and lower case is valid.
- Fields must satisfy any check conditions; for example,
Horse gender must be male (M) or female (F).
- Any file-to-file relationships must be satisfied; for example,
Dam code, if specified, must be the code of a valid horse. In addition, the horse must be female because the HORSE Refers to HORSE For Dam relation uses the Mares access path that selects female horses only.
Sire code, if specified, must be the code of a valid horse. The horse must be male because the HORSE Refers to HORSE For Sire relation uses the Stallions access path that selects male horses only.

Type Z against ...Validate subfile record.

```
EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse
-----
> Validate subfile
---
. ---
. . Read first changed subfile record
. . .REPEAT WHILE
. . | -Changed subfile record found
2 | . . .Validate subfile record          <--
. . | <--QUIT if errors
. . | Update subfile record
. . | Read next changed subfile record
. . | -ENDWHILE
. . ---
. . ---
. . ---

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
```

Press Enter.

Adding a Validation Procedure

In this step you will use the action diagram editor to add your own validation procedure. Add the procedure to the USER: Validate subfile record relations user point.

Type **Z** against ...USER: Validate subfile record relations.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse
___ > Validate subfile record
___ .:
___ . Check fields
___ . <--QUIT if errors
___ . ...USER: Validate subfile record fields <--
___ . <--QUIT if errors
___ . Check relations
___ . <--QUIT if errors
___ . ...CALC: Subfile record function fields <--
Z  . ...USER: Validate subfile record relations <--
___ .:
___ .:

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse
___ > USER: Validate subfile record relations <<<
___ .:
___ .:

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Subfile Record Relations

The three chevrons (<<<) in the right margin of the panel indicate that you may add your own processing at this point.

Editing the Action Diagram

This topic describes some of the Subfile selector values available for editing an action diagram. You can type ? in the Subfile selector to view a selection list of all values. Note that these Subfile selector values are sometimes referred to as *commands*.

Most of the Subfile selector values shown here will be demonstrated in this and the following topics. To learn about additional features of the Action Diagram Editor, refer to the online Help or the CA 2E guide, *Building Applications*.

Showing and hiding hidden constructs—These Subfile selector values were covered previously in this topic; this is just a review. To display a hidden construct individually use **Z** (zoom). To reverse the effect of the last **Z** you typed, use **U** (unzoom); to return to the topmost level, use **T** (top).

To hide a low level construct, use **H** (hide). The value **H** is generally used to simplify an action diagram display so it is easier to follow. To view the contents of a hidden construct, use the value **S** (show).

Inserting new constructs—Use the following Subfile selector values to add new constructs to an action diagram:

Subfile Selector Value	Inserts
IA	An action
IS	A sequence of actions (Sequence construct)
II	An iteration loop (Iterative construct)
IC	A case condition (Case construct)
IX	A new condition within a Case construct

The new construct starts on the line following the one on which the insertion was specified. Inserted constructs are initially defined in general terms. For example:

```

.-CASE
| -!!! New condition
|   !!! Undetermined action
' -ENDCASE
    
```

This is a generic definition of a conditional construct; where, **!!!** New condition indicates a conditional statement and **!!!** Undertermined action indicates the action to be performed if the condition is true. You can use these general structures to check the program logic. After you are sure the logic is correct, you can specify the details of the conditions and actions.

Fast paths for inserting actions—The following Subfile selector values provide fast paths that you can use to enter various actions.

Subfile Selector Value	Inserts
I*	A comment
I+	An *ADD built-in function
I-	A *SUB built-in function
I=	A *MOVE built-in function
IM	A Message function

Entering construct details—You can take an additional fast path to defining the details for any of the fast path constructs/actions by appending **F** to the Subfile selector value (for example, **IAF**). Including the **F** causes CA 2E to display the appropriate panel where you enter details for the construct or action.

Moving and copying constructs—To move or copy a construct, type **M** or **C** in the Subfile selector of the selected construct. Type **A** (after) on the line above the location in the action diagram to which you want to move or copy the construct. The construct will be placed After this line. Alternatively, you can type **B** (before) on the line below the target location. The construct will be placed Before this line.

You can also move or copy a block of constructs using the **MM** (move block) or **CC** (copy block) commands. These commands are used in pairs; for example, type **MM** on the first line in the block to be moved and type another **MM** on the last line of the block to be moved. The entire block must be at the same construct level as indicated by the action diagram indentations. Use **A** (after) or **B** (before) as for the **M** and **C** commands.

Note: CA 2E provides a Notepad utility that lets you copy constructs from one action diagram to another. The Notepad is a temporary action diagram that serves as a work area where you can copy and append constructs from the current action diagram. Press F18 to toggle between the action diagram and the Notepad.

Deleting constructs—To delete a construct, type **D** against the first line of the construct. You can also use a pair of **DD**'s to delete a block of constructs at the same construct level.

Inserting a Single Action

An empty CASE construct has been inserted in the action diagram. The CASE construct by itself only specifies the condition and not the action that is to be taken if the condition is satisfied. You will now add this action.

In this case, you only require a single action. As a result, type **IA** (Insert action).

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

--- > USER: Validate subfile record relations
--- .--
--- .-CASE
IA .-!!! New condition
--- .-ENDCASE
--- .--

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter to insert the new action.

Note: If you wanted more than one action to result from the condition, you could add more actions using the **IA** option repeatedly or by inserting a sequence construct using the **IS** option.

The logic of the action diagram for the first validation is now complete.

Adding Another Condition by Copying

In this step you will add a second condition to validate a horse's date of birth with respect to that of its Sire. You can use the same process you used in the previous step or you can copy the first construct. In this case you will copy the first construct.

Type **A** on the line above the location where you want the construct copied; type **C** next to the first line of the construct you want to copy.

```
EDIT ACTION DIAGRAM      Edit      MYMDL      Horse
FIND=>                   Edit Horse

_____ > USER: Validate subfile record relations
A _____ .-->                                     <<<
C _____ .-CASE                                     <<<
_____ .-!!! New condition                             <<<
_____ .-!!! Undetermined action                       <<<
_____ .-ENDCASE                                       <<<
_____ .-->

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

Press Enter.

Specifying Details of Conditions

Now that both case conditions have been added, you are ready to specify the details of the conditions and actions. In this step you will specify the details of the condition: Is the dam's date of birth greater than or equal to that of the horse. You will specify the action to send an error message later.

First you will specify the controlling condition for the first !!! Undetermined action. Type **F** against the first condition as shown to edit that line of the action diagram.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate subfile record relations
___ .---
___ .-CASE
F  .-!!! New condition
___ .-!!! Undetermined action
___ .-ENDCASE
___ .-CASE
___ .-!!! New condition
___ .-!!! Undetermined action
___ .-ENDCASE
___ .---

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter to display the Edit Action - Condition window.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate
___ .---
___ .-CASE
F  .-!!! New condi
___ .-!!! Undetermi
___ .-ENDCASE
___ .-CASE
___ .-!!! New condi
___ .-!!! Undetermi
___ .-ENDCASE
___ .---

EDIT ACTION - CONDITION
Title. : !!! New condition
Context.Field . . . : 2 ?
Condition . . . . . : ?
OR
Comparison. . . . . :
Context.Field . . . :
F3=Exit F7=Edit Compound Condition

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

The Edit Action Condition Window

The Edit Action - Condition window lets you enter the terms of the condition that you require. Type the name of the field to be evaluated and either the condition it must satisfy or the name of another field to compare it to.

If you type ? in any field on this panel, other than the Comparison field, CA 2E displays a list of possible values.

Contexts

Within a function there are several possible sources for a field's value; for example, a field may be found on the panel display, in a database file, or as an entry parameter. A CA 2E *context* specifies which source of a particular field to use. Different contexts are available at different points in a function's action diagram.

A context is identified by a three-character mnemonic; for example, CTL - subfile control, RCD - subfile record, CON - constant data, and PAR - entry parameter. This mnemonic is prefixed to each field used in an action diagram to show the source of the field. For example, RCD.Date of birth means that the value of the Date of birth field displayed in the subfile record is to be used in the action diagram.

When you enter ? to view a list of possible contexts, the most sensible context appears at the top of the selection list.

Adding Details of the First Condition

In this step, you will test that a horse is younger than its dam; in other words, you will test whether the Dam Date of birth is greater than or equal to the horse's Date of birth. Since dates of field type DT# are stored as an alphanumeric, YYYY-MM-DD, you can do a direct comparison of these dates.

To express the condition, you will use the GE (greater than or equal) comparison operator. The basic question that needs to be asked is:

Is Dam Date of birth GE Date of birth?

If this condition is true, display an error message; if the condition is false, continue to the next action.

Note that when you add this condition to the action diagram for Edit Horse, the context for both fields in the comparison will be RCD since they are both from the subfile record.

Type the details of the comparison as shown; namely, type **RCD** and **Dam Date of birth** for the first context and field of the condition, blank the Condition field, and type **RCD** and **Date of birth** for the second context and field.

```

EDIT ACTION DIAGRAM          Edit  MYMDL  Horse
FIND=>                        Edit Horse
____ > USER: Validate      EDIT ACTION - CONDITION
____ . . . . .              Title. : !!! New condition
____ . . . . .-CASE        Context.Field . . . : RCD Dam Date of birth
____ F . . . . .-!!! New condi  Condition . . . . .
____ . . . . .-!!! Undetermi  OR
____ . . . . .-ENDCASE        Comparison. . . . . : GE
____ . . . . .-CASE          Context.Field . . . : RCD Date of birth
____ . . . . .-!!! New condi
____ . . . . .-!!! Undetermi
____ . . . . .-ENDCASE
____ . . . . .-
____ . . . . .F3=Exit  F7=Edit Compound Condition

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter to return to the action diagram.

Adding the Second Condition

Notice that the test for the condition has been updated. You are now ready to edit the second condition. To edit the second condition, type **F** against **!!! New condition**.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate subfile record relations
___ .--
___ .-CASE
___ .-RCD.Dam Date of birth GE RCD.Date of birth
___ .-!!! Undetermined action
___ .-ENDCASE
___ .-CASE
F  .-!!! New condition
___ .-!!! Undetermined action
___ .-ENDCASE
___ .--

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Press Enter.

Adding Details of the Second Condition

The second condition is similar to the first. In this case, you need to compare Sire Date of birth to Date of birth. Again, both fields have the RCD context since they are from the subfile record.

Type the comparison details as shown; namely, type **RCD** and **Sire Date of birth** for the first context and field of the condition, blank the Condition field, and type **RCD** and **Date of birth** for the second context and field.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate
___ .--
___ .-CASE
___ .-RCD.Dam Date
___ .-!!! Undetermi
___ .-ENDCASE
___ .-CASE
F  .-!!! New condi
___ .-!!! Undetermi
___ .-ENDCASE
___ .--

EDIT ACTION - CONDITION
Title : !!! New condition
Context.Field . . . : RCD Sire Date of birth
Condition . . . . .
OR
Comparison . . . . . : GE
Context.Field . . . : RCD Date of birth
F3=Exit F7=Edit Compound Condition

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Press Enter.

Adding Actions

In the following steps you will add two actions to display an error message at the bottom of the panel when either of the two conditions you just defined is true. This requires that you:

1. Define two message functions
2. Define parameters for the message functions
3. Change the text of the error messages to include the dates that caused the error using substitution variables
4. Select the message functions as the actions within the action diagram

Exiting the Action Diagram

There are two ways to define a message function; you will use both in this tutorial. The first requires that you exit the action diagram and return to the Edit Database Relations panel.

Press F13 to Exit the Action Diagram Editor and display the Exit Function Definition panel. Accept the defaults on this panel to save all changes you made to the action diagram.

Note: The F13 function key (Fast exit) provides a quick way to exit the action diagram. You can use F3, but it will take you back through the action diagram one level at a time.

EXIT FUNCTION DEFINITION		My model
Type choices, press Enter.		
Change/create function.	<u>Y</u>	Y=Yes, N=No
Function name	<u>Edit Horse</u>	Name
Access path name.	<u>Retrieval index</u>	Name
File name	<u>Horse</u>	Name
Function type	Edit file	
Print function.	<u>N</u>	Y=Yes, N=No
Return to editing	<u>N</u>	Y=Yes, N=No
Submit generation	<u>N</u>	Y=Yes, N=No
F5=Refresh F12=Cancel F15=Open Functions		

Press Enter to return to the Edit Functions panel.

The message "Function 'Edit Horse has been saved" displays at the bottom of the panel.

EDIT FUNCTIONS		My model	
File name. . . : Horse		** 1ST LEVEL **	
? Function	Function type	Access path	
- Change Horse	Change object	Update index	
- Create Horse	Create object	Update index	
- Delete Horse	Delete object	Update index	
█ Edit Horse	Edit file	Retrieval index	
- Select Horse	Select record	Retrieval index	
- Select Mares	Select record	Mares	
- Select Stallions	Select record	Stallions	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
More...			
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Marr, O-Open, T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock. F3=Exit F5=Reload F7=File details F9=Add functions F17=Services			

Press F3 to return to the Edit Database Relations panel.

EDIT DATABASE RELATIONS		My model		
=>	<u>Horse</u>	Rel lvl:		
? Typ	Object	Relation	Seq Typ	Referenced object
- FIL	Horse	Known by	10 FLD	Horse code
- FIL	Horse	Has	20 FLD	Horse name
- FIL	Horse	Has	30 FLD	Horse gender
- FIL	Horse	Has	40 FLD	Horse value
- FIL	Horse	Has	50 FLD	Date of birth
- FIL	Horse	Refers to	60 FIL	Horse
	For: Dam		Sharing: *ALL	
- FIL	Horse	Refers to	70 FIL	Horse
	For: Sire		Sharing: *ALL	
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
More...				
Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys				

Displaying the Message Functions

The Edit Message Functions panel displays a list of the message functions available on the file *Messages. A number of general purpose messages are supplied with CA 2E. The types of messages available include, ERR (Error message), INF (Information message), EXC (Execution message), and STS (Status message). You can scroll through the messages by pressing Roll Up and Roll Down.

You can select one of the messages displayed or you can create your own. To send an explicit message about a horse, you will need to create a new message.

```

EDIT MESSAGE FUNCTIONS                               My model
File . . . : *Messages                             Default msg file. . : QUSRMSG
                                                    Generation library. : MYGEN

Message
█                                                    <== Position

? Message                                           Type  Msgid   Ovr Msgf
- *Accelerator key error                          ERR  Y2U0029 Y2USRMSG
- *Action Bar API error                          ERR  Y2U0027 Y2USRMSG
- *Action Bar not found                          ERR  Y2U0028 Y2USRMSG
- *Array full-cannot add...                       ERR  Y2U0036 Y2USRMSG
- *Arrays                                         EX    ERR  Y2U0035 Y2USRMSG
- *Arrays                                         NF    ERR  Y2U0034 Y2USRMSG
- *CHECK(MF) validation msg                       ERR  Y2U0020 Y2USRMSG
- *Clearing status message                       STS  Y2U0041 Y2USRMSG
- *Configuration Table EX                        ERR  Y2U0048 Y2USRMSG
- *Configuration Table NF                        ERR  Y2U0047 Y2USRMSG
- *Confirm Connect to Nxt                        INF  Y2U0025 Y2USRMSG
- *Confirm Connect to Prv                       INF  Y2U0049 Y2USRMSG
- *Connect failed                               INF  Y2U0040 Y2USRMSG
SEL: Z-Details, P-Param, N-Harr, D-Delete, C-Copy, L-Locks, U-Where used.
F3=Exit F5=Reload F7=Change seq. F9=Add message F21=Convert messages
    
```

Adding a New Message Function

Press F9 to add a new message function that will be executed if Dam Date of birth is greater than or equal to Date of birth.

Name the message function Dam younger than horse. This is to be an error message so the type will be ERR. Type the message name.

```

EDIT MESSAGE FUNCTIONS                               My model
File . . . : *Messages                             Default msg file. . : QUSRMSG
                                                    Generation library. : MYGEN

Message
_____ <== Position

? Message                                           Type  Msgid   Ovr Msgf
- Dam younger than horse                          ERR
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
SEL: Z-Details, P-Param, N-Harr, D-Delete, C-Copy, L-Locks, U-Where used.
F3=Exit F5=Reload F7=Change seq. F9=Add message F21=Convert messages
    
```


Adding Text to the First Message

You will use the two parameters you just defined as substitution variables within the message text. Substitution variables are indicated by the symbol "&n", where 'n' is the number of the parameter. Note the numbers assigned to the two parameters in the No. column.

Add the text "&1 before &2" to indicate that the date of birth of the horse is prior or equal to the date of birth of the dam.

When the message appears on the panel, the value contained in that field will be substituted in the message text. For example, the resulting message might read: "Dam younger than horse (10185 before 11294)." Substitution variables help the end user understand which fields are in error.

Type the new text containing the substitution variables, "&1 before &2", after the default message text.

```
EDIT MESSAGE FUNCTION DETAILS          My Model
File name . . . : *Messages

Message . . . . : Dam younger than horse
Message type. . : ERR (INF,ERR,STS,CMP)
Message id. . . : USR0011      Override message file. : *LIBL
                               Default message file. : QUSRMSG  MYGEN

Severity. . . . : 20
Message text: Dam younger than horse (&1 before &2)

-----
Parameters . :
No.  Field                Type  Length
&1   Date of birth        DT#    6.0
&2   Dam Date of birth    REF    6.0

F3=Exit  F7=Second level text  F8=Change name
```

Press Enter to return to the Edit Message Functions panel.

Returning to the Edit Horse Action Diagram

In this step you will insert the action you just defined into the Edit Horse action diagram and define another message function as the action when the horse's date of birth is earlier than its sire's date of birth. This time you will define the message function from within the action diagram.

Press F3 to return to the Edit Database Relations panel. When the Edit Database Relations panel displays, type **Horse*** on the selection line and press Enter to display relations for the HORSE file.

EDIT DATABASE RELATIONS		My Model		
=>	Horse*	Rel lvl:		
?	Typ Object	Relation	Seq	Typ Referenced object
█	FIL Horse	Known by	10	FLD Horse code
—	FIL Horse	Has	20	FLD Horse name
—	FIL Horse	Has	30	FLD Horse gender
—	FIL Horse	Has	40	FLD Horse value
—	FIL Horse	Has	50	FLD Date of birth
—	FIL Horse	Refers to	60	FIL Horse
	For: Dam			Sharing: *ALL
—	FIL Horse	Refers to	70	FIL Horse
	For: Sire			Sharing: *ALL
—				
—				
—				
—				
—				
—				
				Bottom
Z(n)=Details		F=Functions	E(n)=Entries	S(n)=Select
F3=Exit		F5=Reload	F6=Hide/Show	F7=Fields
		F9=Add/Change	F24=More keys	

Type **F** against one of the relations and press Enter to display functions for the HORSE file. Type **F** against the Edit Horse function.

EDIT FUNCTIONS		My model	
File name. . . : Horse			** 1ST LEVEL **
?	Function	Function type	Access path
—	Change Horse	Change object	Update index
—	Create Horse	Create object	Update index
—	Delete Horse	Delete object	Update index
█	Edit Horse	Edit file	Retrieval index
—	Select Horse	Select record	Retrieval index
—	Select Mares	Select record	Mares
—	Select Stallions	Select record	Stallions
—			
—			
—			
—			
—			
—			
			More...
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Narr, O-Open,			
T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock.			
F3=Exit F5=Reload F7=File details F9=Add functions F17=Services			

Press Enter to display the Edit Horse action diagram.

```

EDIT ACTION DIAGRAM          Edit  MYMDL  Horse
FIND=>                        Edit Horse

█ > Edit Horse
--- ---
--- ...Initialize <--
--- . =REPEAT WHILE
--- . - *ALWAYS
--- . ...Load first subfile page <--
--- . PGM.*Reload subfile = CND.*NO
--- . > Conduct screen conversation
--- . . =REPEAT WHILE
--- . . | -PGM.*Reload subfile is *NO
--- . . | Display screen
--- . . | ...Process response <--
--- . . | -ENDWHILE
--- . . -ENDWHILE
--- . ...Closedown <--
--- ---

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Displaying User Points for Edit Horse

Recall that you added the two conditions and actions at the user point USER: Validate subfile record relations. To return to that user point quickly, press F5 to display a list of all user points for the Edit Horse function. If you wish, you can press Roll Up to view the additional user points.

Type X (or Z) against USER: Validate subfile record relations.

```

EDIT ACTION DIAGRAM          Edit  MYMDL  Horse
FIND=>                        Edit Horse

--- > Edit : ACTION DIAGRAM EXIT POINTS F3=Exit SEL:X,Z>Select.
--- --- : USER: Initialize program
--- . . .I : USER: Initialize subfile header <--
--- . =RE : USER: Initialize subfile record (existing record)
--- . - *A : USER: Initialize subfile record (new record) <--
--- . . . : CALC: Subfile control function fields
--- . PG : USER: Validate subfile control <--
--- . > : USER: Validate subfile record fields
--- . . = : CALC: Subfile record function fields
--- . . - : X USER: Validate subfile record relations + <<<
--- . . | ...Process response <--
--- . . | -ENDWHILE
--- . . -ENDWHILE
--- . ...Closedown <--
--- ---

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Press Enter.

Add Action for First Condition

Type **F** against the first !!! Undetermined action as shown.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>
___ > USER: Validate subfile record relations
___ .--
___ .-CASE
___ .-RCD.Dam Date of birth GE RCD.Date of birth
F .-!!! Undetermined action
___ .-ENDCASE
___ .-CASE
___ .-RCD.Sire Date of birth GE RCD.Date of birth
___ .-!!! Undetermined action
___ .-ENDCASE
___ .--
___

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter to display the Edit Action - Function Name window.

The Edit Action Function Name Panel

The Edit Action - Function Name window lets you specify the function to be called if the first CASE condition is satisfied.

Because all functions are associated with a file, when you specify a function you must give both a file and a function name. Functions can be divided into three groups:

- Functions attached to user-defined files. For example the Edit Horse function that you are currently editing.
- Functions attached to CA 2E shipped system files. For example, CA 2E user-defined message functions are attached to a system file called *Messages.
- Built-in shipped functions, which are also attached to CA 2E shipped system files. Such functions provide commonly required low level actions; for example, to manipulate fields. Some examples are, *ADD, *SUB, and *MOVE. If you do not specify a file name, CA 2E assumes you are referring to a built-in function.

Message Functions

Because you want to send the user-defined message you just defined, type ***Messages** for the Function file as shown and leave the **?** in the Function field.

```

EDIT ACTION DIAGRAM          Edit   MYMDL   Horse
FIND=>                        Edit Horse
-----
> USER: Validate subfile re  : EDIT ACTION - FUNCTION NAME
: Function file : *Messages
: Function. . . : ?
: Comment . . . :
-----
.-CASE
.-RCD.Dam Date of birth G   :
F . . . !!! Undetermined action : F3=Exit
.-ENDCASE
.-CASE
.-RCD.Sire Date of birth   :
: . . . !!! Undetermined action :
.-ENDCASE
-----
<<<

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Press Enter.

Displaying the Message Functions

The Edit Message Functions panel displays a list of the message functions available on the file ***Messages**. Type **D** in the positioner field at the top of the panel as shown to position to the Dam younger than horse message function you just defined.

```

EDIT MESSAGE FUNCTIONS          My model
File . . . : *Messages          Default msg file. . : QUSRMSG
                                Generation library. : MYGEN
-----
Message
D                               <== Position
-----
? Message                        Type Msgid   Ovr Msgf
- *Accelerator key error         ERR Y2U0029 Y2USRMSG
- *Action Bar API error          ERR Y2U0027 Y2USRMSG
- *Action Bar not found          ERR Y2U0028 Y2USRMSG
- *Array full-cannot add...      ERR Y2U0036 Y2USRMSG
- *Arrays                        EX  ERR Y2U0035 Y2USRMSG
- *Arrays                        HF  ERR Y2U0034 Y2USRMSG
- *CHECK(MF) validation msg      ERR Y2U0020 Y2USRMSG
- *Clearing status message       STS Y2U0041 Y2USRMSG
- *Configuration Table           EX  ERR Y2U0048 Y2USRMSG
- *Configuration Table           HF  ERR Y2U0047 Y2USRMSG
- *Confirm Connect to Hxt        INF Y2U0025 Y2USRMSG
- *Confirm Connect to Prv        INF Y2U0049 Y2USRMSG
- *Connect failed                INF Y2U0040 Y2USRMSG
-----
SEL: Z=Details, P=Param, H=Harr, D=Delete, C=Copy, L=Locks, U=Usage, X=Select.
F3=Exit F5=Reload F7=Change seq. F9=Add message F21=Convert messages
    
```

Press Enter.

Defining the Second Action

In this step you will define the message function to be called when the sire is younger than the horse. The entire process will take place within the action diagram. Note that you could have defined both message functions in this way.

Type **F** against the second **!!! Undetermined action**.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate subfile record relations
___ .-.-
___ .-.-CASE
___ .-.-RCD.Dam Date of birth GE RCD.Date of birth
___ .-.-Send error message - 'Dam younger than horse'
___ .-.-ENDCASE
___ .-.-CASE
___ .-.-RCD.Sire Date of birth GE RCD.Date of birth
F  .-.-!!! Undetermined action
___ .-.-ENDCASE
___ .-.-

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter. A blank Edit Action - Function Name window displays as before. Type ***Messages** for the Function file field as shown. Leave the **?** in the Function name field.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate subfile re : EDIT ACTION - FUNCTION NAME
___ .-.-CASE : Function file : *Messages
___ .-.-RCD.Dam Date of birth G : Function. . . : ?
___ .-.-Send error message - 'D : Comment . . . :
___ .-.-ENDCASE : F3=Exit F22=File Locks
___ .-.-CASE
___ .-.-RCD.Sire Date of birth
F  .-.-!!! Undetermined action
___ .-.-ENDCASE
___ .-.-

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter.

Adding the Second Message Function

All message functions attached to the *Messages file are displayed. You will now create a new message function to be executed if Sire Date of birth is greater than or equal to Date of birth as you did for the first message function.

```

EDIT MESSAGE FUNCTIONS                               My model
File . . . : *Messages                             Default msg file. . : QUSRMSG
                                                    Generation library. : MYGEN

Message
|_____ <== Position

? Message      Type  Msgid   Ovr Msgf
- *Accelerator key error  ERR  Y2U0029 Y2USRMSG
- *Action Bar API error  ERR  Y2U0027 Y2USRMSG
- *Action Bar not found  ERR  Y2U0028 Y2USRMSG
- *Array full-cannot add... ERR  Y2U0036 Y2USRMSG
- *Arrays              EX  ERR  Y2U0035 Y2USRMSG
- *Arrays              NF  ERR  Y2U0034 Y2USRMSG
- *CHECK(HF) validation msg  ERR  Y2U0020 Y2USRMSG
- *Clearing status message  STS  Y2U0041 Y2USRMSG
- *Configuration Table  EX  ERR  Y2U0048 Y2USRMSG
- *Configuration Table  NF  ERR  Y2U0047 Y2USRMSG
- *Confirm Connect to Nxt  INF  Y2U0025 Y2USRMSG
- *Confirm Connect to Prv  INF  Y2U0049 Y2USRMSG
- *Connect failed        INF  Y2U0040 Y2USRMSG
+
SEL: Z-Details, P-Param, N-Harr, D-Delete, C-Copy, L-Locks, U-Usage, X-Select.
F3=Exit F5=Reload F7=Change seq. F9=Add message F21=Convert messages
    
```

Press F9 to add the new message.

Details of the Second Message Function

To define the second message function you need to specify a function name and a function type as you did for the first message function. Name the message function **Sire younger than horse**. The type will be **ERR**. Type the message name and type.

```

EDIT MESSAGE FUNCTIONS                               My model
File . . . : *Messages                             Default msg file. . : QUSRMSG
                                                    Generation library. : MYGEN

Message
|_____ <== Position

? Message      Type  Msgid   Ovr Msgf
- Sire younger than horse  ERR
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
+
SEL: Z-Details, P-Param, N-Harr, D-Delete, C-Copy, L-Locks, U-Usage, X-Select.
F3=Exit F5=Reload F7=Change seq. F9=Add message F21=Convert messages
    
```

Press Enter.

The second message function has now been added to the *Messages file.

Defining Parameters for the Second Message Function

Parameters define the values to be communicated between functions at execution time. As before the objective is to include the date that caused the error in the text of the error message.

Define the parameters for the second message function in the same way as you did for the first message function. Type **P** next to the message function.

```

EDIT MESSAGE FUNCTIONS                               My model
File . . . : *Messages                             Default msg file. . : QUSRMSG
                                                    Generation library. : MYGEN

Message
_____ <== Position

? Message                                           Type  Msgid   Ovr Msgf
P Sire younger than horse                          ERR   USR0012

_____
_____
_____
_____
_____
_____
_____
_____

SEL: Z-Details, P-Param, N-Attr, D-Delete, C-Copy, L-Locks, U-Where used.
F3=Exit F5=Reload F7=Change seq. F9=Add message F21=Convert messages
  
```

Press Enter to display the Edit Function Parameters panel. Type the message function parameters as shown.

```

EDIT FUNCTION PARAMETERS                             My model
Function name. . : Sire younger than horse          Type : Send error message
Received by file : *Messages                       Acpth:

? File/*FIELD                                     Access path/Field   Passed
- *FIELD                                           Date of birth       as   Seq
- *FIELD                                           Sire Date of birth  FLD  █
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Values
FLD: One parameter per field
RCD: One parameter for all fields
KEY: One parameter for key fields only

SEL: Z-Details (field selection).
F3=Exit F5=Reload
  
```

Press Enter to confirm. Press F3 to return to the Edit Message Functions panel.

Completed Action Diagram

The USER: Validate subfile record relations construct is now complete.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>
_____
> USER: Validate subfile record relations
_____
.-.-
.-.-CASE                      <<<
.-.-RCD.Dam Date of birth GE RCD.Date of birth <<<
.-.-Send error message - 'Dam younger than horse' <<<
.-.-ENDCASE                    <<<
.-.-CASE                      <<<
.-.-RCD.Sire Date of birth GE RCD.Date of birth <<<
.-.-Send error message - 'Sire younger than horse' <<<
.-.-ENDCASE                    <<<
_____
_____

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
    
```

Exiting the Action Diagram

Press F13 (Fast exit) to Exit the Action Diagram Editor and display the Exit Function Definition panel. Accept the defaults on this panel to save all changes you made to the action diagram.

```

EXIT FUNCTION DEFINITION          My model
Type choices, press Enter.
Change/create function. . . . Y          Y=Yes, N=No
Function name . . . . . Edit Horse       Name
Access path name. . . . . Retrieval index Name
File name . . . . . Horse              Name
Function type . . . . . Edit file

Print function. . . . . N              Y=Yes, N=No
Return to editing . . . . . N          Y=Yes, N=No
Submit generation . . . . . N         Y=Yes, N=No

F5=Refresh  F12=Cancel  F15=Open Functions
    
```

Press Enter to return to the Edit Functions panel.

The message "Function 'Edit Horse has been saved" displays at the bottom of the panel.

EDIT FUNCTIONS		My model	** 1ST LEVEL **
File name. . . : Horse			
? Function	Function type		Access path
- Change Horse	Change object		Update index
- Create Horse	Create object		Update index
- Delete Horse	Delete object		Update index
█ Edit Horse	Edit file		Retrieval index
- Select Horse	Select record		Retrieval index
- Select Mares	Select record		Mares
- Select Stallions	Select record		Stallions
-			
-			
-			
-			
-			
-			
-			
			Note...
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Narr, O-Open,			
T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock.			
F3=Exit F5=Reload F7=File details F9=Add functions F17=Services			
Function 'Edit Horse' has been saved.			

Function Options

This topic discusses how to change the function options for a function.

New term introduced:

- Function Option

New panel introduced:

- Edit Function Options

Objectives

In this topic you will remove the capability to delete records from the Edit Horse function and change the default confirm prompt to Y.

Accessing the Function Options Panel

From the Edit Functions panel, type **Z** against the Edit Horse function.

```

EDIT FUNCTIONS                               My model
File name. . . : Horse                       ** 1ST LEVEL **
? Function                                     Function type       Access path
- Change Horse                               Change object        Update index
- Create Horse                               Create object        Update index
- Delete Horse                               Delete object        Update index
Z Edit Horse                                 Edit file            Retrieval index
█ Select Horse                               Select record        Retrieval index
- Select Mares                               Select record        Mares
- Select Stallions                           Select record        Stallions
-
-
-
-
-
-
-
-
-
-
More...
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, M-Marr, O-Open,
T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock.
F3=Exit F5=Reload F7=File details F9=Add functions F17=Services
Function 'Edit Horse' has been saved.
    
```

Press Enter to display the Edit Function Details panel.

```

EDIT FUNCTION DETAILS                         My model
Function name . . : Edit Horse                 Type : Edit file
Received by file. : Horse                     Acpth: Retrieval index
Workstation . . . : NPT
Source library. . : MYGEN

Object Source Target
? Type Name HLL Text
█ PGM MYAHEFR RPG Edit Horse Edit file
- DSP MYAHEFRD DDS Edit Horse Edit file
- HLP MYAHEFRH UIM Edit Horse Edit file

SEL: E-STRSEU, O-Compiler Overrides.
F3=Exit F7=Options F8=Change name F9=Scr/rpt layout F20=Narrative
    
```

Default Function Options

To view the function options for Edit Horse, press F7. The Edit Function Options panel gives you a simple means of modifying certain aspects of the behavior of a function. The actual function options available and their defaults depend on the function type. In this step you will change the two following function options for the Edit Horse function.

Delete record

This option specifies whether you can delete database records. The default is Y, which means you can delete database records. If you change this value to N, the function code will not include logic to delete database records.

Confirm prompt

The Confirm prompt option specifies whether the Edit Horse function prompts for confirmation before updating the database files. The default is Y.

If the Confirm prompt option is Y, a related option, Initially "Yes", specifies whether the default for the confirm prompt will be Y or N.

Note: When the default value for a function option is M, it means that the function option's default value depends on the setting of a model value. The current setting of the model value is shown highlighted or underlined.

Changing Function Options

From the Edit Function Options panel for the Edit Horse function, change the value for the Delete record option to N. Change the initial value of the confirm prompt by typing Y for Initially 'Yes'.

```

EDIT FUNCTION OPTIONS                               My model
Function name . . . : Edit Horse                    Type : Edit file
Received by file. . : Horse                         Acpth: Retrieval index
Header/Footer . . . : *STD CUA ACTION BAR          <-Implicitly set by mdl default

OPTION          SEL  VALID VALUES
Create record . . . . . : Y  ( Y-Yes, N-No )
Change record . . . . . : Y  ( Y-Yes, N-No )
Delete record . . . . . : N  ( Y-Yes, N-No )
Dynamic program mode. . . . . : N  ( Y-Yes, N-No )
Subfile selection . . . . . : Y  ( Y-Yes, N-No )
Confirm Prompt. . . . . : Y  ( Y-Yes, N-No )
Initially "Yes" . . . . . : Y  ( M-MDLVAL, Y-Yes, N-No )
Commit control. . . . . : N  ( M-Master, S-Slave, N-None )
If action bar, what type? . . . : M  ( M-MDLVAL, A-Action bar, D-DDS-menubar )
Generation mode . . . . . : A  ( M-MDLVAL, D-DDS, S-SQL, A-ACPVAL)
                                           More...

F3=Exit  F5=Select header/footer  F10=All options

```

Press Enter to return to the Edit Function Details panel.

```
EDIT FUNCTION DETAILS                               My model
Function name . . . : Edit Horse                    Type : Edit file
Received by file . . : Horse                        Acpth: Retrieval index
Workstation . . . . : NPT
Source library . . . : MYGEN

Object Source      Target
? Type Name        HLL   Text
■ PGM  MYAHEFR     RPG   Edit Horse      Edit file
_ DSP  MYAHEFRD    DDS   Edit Horse      Edit file
_ HLP  MYAHEFRH    UIM   Edit Horse      Edit file

SEL: E-STRSEU, O-Compiler Overrides.
F3=Exit F7=Options F8=Change name F9=Scr/rpt layout F20=Narrative
```

Press F3 to return to the Edit Functions panel.

Linking Functions

This topic shows how to use CA 2E to link two functions together to build a larger function. In the course of doing this, you will define the second function and an access path upon which it is based.

New terms introduced:

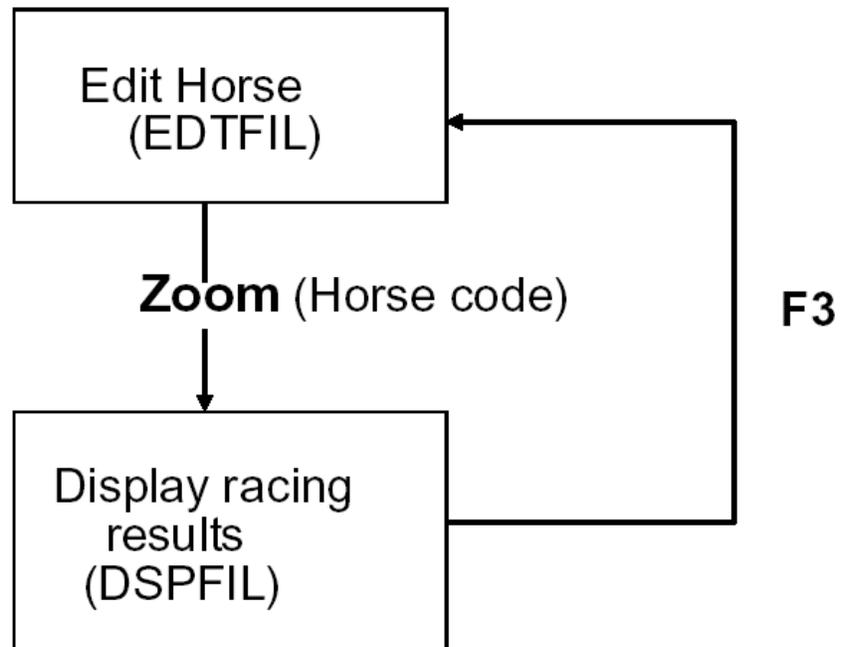
- Built-in function
- *MOVE function

New panels introduced:

- Action Diagram User Points
- Edit Access Path Format Entries

Objectives

Modify the Edit Horse function to give it a Subfile selector option. The new facility should let the user zoom against the detail line for a particular horse on the Edit Horse panel in order to view a subsidiary display of the races in which the horse has raced.



To achieve this, you will define a new function, Display Racing results. The new function will display information from the RACE ENTRY file for the horse selected. You also need to modify the action diagram of the existing Edit Horse function to call the new function. Note that CA 2E lets you define the new function while you are in the process of modifying the action diagram of the existing function.

The two functions will be implemented as separate programs. The Horse code of the selected line will be passed as a parameter between the two programs in order for the Display Racing results program to display race entries for a particular horse.

Steps Required to Link Functions

In this topic, you will define a Display Racing results function and link it to the Edit Horse function. You will also update the Edit Horse function. The process is similar to that of adding a message function. To achieve the objectives for this topic you will need to:

1. Modify the action diagram of the Edit Horse function to specify the condition under which the Display Racing results function is to be called.
2. Define the Display Racing results function by giving it a name and type and selecting an appropriate access path based on the RACE ENTRY file.
3. Specify the parameters of the Display Racing results function; namely, Horse code.
4. Select the Display Racing results function for inclusion in the action diagram of the Edit Horse function.
5. Modify the action diagram of the Edit Horse function to defer updating the HORSE file if a line selection is made.
6. Modify the Selector Choice menu of the action bar of the Edit Horse function's device design to show the availability of the Display Racing results function.

Modifying the Edit Horse Action Diagram

The first step is to modify the action diagram of the Edit Horse function so that the Display Racing results function is called when the end user types / in the Subfile selector field and selects the Display Racing results action from the Selector Choice menu of the Edit Horse function's action bar.

You will access the Action Diagram Editor for the Edit Horse function and locate the USER: Validate subfile record relations user point. Recall that user points are the areas in an action diagram that you can modify.

From the Edit Functions panel, type **F** next to the Edit Horse function to enter the action diagram.

EDIT FUNCTIONS		My model	** 1ST LEVEL **
File name. . . : Horse			
? Function	Function type	Access path	
- Change Horse	Change object	Update index	
- Create Horse	Create object	Update index	
- Delete Horse	Delete object	Update index	
F Edit Horse	Edit file	Retrieval index	
█ Select Horse	Select record	Retrieval index	
- Select Hares	Select record	Hares	
- Select Stallions	Select record	Stallions	
-			
-			
-			
-			
-			
-			
More...			
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, M-Marr, O-Open,			
T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock.			
F3=Exit F5=Reload F7=File details F9=Add functions F17=Services			

Press Enter.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

█ > Edit Horse
--- ---
--- ...Initialize <--
--- . =REPEAT WHILE
--- . -*ALWAYS
--- . ...Load first subfile page <--
--- . PGM.*Reload subfile = CHD.*NO
--- . > Conduct screen conversation
--- . . =REPEAT WHILE
--- . . -PGM.*Reload subfile is *NO
--- . . Display screen
--- . . ...Process response <--
--- . . -ENDWHILE
--- . . -ENDWHILE
--- . . ...Closedown <--
--- ---

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Obtaining the Action Diagram User Points

Press F5 to view the list of user points for the Edit Horse function.

Type X against USER: Validate subfile record relations.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

--- > Edit : ACTION DIAGRAM EXIT POINTS          F3=EXIT  SEL:X,Z-Select.
--- ---
--- ...I : USER: Initialize program <--
--- . =RE : USER: Initialize subfile header
--- . -*A : USER: Initialize subfile record(existing record)
--- . PG : USER: Initialize subfile record(new record) <--
--- . > : CALC: Subfile control function fields
--- . = : USER: Validate subfile control
--- . - : USER: Validate subfile record fields
--- . - : CALC: Subfile record function fields
--- . - : X USER: Validate subfile record relations
--- . . : ...Process response <--
--- . . -ENDWHILE
--- . . -ENDWHILE
--- . . ...Closedown <--
--- ---

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Press Enter.

Adding a New CASE Construct

Insert a condition in the action diagram that defines when the Display Racing results function is to be called. You can insert the new condition after the validation conditions you added in the previous topic.

Entering the Condition Details

The *SFLSEL field is in the subfile record; as a result, its context is RCD. You will specify the context and the field name and leave the ? in the Condition field to display a list of conditions available for the field.

Type the context **RCD**, field name ***SFLSEL**, and **?** for the condition.

```

EDIT ACTION DIAGRAM          Edit  MYMDL  Horse
FIND=>                        Edit Horse
-----
> USER: Validate             EDIT ACTION - CONDITION
-----
- - - - -
- - - - - -CASE              Title. : !!! New condition
- - - - - -RCD.Dam Date      Context.Field . . . : RCD *SFLSEL
- - - - -   Send error me    Condition . . . . . : ?
- - - - - -ENDCASE
- - - - - -CASE              OR
- - - - - -RCD.Sire Date     Comparison. . . . . :
- - - - -   Send error me    Context.Field . . . :
- - - - - -ENDCASE
ICF
-----
F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
    
```

Press Enter.

Selecting the Zoom#1 Condition

The Edit Field Conditions panel shows the existing conditions for the *SFLSEL field. You may select an existing condition or create a new one.

Type **X** against the *Zoom#1 condition.

```

EDIT FIELD CONDITIONS          My model
Field name. . . . . : *SFLSEL      Attr. : STS
Enter condition . . . :              and type to add new condition.
type . . . : (Type: LST, VAL)
-----
? Condition              Type Op File/From value      Display/To value      MN
- *ALL values            LST **
- *Delete                LST
- *Select                LST
- *Selection character   LST
- *Zoom                  LST
- *Delete#1              VAL      4      4
- *Delete#2              VAL      4      4
- *Select#1              VAL      1      1
- *Select#2              VAL      1      1
- *Selection char value  VAL      /
- *Selection char value #2 VAL      /
X *Zoom#1                VAL      5      5
█ *Zoom#2                VAL      5      5
-----
SEL: Z-Details, D-Delete, X-Select, U-Where used, N-Narrative.
F3=Exit
    
```

Press Enter to return to the Edit Action - Condition and note that Zoom#1 has been inserted in the Condition field. Press Enter again to return to the Action Diagram Editor.

Specifying a Function as the Action

You have now finished defining the condition. Next you will specify a function to be called as the action when the condition is true.

Type **IAF**.

```
EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse
____ > USER: Validate subfile record relations
____ .--
____ . .-CASE
____ . .|-RCD.Dam Date of birth GE RCD.Date of birth
____ . .| Send error message - 'Dam younger than horse'
____ . .|-ENDCASE
____ . .-CASE
____ . .|-RCD.Sire Date of birth GE RCD.Date of birth
____ . .| Send error message - 'Sire younger than horse'
____ . .|-ENDCASE
____ . .-CASE
IAF . .|-RCD.*SFLSEL is *Zoom#1
█ . .|-ENDCASE
____ .--

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
```

Press Enter to display the Edit Action - Function Name window.

Creating a New Access Path

The existing RTV and UPD access paths for RACE ENTRY will be keyed according to the key relations for the RACE ENTRY file as follows.

1. Course code
2. Race date
3. Race time
4. Entry number

Because you want to see horse racing results in horse order, you need to specify a new access path. Call it Races for a Horse. Use a Resequenece access path (RSQ) to specify an alternative key order.

Type **Z** in the Subfile selector field, **RSQ** for the access path type, and **Races for a Horse** for the access path name.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Race Entry
Attribute . . . . . : CPT           Field reference file. : *NONE
Documentation sequence. . . . . :           Source library. . . . . : MYGEN
GEN format prefix . . . . . : AD       Distributed . . . . . : H (Y,N)
Assimilated physical. . . . . :
Record not found message. : Race Entry      NF Msgid. : USR0005
Record exists message . . : Race Entry      EX Msgid. : USR0006

? Typ Access path           Source mbr Key   Index options   Auto add
- PHY Physical file       HYADCPP   NONE           ATR ONLY
- UPD Update index       HYADCPL0 UNIQUE IMMED  ATR ONLY
- RTV Retrieval index   HYADCPL1 UNIQUE IMMED  ATR ONLY
Z RSQ Races for a Horse
-
-
-
-
SEL: X-Select, Z-Details, G/J-Generate, E-STRSEU, D-Delete, O-Override, L-Lock
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F8=Change name F17=Services F20=Narrative

```

Press Enter.

The Edit Access Path Details panel is displayed. Type **Z** against the format.

```
EDIT ACCESS PATH DETAILS                               My model
File name . . . . . : Race Entry                      Attribute . . : CPT
Access path name. . . . : Races for a Horse           Type. . . . . : RSQ
Unique or duplicate order : E (U-Unique,F-FIFO,L-LIFO,C-FCFO,''-Undefined)
Index maintenance option : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . . : (S-Static, D-Dynamic, ''-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . : HYADCPL2
Source member text . . . : Race Entry                  Races for a Horse

Format      GEN  Format text                      Associated
? Seq name  pfx  (Based on file)                 Retrieval access path
Z  1  AD  CPZ  AD  Race Entry                      Retrieval index

SEL: Z-Entries, R-Relations, S-Select/omit, A-Assoc.acps, T-Trim, V-Virtualize
F3=Exit F8=Rename F20=Narrative
```

Press Enter.

Specifying the Access Path Details

On the Edit Access Path Format Entries panel you will specify the new key order for the RSQ access path. Initially, the keys default to be the same as for the RTV type access path. Remember, you cannot change the keys for a RTV access path.

Defining the Access Path Key

The objective for the resulting application is to give the end user the capability to view race results for a selected horse. The recommended order by which to retrieve the RACE ENTRY file is by Horse code, Race date, and Race time, with the most recent races retrieved first. Specify a key of Horse code followed by Race date (descending order) and Race time (descending order). Before you change the order, clear the numbers from the original key order.

Type the details as shown. In other words, blank the Key no. field for Course code and Entry number; type **2, 3, 1** in the Key no. field for Race date, Race time, and Horse code, respectively; and type **D** (descending order) in the Dsc column for Race date and Race time.

```

EDIT ACCESS PATH FORMAT ENTRIES      My model
File name . . . . . : Race Entry      Attribute . . : CPT
Access path name. . . . . : Races for a Horse  Type. . . . . : RSQ
Format text . . . . . : Race Entry
Based on. . . . . : Race Entry          Format No . . : 1

? Field                               GEN      Key   Altcol Ref
Name                                   Name     no.  Dsc seq cnt
- Course code                         CDE      ABCD  K    -    1
- Race date                           DT#      ABDZ  K    2  D    1
- Race time                           TM#      ABTZ  K    3  D    1
- Entry number                        CDE      ACCD  K    -    1
- Horse code                          CDE      ADCD  A    -    1
- Jockey code                         CDE      AECD  A    -    1
- Finishing position                 NBR      ABNB  A    -    1
- Handicap                            QTY      ABQT  A    -    1
- Entry Status                       STS      ACST  A    -    1

SEL: 2-Field details, L-Locks.
F3=Exit F7=Relations
    
```

Press Enter to confirm the keys. Press F13 to return to the Edit File Details panel.

Selecting the Access Path

Now select the new access path for use in the Display Racing results function. Type **X** to select the Races for a Horse RSQ access path.

```
EDIT FILE DETAILS                               My model
File name . . . . . : Race Entry
Attribute . . . . . : CPT                      Field reference file. : *NONE
Documentation sequence. . . :                   Source library. . . . : MYGEN
GEN format prefix . . . . . : AD                Distributed . . . . . : H (Y,N)
Assimilated physical. . . . :
Record not found message. . : Race Entry        HF Msgid. : USR0005
Record exists message . . . : Race Entry        EX Msgid. : USR0006

? Typ Access path          Source mbr Key   Index options   Auto add
■ PHY Physical file       MYADCPP      NONE           ATR ONLY
- UPD Update index        MYADCPL0     UNIQUE IMMED   ATR ONLY
- RTV Retrieval index     MYADCPL1     UNIQUE IMMED   ATR ONLY
X RSQ Races for a Horse   MYADCPL2     FIFO IMMED     ATR ONLY
-
-
-
-
-
-
SEL: X-Select, Z-Details, G/J-Generate, E-STRSEU, D-Delete, O-Override, L-Lock
      H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F8=Change name F17=Services F20=Narrative
Function 'Display Racing results' is being created ...
```

Press Enter. The message "Function 'Display Racing results' is being created" appears at the bottom of the panel. When the function is created, CA 2E returns to the Edit Functions panel, which now includes the Display Racing results function.

Function Parameters

Function parameters specify which fields can be passed between the calling and the called functions. Each call can pass different values in these fields.

New terms introduced:

- Function parameter
- Parameter usage
- Parameter role
- Restrictor parameter

New panels introduced:

- Edit Function Parameter Details
- Work with Choices
- Work with Actions of a Choice
- Edit Action
- Work with Actions of a Choice

Objectives

In this topic you will specify the parameters that will be passed from the Edit Horse function to the Display Racing results function in order to view races for a particular horse.

Understanding Parameter Usage and Role

You need to assign a usage and role for each parameter to direct the calling and called functions to use the parameter in a particular way.

- **Parameter Usage**—A parameter’s usage determines how the parameter is to be received from or returned to the calling function. The four possible usages are Input only, Output only, Both, and Neither. In this tutorial you will use only the first two usages:
 - **Input only**—A value for the parameter is passed to the called function. The called function returns the value to the calling function without changing it.
 - **Output only**—The called function returns a value for the parameter to the calling function when the called function ends.
- **Parameter Role**—The role of a function parameter specifies how the parameter will be used in the called function. The four possible roles are Map, Restrictor, Positioner, and Vary. In this tutorial you will use only the Restrictor role.

The Restrictor role is used to restrict which records from a database file will be displayed, changed, or printed by the called function. A Restrictor parameter must be a key field on the access path to which the called function attaches. If there are multiple keys, the parameter sequence must match the key sequence.

You will specify the Restrictor role for the Horse code parameter to restrict the Display Racing results function to show only race entries for a particular horse. In other words, the function can only process database records whose keys match the Horse code parameter.

Defining Function Parameters

The Edit Function Parameters panel lets you specify parameters for a function in one of two ways:

- You can specify individual fields as parameters by typing the keyword ***FIELD** under File/*FIELD and typing the field name under Access path/Field. In the Passed as column, type **FLD** to indicate that each field is passed as an individual parameter.
- You can specify a set of fields from a file by typing a file name under File/*FIELD and the name of an access path based on the file. In the Passed as column, type one of the following.
 - **RCD** to indicate that all the fields from the access path are to be passed as a single parameter. **KEY** to indicate that only the key fields from the access path are to be passed as a single parameter.

In this case, you can zoom to display the Edit Function Parameter Details panel to select fields from the specified access path.

You used the *FIELD method to specify parameters earlier in the tutorial when you defined error message functions for the Edit Horse function. In this topic you will use the access path method.

Specifying Parameters Using an Access Path

Type the details as shown: type **Race Entry** as the file name, type **Races for a Horse** as the access path, type **KEY** as the Passed as value, and type **Z** in the Subfile selector to select the key fields on the access path to be used as parameters.

EDIT FUNCTION PARAMETERS		My model	
Function name . . .	: Display Racing results	Type :	Display file
Received by file :	Race Entry	Acpth:	Races for a Horse
		Passed	
? File/*FIELD	Access path/Field	as	Seq
Z Race Entry	Races for a Horse	KEY	█
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
			Values
			FLD: One parameter per field
			RCD: One parameter for all fields
			KEY: One parameter for key fields only
SEL: Z-Details (field selection).			
F3=Exit F5=Reload			

Press Enter to display the Edit Function Parameter Details panel.

Defining Parameter Details

From the Edit Function Parameter Details panel, you can define parameter details.

The Horse code from the selected subfile record is to be passed as an input parameter to the Display Racing results function and will be restricted to show only race entries for this horse. This is where you specify that Horse code is an input only, restrictor parameter.

Type **R** against Horse code.

```
EDIT FUNCTION PARAMETER DETAILS      My model
Function name. . : Display Racing results  Type : Display file
Received by file : Race Entry             Acpth: Races for a Horse
Parameter (file) : Race Entry             Passed as: KEY
? Field                                     Usage  Role  Flag error
R Horse code                               I      RST
■ Race date
- Race time

SEL: Usage: I-Input, O-Output, B-Both, N-Neither, D-Drop.
      Role: R-Restrict, M-Map, V-Vary length, P-Position. Error: E-Flag Error.
F3=Exit
```

Press Enter.

Note that the Usage for Horse code defaulted to I (Input only) and the parameter role changed to RST (restrictor).

```
EDIT FUNCTION PARAMETER DETAILS      My model
Function name. . : Display Racing results  Type : Display file
Received by file : Race Entry             Acpth: Races for a Horse
Parameter (file) : Race Entry             Passed as: KEY
? Field                                     Usage  Role  Flag error
■ Horse code                               I      RST
- Race date
- Race time

SEL: Usage: I-Input, O-Output, B-Both, N-Neither, D-Drop.
      Role: R-Restrict, M-Map, V-Vary length, P-Position. Error: E-Flag Error.
F3=Exit
```


Returning to the Edit Action - Function Details Window

This window confirms that you have selected Display Racing results as the function for your action. CA 2E has defaulted the value of Horse code from the subfile record to pass as the parameter to the Display Racing results function. Note the RCD context.

```
EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse
-----
> USER: Validate subfile re :  EDIT ACTION - FUNCTION NAME
-----
: EDIT ACTION - FUNCTION DETAILS
: Function file : Race Entry
: Function. . . : Display Racing results
:                               Obj
: IOB Parameter          Use Typ Ctx Object Name
: I Horse code          RST FLD RCD Horse code
:
:
: IAF
:
: F3=Exit F9=Edit parameters F10=Default parms F12=Previous
: Some parameters have been defaulted. Press ENTER to accept
-----
F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

You can override these defaults; however, in this case, you will accept the defaults. Press Enter to accept the defaults.

The action diagram shows that the Display Racing results function is called when the end user selects the Zoom#1 option.

Suppressing the Confirm Prompt and File Update

In this step you will insert an action in the Edit Horse function to suppress both the confirm prompt and the update of the HORSE file when the user zooms to display racing results. As a result, the Edit Horse panel will remain open for input on return from the Display Racing results function. This step is not strictly necessary, but will make the function easier to use.

CA 2E supplies a set of system fields that control the execution of functions. *Defer confirm is the system field that controls whether the confirm prompt is displayed or suppressed. *Defer confirm is a status field (STS) that has two condition values: Proceed to confirm (the default) and Defer confirm. Note that the name of the field and the name of one of its values are the same, namely, Defer confirm.

The action you will insert will override the default for the *Defer confirm field using the *MOVE built-in function and the CND context.

- The *MOVE built-in function lets you move the value of one field to another field. It has two parameters: an input parameter, which is the field to be moved, and an output parameter, which is the field into which the input field is moved.
- The CND context lets you specify a condition value and gives you the capability of specifying a condition value as a field value or a function parameter.

You will use the *MOVE function to move the condition value Defer confirm (CND context) to the system field *Defer confirm, thus overriding the default value of the *Defer confirm system field.

Inserting *MOVE as an Action

CA 2E provides the I= command as a shortcut for inserting a *MOVE built-in function as a new action. The I= command performs three steps in one: IA (inserts an action), F (edits action details), and specifies the *MOVE built-in function as the action.

Type I= next to the function to insert a *MOVE built-in function.

```
EDIT ACTION DIAGRAM          Edit      MYMDL      Horse
FIND=>
-----
> USER: Validate subfile record relations
-----
. . . . .
. . . . .-CASE
. . . . .:RCD.Dam Date of birth GE RCD.Date of birth
. . . . .: Send error message - 'Dam younger than horse'
. . . . .-ENDCASE
. . . . .-CASE
. . . . .:RCD.Sire Date of birth GE RCD.Date of birth
. . . . .: Send error message - 'Sire younger than horse'
. . . . .-ENDCASE
. . . . .-CASE
. . . . .:RCD.*SFLSEL is *Zoom#1
. . . . .: Display Racing results - Race Entry *
. . . . .-ENDCASE
-----
F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
```

Press Enter.

Specifying Parameters for the *MOVE Function

From the Edit Action - Function Details window, you can specify the parameters for the *MOVE function.

The *MOVE built-in function moves the value of one field to another field and thus has two parameters. On the Edit Action - Function Details window the output parameter is indicated by *Result and the input parameter is indicated by *Factor 2.

Recall that you can type ? in any of the fields on this panel to display a selection list of possible values for the field.

Specifying Defer Confirm

Type parameters for the *MOVE built-in function. In this case, you will type the system field ***Defer confirm** as the output field. Because it is a system field, the appropriate context is **PGM**. The input field is the Defer confirm condition. Type **CND** for the context. This lets you use a condition value as if it were a field value and gives you the capability of specifying a condition value as a function parameter.

```

EDIT ACTION DIAGRAM          Edit    MYMDL      Horse
FIND=>                        Edit Horse

___ > USER: Validate subfile record relations
___
___ : EDIT ACTION - FUNCTION DETAILS
___ : Function file :
___ : Function. . . : *MOVE
___
___ : IOB Parameter          Obj
___ : 0 *Result              Use Typ Ctx Object Name
___ : I *Factor 2            PGM *Defer confirm
___ :                               CND Defer confirm
___
___ :
___ : I=
___ :
___ : F3=Exit  F9=Edit parameters  F10=Default parms  F12=Previous
___
___ :
___ : F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
___ : F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter.

Your action diagram now shows the action that will suppress the confirm prompt.

Reload Subfile

To activate the action bar and call the Display Racing results program, the end user types / in the Subfile selector of the Edit Horse program. As the Edit Horse program is now designed, the / remains in the Subfile selector when control is returned to Edit Horse. To prevent this, you will add processing in the action diagram to refresh the Edit Horse panel on return from the Display Racing results function. To reload and redisplay this panel, you need to override the default value of the *Reload subfile system field. *Reload subfile is a status field with two conditions: *NO and *YES and has the PGM context.

To accomplish this task, use the method you just used to override the default value of the *Defer confirm system field. In other words, you will insert another *MOVE function to move a value of *YES to the *Reload subfile system field.

Type I= as shown to insert a *MOVE built-in function as an action in the action diagram.

```
EDIT ACTION DIAGRAM          Edit      MVMMDL      Horse
FIND=>                        Edit Horse
___ > USER: Validate subfile record relations
___ .--
___ . .-CASE
___ . . .-RCD.Dam Date of birth GE RCD.Date of birth
___ . . . Send error message - 'Dam younger than horse'
___ . . .-ENDCASE
___ . .-CASE
___ . . .-RCD.Sire Date of birth GE RCD.Date of birth
___ . . . Send error message - 'Sire younger than horse'
___ . . .-ENDCASE
___ . .-CASE
___ . . .-RCD.*SFLSEL is *Zoom#1
___ . . . Display Racing results - Race Entry *
I= . . . PGM.*Defer confirm = CND.Defer confirm
___ . . .-ENDCASE
___ .--

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

Press Enter.

Specifying Reload Subfile

Type the details as shown. In other words, type **PGM** for the output parameter context, type ***Reload subfile** for the parameter name, type **CND** for the input parameter context, and type ***Yes** for the condition to be moved.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate subfile record relations
___
___ : EDIT ACTION - FUNCTION DETAILS
___ : Function file :
___ : Function. . . : *MOVE
___
___ : IOB Parameter          Obj          Use Typ Ctx Object Name
___ : 0 *Result                PGM *Reload subfile
___ : 1 *Factor 2              CND *Yes
___
___
___
___ : F3=Exit  F9=Edit parameters  F10=Default parms  F12=Previous
___
___
F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter to return to the action diagram.

The Completed Action Diagram

The action diagram now shows the action to reload the subfile.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Edit Horse

___ > USER: Validate subfile record relations
___
___ : -CASE
___ : -RCD.Dam Date of birth GE RCD.Date of birth
___ : Send error message - 'Dam younger than horse'
___ : -ENDCASE
___ : -CASE
___ : -RCD.Sire Date of birth GE RCD.Date of birth
___ : Send error message - 'Sire younger than horse'
___ : -ENDCASE
___ : -CASE
___ : -RCD.*SFLSEL is *Zoom#1
___ : Display Racing results - Race Entry *
___ : PGM.*Defer confirm = CND.Defer confirm
___ : PGM.*Reload subfile = CND.*YES
___ : -ENDCASE
___
___
F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press F13 to fast exit to the Exit Function Definition panel.

Saving the Action Diagram

You have now finished specifying the interface to call the Display Racing results function from the Edit Horse function.

```

EXIT FUNCTION DEFINITION          My model
Type choices, press Enter.
Change/create function. . . . Y      Y=Yes, N=No
  Function name . . . . . Edit Horse      Name
  Access path name. . . . Retrieval index  Name
  File name . . . . . Horse              Name
  Function type . . . . . Edit file
Print function. . . . . N              Y=Yes, N=No
Return to editing . . . . . N          Y=Yes, N=No
Submit generation . . . . . N         Y=Yes, N=No

F5=Refresh  F12=Cancel  F15=Open Functions
    
```

Accept the default of Y (Change/create function) by pressing Enter. You have now completed the update to the action diagram for Edit Horse.

Updating the Edit Horse Function's Action Bar

In this step you will change the text in the Selector Choice menu on the action bar at the top of the Edit Horse function device design to show that the Display Racing results option is available. You will use the Device Design Editor to do this.

Type **S** against the Edit Horse function as shown to access the Device Design Editor.

```

EDIT FUNCTIONS          My model
File name. . . . : Horse      ** 1ST LEVEL **
? Function              Function type      Access path
- Change Horse          Change object      Update index
- Create Horse          Create object       Update index
- Delete Horse          Delete object       Update index
S Edit Horse            Edit file           Retrieval index
- Select Horse          Select record       Retrieval index
- Select Mares          Select record       Mares
- Select Stallions     Select record       Stallions
-
-
-
-
-
-
-
-
-
-
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Narr, O-Open,
      T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock.
F3=Exit F5=Reload F7=File details F9=Add functions F17=Services
    
```

Press Enter.

Updating the Edit Horse Panel's Zoom Action Text

CA 2E has already updated the Edit Horse panel and added the Zoom#1 action to the action bar on the Edit Horse panel. Change the text from Zoom#1 to Display Racing results to provide a better explanation to the end user.

Move the cursor onto the action bar.

```

File  fFunction  Selector  Help
-----
*PROGRAM  *PGMMOD                      DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code . _____
Select items, then select an action.

Opt Horse   Horse name                Horse  Horse value  Date of
code      name                gender  value         birth
-----
-   Dam _____ 00000000000000000000000000000000  Dam Date of birth 66/66/66
    Sire _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66
-   Dam _____ 00000000000000000000000000000000  Dam Date of birth 66/66/66
    Sire _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66
-   Dam _____ 00000000000000000000000000000000  Dam Date of birth 66/66/66
    Sire _____ 00000000000000000000000000000000  Sire Date of birth 66/66/66

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press Enter to access the Work with Choices panel.

Working with the Selector Choice

From the Work with Choices panel, you can access the Work with Actions panel for a particular choice. In this case, you will work with the actions listed in the Selector Choice menu.

Type **A** next to Selector.

```

WORK WITH CHOICES                      My model
File Name . . . : Horse
Function name . : Edit Horse

Opt Sequence  Choice                      Usage  Mnemonic  CUA  Model
-----
-           1   File                      F      F      A
-           4   fFunction                    U      U      A
A           5   Selector                    S      S      A
█           99  Help                      H      H      A

SEL: Z-Details  D-Delete  A-Actions  H/S-Usage  N-Narrative
F3=Exit  F6=Add A Choice  F7=All Actions
    
```

Press Enter.

Modifying an Action

The Work with Actions of a Choice panel lists all the actions available for a particular choice. You will zoom into the Zoom#1 action to view the details for that action.

Type **Z** in the Opt field against the Zoom#1 action.

```

WORK WITH ACTIONS OF A CHOICE      My Model
File Name . . . : Horse
Function name . . : Edit Horse
Choice name . . . : Selector

Opt  Sequence  Action                Usage  CUA Model
Z    1         Zoom#1                A

SEL: Z=Details, H,S=Usage, N=Narrative
F3=Exit
    
```

Press Enter.

Changing the Action Text

Update the text for the Zoom#1 action to read "Display Racing results."

Type **Display Racing results** in the Action text field.

```

EDIT ACTION                          My model
File Name . . . : Horse
Function name . . : Edit Horse

Action . . . . . Display Racing results  Text                Msgid
Sequence . . . . . 1                    1..99                MAAAAAA
Choice . . . . . Selector                Choice text
Usage . . . . . A                        H, blank
CUA Model . . . . . A                    A, T, G

CUA Text :
Accelerator . . . . . *CMDkey val cnd

CUA Graphic :
Accelerator . . . . . *PWSkey val cnd  MAAAAAC
Mnemonic . . . . . Z                    Character            MAAAAAB
Pushbutton sequence . 0                0..99
Pushbutton default . H                    Y, N

F3=Exit F20=Narrative
    
```

Press Enter to confirm. Press F3 to exit.

Showing the New Action Text

The Work With Actions of a Choice panel now shows the new action text for the Selector Choice menu.

```

WORK WITH ACTIONS OF A CHOICE      My Model
File Name . . . : Horse
Function name . : Edit Horse
Choice name . . : Selector

Opt  Sequence  Action                Usage  CUA Model
█    1         Display Racing results      Usage  A

SEL: Z-Details, H,S-Usage, N-Narrative
F3=Exit

```

Press F3 to return to the Work With Choices panel.

```

WORK WITH CHOICES                  My model
File Name . . . : Horse
Function name . : Edit Horse

Opt Sequence  Choice                Usage  Mnemonic  CUA Model
█    1         File                    F      A
-    4         fUnction                U      A
-    5         Selector                S      A
-    99        Help                    H      A

SEL: Z-Details D-Delete A-Actions H/S-Usage N-Narrative
F3=Exit F6=Add A Choice F7=All Actions

```


Exercise

Check the device design for the Display Racing results function to improve its appearance and to ensure that the device design does not exceed the size of the panel. The latter prevents errors when you generate the functions in the *Generating, Compiling, and Executing* chapter.

Note: You can access the device design for a function by typing **S** against it on the Edit Functions panel or by pressing F9 from the Edit Function Details panel.

To edit the device design, use the function keys you used to edit the device designs for the Edit Horse and Select Horse functions in the Device Designs topic earlier in this chapter. Press Help or refer to the table in the Device Designs topic for a list of function keys.

Chapter 5: Generating, Compiling, and Executing

This chapter introduces the following topics:

- Implementing Access Paths and Functions
- Executing and Testing Compiled Programs

This section contains the following topics:

[Implementing Access Paths and Functions](#) (see page 221)

[Executing and Testing Compiled Programs](#) (see page 236)

Implementing Access Paths and Functions

This topic discusses how to generate source to implement the access paths and functions you have created. You will then compile the source to produce executable i OS objects: files and programs.

New terms introduced:

- Job list
- Creation

New displays introduced:

- Display Services Menu
- Submit Model Creates
- Submit Model Generations & Creates
- Convert Condition Values

Objectives

Submit the batch generation of all the access paths and functions you have designed. After generating the source code, each access path and function will be compiled. You will then execute the Edit Horse program.

Overview of Implementation

Once your application design is complete, you are ready to generate the source members for the database files, programs, display files, and help text that will implement the access paths and functions. Once generated, the source will need compiling.

You can generate source either interactively or in batch. CA 2E automatically keeps a list of the members to be generated and compiled in batch or to be generated interactively and not yet compiled. In this tutorial, you will generate source code and compile executable objects for all of your access paths and functions as one batch job. To do this, you will use options available on the Display Services Menu.

Source Generation and Compilation of Access Paths and Functions

You must generate and compile the source for your access paths and functions before you can test your application programs. The first step is to indicate which access paths and functions you want generated and compiled. The Display Services Menu includes options to facilitate this process.

From the Edit Database Relations panel, press F17 to go to the Display Services Menu.

EDIT DATABASE RELATIONS		My model	
?	Typ	Object	Relation
	FIL	Course	Known by
	FIL	Course	Has
	FIL	Horse	Known by
	FIL	Horse	Has
	FIL	Horse	Refers to
	FIL	Horse	Refers to
	FIL	Jockey	Known by
	FIL	Jockey	Has
	FIL	Jockey	Has
	FIL	Race	Owned by

Rel lvl:	Seq	Typ	Referenced object
		FLD	Course code
		FLD	Course name
	10	FLD	Horse code
	20	FLD	Horse name
	30	FLD	Horse gender
	40	FLD	Horse value
	50	FLD	Date of birth
	60	FIL	Horse
	70	FIL	Horse
		FLD	Jockey code
		FLD	Jockey name
		FLD	Jockey gender
		FIL	Course

For: Dam Sharing: *ALL
 For: Sire Sharing: *ALL

Z(n)=Details F=Functions E(n)=Entries S(n)=Select More...
 F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys

Display all Access Paths for Selection

The Display Services Menu contains an option to display a list of all access paths designed in the design model.

Select the Display all access paths option.

```

DISPLAY SERVICES MENU                               My model
Generation                                         1. Submit model create request (YSBMMDCRT)
                                                    2. Convert model data menu
                                                    3. Job list menu
Documentation                                       6. Documentation menu
                                                    7. Convert model panel designs (YCVTMDLPHL)
Model                                              8. Display all access paths
                                                    9. Display all functions
                                                    10. Display model values (YDSPMDLVAL)
                                                    11. Edit model profile (YEDTMDLPRF)
                                                    12. Work with model lists (YWRKMDLLST)
                                                    13. Edit model list (YEDTMDLLST *SESSION)
                                                    14. Impact analysis menu
Change Control                                     21. Go to 2ECM menu

Option: 8 (press F4 to prompt commands)
F3=Exit F6=Messages F8=Submitted jobs F9=Command Line F10=Display job log
    
```

Press Enter.

Selecting All Access Paths for Batch Generation and Compilation

The Display All Access Paths panel presents a list of all access paths in the design model. It lets you perform many design, control, and generation tasks for one or more access paths from one panel.

Select all of the existing access path designs for batch generation and compilation by typing a J in the Subfile selector next to each access path in the list.

```

DISPLAY ALL ACCESS PATHS                           My model
Application area. . :  Source library. . : MYGEN
? File Access path Prefix
-----
J Course Physical file PHY MYABREP AB
J Course Retrieval index RTV MYABREL1 AB
J Course Update index UPD MYABREL0 AB
J Horse Mares RTV MYAEREL2 AE
J Horse Physical file PHY MYAEREP AE
J Horse Retrieval index RTV MYAEREL1 AE
J Horse Stallions RTV MYAEREL3 AE
J Horse Update index UPD MYAEREL0 AE
J Jockey Physical file PHY MYAFREP AF
J Jockey Retrieval index RTV MYAFREL1 AF
J Jockey Update index UPD MYAFREL0 AF
J Race Physical file PHY MYACREP AC
J Race Retrieval index RTV MYACREL1 AC
J Race Update index UPD MYACREL0 AC
J Race Entry Physical file PHY MYADCPP AD +
SEL: Z-Details, G/J-Generate, E-STRSEU, N-Narrative,
      D-Delete, U-Usage, F-Function refs., L-Locks.
F3=Exit F5=Reload
    
```

Press Roll Up to display the next screen of access paths. Select all remaining access paths with a J.

```

DISPLAY ALL ACCESS PATHS                               My model
Application area. . . :                                Source library. . . : MYGEN
? File                                                  Access path                                     Prefix
-----
J Race Entry                                           Races for a Horse                               RSO HYADCPL2                               AD
J Race Entry                                           Retrieval index                                RTV HYADCPL1                               AD
J Race Entry                                           Update index                                   UPD HYADCPL0                               AD

SEL: Z-Details, G/J-Generate, E-STRSEU, N-Narrative,
      D-Delete, U-Usage, F-Function refs., L-Locks.
      F3=Exit  F5=Reload
    
```

Press Enter.

Limitation:

When you to take the G / J option to generate the access paths from the Display All Access Paths panel and the access path has either of the four DDL limitations, the generation is prevented. The access path source is not generated and no entry is added to the jobs list.

- The current implementation of the DDL generation mode is not valid for the following cases:
 - Access paths that have virtual fields
 - SPN access path
 - QRY access path
 - Multi-member files

Workaround for Virtual Fields, SPN, and QRY Access Paths: If the earlier generation mode is *DDS, revert to it and regenerate the access path. You need not regenerate the functions that use this access path. If you want to have an SQL type database, regenerate the access path using *SQL generation mode. The functions using this access path must be regenerated.

Workaround for Multi-Member Files: If you want to have more than one member for the access paths, revert to *DDS generation mode.

Note: If you want to change an access path, which is previously defined as *DDS with a MAXMBR compiler override, to *DDL, you must revert to *DDS generation mode and must remove the compiler override, and then change back to *DDL generation mode.

Completing the Request

When the process is complete, the Display All Access Paths panel will be redisplayed with messages displayed at the bottom of the panel. The messages will state that the source generation requests have been accepted.

```

DISPLAY ALL ACCESS PATHS                               My model
Application area. . :  Access path      Source library. . : MYGEN
? File
-----
- Race Entry      Races for a Horse      RSO MYADCPL2      AD
- Race Entry      Retrieval index       RTV MYADCPL1      AD
- Race Entry      Update index          UPD MYADCPL0      AD

SEL: Z=Details, G/J=Generate, E=STRSEU, H=Narrative,
      D=Delete, U=Usage, F=Function refs., L=Locks.
F3=Exit  F5=Reload
Source generation request for MYABREP accepted.
    
```

Press F3 to return to the Display Services Menu.

Display all Functions for Selection

In this step you will repeat this process for the functions in your design model. The Display Services Menu includes an option to display a list of the functions in the design model.

Select the Display all functions option.

```

DISPLAY SERVICES MENU                               My model
Generation      1. Submit model create request (YSBMMDLCRT)
                2. Convert model data menu
                3. Job list menu
Documentation    6. Documentation menu
                7. Convert model panel designs (VCVTMDLPNL)
Model           8. Display all access paths
                9. Display all functions
               10. Display model values (YDSPMDLVAL)
               11. Edit model profile (YEDTMDLPRF)
               12. Work with model lists (VWRKMDLLST)
               13. Edit model list (YEDTMDLLST *SESSION)
               14. Impact analysis menu
Change Control  21. Go to 2ECM menu
                Option:  (press F4 to prompt commands)
F3=Exit  F6=Messages  F8=Submitted jobs  F9=Command line  F10=Display job log
    
```

Press Enter.

Selecting All External Functions for Batch Generation and Compilation

The Display All Functions panel displays a list of all functions in the design model. It lets you perform many design, control, and generation tasks for one or more functions from one display.

Only external functions need to be generated and compiled. External functions can be identified by the source member name found in the GEN name column; internal functions show *N/A in this column. Start by displaying just the external functions in your design model.

To do so, type ***EXT** in the Type column on the selection line.

DISPLAY ALL FUNCTIONS		My model	Source library: MYGEN
Application area. : ___	Function	Type	GEN name
? File		*EXT	
- Course	Change Course	CHGOBJ	*N/A
- Course	Create Course	CRTOBJ	*N/A
- Course	Delete Course	DLTOBJ	*N/A
- Course	Edit Course	EDTFIL	MYACEFR
- Course	Select Course	SELRCO	MYABSRR
- Horse	Change Horse	CHGOBJ	*N/A
- Horse	Create Horse	CRTOBJ	*N/A
- Horse	Delete Horse	DLTOBJ	*N/A
- Horse	Edit Horse	EDTFIL	MYAEEFR
- Horse	Select Horse	SELRCO	MYAISRR
- Horse	Select Mares	SELRCO	MYAJSRR
- Horse	Select Stallions	SELRCO	MYAKSRR
- Jockey	Change Jockey	CHGOBJ	*N/A
- Jockey	Create Jockey	CRTOBJ	*N/A
- Jockey	Delete Jockey	DLTOBJ	*N/A

SEL: Z-Dtls, P-Parms, H-Harr., F-Action diagram, S-Device Design, T-Structure, A-Acp, G/J-Gen, E-STRSEU(pgm), L-Locks, D-Delete, U-Where used, 3-Doc.
F3=Exit F5=ReLoad

Press Enter to redisplay the Display All Functions panel showing only external functions.

Note: Write down the implementation names shown in the GEN name column for the following functions: Edit Course, Edit Horse, and Edit Jockey. You will need these later when you test the compiled programs.

Select all of the external functions for batch generation and compilation by typing a J in the Subfile selector next to each function on the list.

DISPLAY ALL FUNCTIONS		My model		Source library: MYGEN	
Application area. : █					
? File	Function	Type	GEN name		
J	Course	EDTFIL	MYACEFR		
J	Course	SELRCO	MYABSRR		
J	Horse	EDTFIL	MYAEEFR		
J	Horse	SELRCO	MYAISRR		
J	Horse	SELRCO	MYAJSRR		
J	Horse	SELRCO	MYAKSRR		
J	Jockey	EDTFIL	MYANEFR		
J	Jockey	SELRCO	MYAMSRR		
J	Race	EDTFIL	MYAPEFR		
J	Race	SELRCO	MYAOSRR		
J	Race Entry	DSPFIL	MYALDFR		

SEL: Z-Dtls, P-Parms, N-Harr., F-Action diagram, S-Device Design, T-Structure, A-Acp, G/J-Gen, E-STRSEU(pgm), L-Locks, D-Delete, U-Where used, 3-Doc. F3=Exit F5=Reload

Press Enter.

Completing the Request

When the process is complete, the Display All Functions panel will be redisplayed with messages displayed at the bottom of the panel. These messages state that the source generation requests have been accepted.

DISPLAY ALL FUNCTIONS		My model		Source library: MYGEN	
Application area. : █					
? File	Function	Type	GEN name		
█	Course	EDTFIL	MYACEFR		
-	Course	SELRCO	MYABSRR		
-	Horse	EDTFIL	MYAEEFR		
-	Horse	SELRCO	MYAISRR		
-	Horse	SELRCO	MYAJSRR		
-	Horse	SELRCO	MYAKSRR		
-	Jockey	EDTFIL	MYANEFR		
-	Jockey	SELRCO	MYAMSRR		
-	Race	EDTFIL	MYAPEFR		
-	Race	SELRCO	MYAOSRR		
-	Race Entry	DSPFIL	MYALDFR		

SEL: Z-Dtls, P-Parms, N-Harr., F-Action diagram, S-Device Design, T-Structure, A-Acp, G/J-Gen, E-STRSEU(pgm), L-Locks, D-Delete, U-Where used, 3-Doc. F3=Exit F5=Reload
Source generation request for MYACEFR accepted. +

Press F3 to return to the Display Services Menu.

Submit Batch Generation and Creation

In this step you will use the Display Services Menu to Submit generations and compilations of all the access paths and external functions you have selected.

Generating and Creating Objects

When you submit a request for generation/compilation, the CA 2E generator automatically does the following.

- The member names to be generated are placed in a job list. The same job list controls generation and compilation. You can review this job list during generation to monitor the process and edit the job list.
- Source is produced and placed in the appropriate source file in the generation library associated with your CA 2E design model.
- The generated source is compiled from the source file.
- CA 2E assigns a status to each member on the list. Once source is successfully generated for the members, CA 2E automatically submits a request to compile the generated source. If errors occur, CA 2E flags the specific members in error.

You can submit generations and compilations of all the items in the list from the Display Services Menu.

To submit your generation/compilation request, select the Submit model create request (YSBMMDLCRT) option.

```
DISPLAY SERVICES MENU           My model
Generation                     1. Submit model create request (YSBMMDLCRT)
                               2. Convert model data menu
                               3. Job list menu
Documentation                   6. Documentation menu
                               7. Convert model panel designs (YCVTMDLPNL)
Model                          8. Display all access paths
                               9. Display all functions
                               10. Display model values (YDSPMDLVAL)
                               11. Edit model profile (YEDTMDLPRF)
                               12. Work with model lists (YWRKMDLLST)
                               13. Edit model list (YEDTMDLLST *SESSION)
                               14. Impact analysis menu
Change Control                 21. Go to 2ECM menu
                               Option: 1 (press F4 to prompt commands)
F3=Exit F6=Messages F8=Submitted jobs F9=Command line F10=Display job log
```

Press Enter to execute the Submit Model Create Requests (YSBMMDLCRT) command.

Note: CA 2E supplies default parameter values for the YSBMMDLCRT command based on your model profile and options you specified when you created your model. You can override these defaults by pressing F4 instead of Enter to prompt the command.

List of Objects to be Generated and Created

CA 2E displays a list of the source members to be generated and compiled. Each member has either GEN or CRT next to it to indicate whether the member has been submitted for generation or compilation. In this case, all the functions and access paths should show GEN. You can review the list by pressing Roll Up and Roll Down.

```

SUBMIT MODEL GENERATIONS & CREATES. My model

                                           GENLIB: MYGEN
? Member      Type Act Status  Text
■ MYABREP     PF  GEN      Course      Physical file
- MYACREP     PF  GEN      Race        Physical file
- MYADCPP     PF  GEN      Race Entry  Physical file
- MYAEREP     PF  GEN      Horse       Physical file
- MYAFREP     PF  GEN      Jockey      Physical file
- MYABREL0    LF  GEN      Course      Update index
- MYACREL0    LF  GEN      Race        Update index
- MYADCLP0    LF  GEN      Race Entry  Update index
- MYAEREL0    LF  GEN      Horse       Update index
- MYAFREL0    LF  GEN      Jockey      Update index
- MYABREL1    LF  GEN      Course      Retrieval index
- MYACREL1    LF  GEN      Race        Retrieval index
- MYADCLP1    LF  GEN      Race Entry  Retrieval index  +

SEL: G-Rqs GEN, C-Rqs CRT, E-STRSEU, D-Drop, JOB(1-DSP, 4-HLD, 6-RLS, 9-CNL)
F3=Exit F5=Reload F6=Msgs F8=Submitted jobs F9=Command line ENTER=Submit
    
```

Press Roll Up until you see the bottom of the list.

```

SUBMIT MODEL GENERATIONS & CREATES. My model

                                           GENLIB: MYGEN
? Member      Type Act Status  Text
■ MYAPEFRH    PHL GEN      Edit Race   Edit file
- MYABSRR     RPG GEN      Select Course Select record
- MYACEFR     RPG GEN      Edit Course Edit file
- MYAEEFR     RPG GEN      Edit Horse  Edit file
- MYAISRR     RPG GEN      Select Horse Select record
- MYAJSRR     RPG GEN      Select Mares Select record
- MYAKSRR     RPG GEN      Select Stallions Select record
- MYALDFR     RPG GEN      Display Racing results Display file
- MYAMSRR     RPG GEN      Select Jockey Select record
- MYANEFR     RPG GEN      Edit Jockey Edit file
- MYAOSRR     RPG GEN      Select Race Select record
- MYAPEFR     RPG GEN      Edit Race   Edit file

SEL: G-Rqs GEN, C-Rqs CRT, E-STRSEU, D-Drop, JOB(1-DSP, 4-HLD, 6-RLS, 9-CNL)
F3=Exit F5=Reload F6=Msgs F8=Submitted jobs F9=Command line ENTER=Submit
    
```

Press Enter to submit the job list.

Confirming the Job List

The panel will be redisplayed with the option to confirm at the bottom right-hand corner. Accept the default of Y.

```
SUBMIT MODEL GENERATIONS & CREATES. My model

                                     GENLIB: MYGEN
? Member      Type Act Status  Text
- MYAPEFRH    PNL  GEN      Edit Race      Edit file
- MYABSRR     RPG  GEN      Select Course   Select record
- MYACEFR     RPG  GEN      Edit Course     Edit file
- MYAEEFR     RPG  GEN      Edit Horse     Edit file
- MYAISRR     RPG  GEN      Select Horse    Select record
- MYAJSRR     RPG  GEN      Select Mares    Select record
- MYAKSRR     RPG  GEN      Select Stallions Select record
- MYALDFR     RPG  GEN      Display Racing results Display file
- MYAMSRR     RPG  GEN      Select Jockey   Select record
- MYANEFR     RPG  GEN      Edit Jockey     Edit file
- MYAOSRR     RPG  GEN      Select Race     Select record
- MYAPEFR     RPG  GEN      Edit Race      Edit file

SEL: G-Rqs GEN, C-Rqs CRT, E-STRSEU, D-Drop, JOB(1-DSP, 4-HLD, 6-RLS, 9-CNL)
F3=Exit F5=Reload F6=Msgs F8=Submitted jobs F9=Command line ENTER=Submit
                                     CONFIRM:  (Y,N)
```

Press Enter.

Successful Submit for Generation and Compilation

CA 2E submits the jobs to generate and/or compile members in this list. If you request batch generation, compilation requests are also submitted by default. Compilation creates the i OS objects once the source has been generated. As a result, compilation is also referred to as *creation*. All generations are carried out in a single job called YGENSRC; a separate compilation job is submitted for each source member.

After confirming the list of objects, you will see a series of messages at the bottom of the panel. These are "Job YGENSRC is being prepared," "Existing objects are being deleted," and finally "Joblist successfully processed." In batch processing, the generations/ compilations take place in the background. You may continue to specify new objects (functions, access paths) while this is happening.

```

SUBMIT MODEL GENERATIONS & CREATES. My model

                                     GENLIB: MYGEN
? Member      Type Act Status  Text
■ MYABREP     PF  GEN *SBM  Course      Physical file
- MYACREP     PF  GEN *SBM  Race        Physical file
- MYADCPP     PF  GEN *SBM  Race Entry  Physical file
- MYAEREP     PF  GEN *SBM  Horse       Physical file
- MYAFREP     PF  GEN *SBM  Jockey      Physical file
- MYABREL0    LF  GEN *SBM  Course      Update index
- MYACREL0    LF  GEN *SBM  Race        Update index
- MYADCPLO    LF  GEN *SBM  Race Entry  Update index
- MYAEREL0    LF  GEN *SBM  Horse       Update index
- MYAFREL0    LF  GEN *SBM  Jockey      Update index
- MYABREL1    LF  GEN *SBM  Course      Retrieval index
- MYACREL1    LF  GEN *SBM  Race        Retrieval index
- MYADCPLO1   LF  GEN *SBM  Race Entry  Retrieval index

SEL: G-Rqs GEN, C-Rqs CRT, E-STRSEU, D-Drop, JOB(1-DSP, 4-HLD, 6-RLS, 9-CNL)
F3=Exit F5=Reload F6=Msgs F8=Submitted jobs F9=Command line ENTER=Submit
Joblist successfully processed
    
```

Examining the Job List

Once submitted, each item in the list is initially shown with a status of *SBM. As each item in the list is processed, the status in the list is updated as follows.

Status	Description
*GENSRC	The source member is being generated
*JOBQ	The source is on the job queue to be compiled
*ACTIVE	The source is being compiled

Press F5 to refresh the list and see the latest status.

Once the source members have been successfully compiled, they are removed from the list.

```
SUBMIT MODEL GENERATIONS & CREATES. My model

                                           GENLIB: MYGEN
? Member      Type Act Status Text
■ MYABREP     PF  GEN *GENSRC Course      Physical file
- MYACREP     PF  GEN *SBM  Race       Physical file
- MYACPP      PF  GEN *SBM  Race Entry  Physical file
- MYAEREP     PF  GEN *SBM  Horse      Physical file
- MYAFREP     PF  GEN *SBM  Jockey     Physical file
- MYABREL0    LF  GEN *SBM  Course     Update index
- MYACREL0    LF  GEN *SBM  Race       Update index
- MYACPL0     LF  GEN *SBM  Race Entry  Update index
- MYAEREL0    LF  GEN *SBM  Horse      Update index
- MYAFREL0    LF  GEN *SBM  Jockey     Update index
- MYABREL1    LF  GEN *SBM  Course     Retrieval index
- MYACREL1    LF  GEN *SBM  Race       Retrieval index
- MYACPL1     LF  GEN *SBM  Race Entry  Retrieval index +

SEL: G-Rqs GEN, C-Rqs CRT, E-STRSEU, D-Drop, JOB(1-DSP, 4-HLD, 6-RLS, 9-CNL)
F3=Exit F5=Reload F6=Msgs F8=Submitted jobs F9=Command line ENTER=Submit
```

When the compilations have been submitted, press F3 to return to the Display Services Menu. You can check the status of your submitted jobs from the Display Services Menu by pressing F8.

Converting Condition Values to a Database File

Before calling your program, you must convert the values that are entered into status fields using the Convert Condition Values (YCVTCNDVAL) command. This command moves the values you defined for status fields from the model library to the condition values list database file in the generation library.

When you convert condition values to a database file, you give end users the capability to prompt for valid condition values when they use the application. Horse gender is an example of a status field. In this case, the end user will be able to prompt the application and display a list of valid values for Horse gender, namely, M and F.

You can run the YCVTCNDVAL command to convert the condition values to a database file using the Convert model data menu, which is an option on the Display Services Menu.

Select the Convert model data menu option.

```

DISPLAY SERVICES MENU
My model
Generation      1. Submit model create request (YSBMMDLCRT)
                  2. Convert model data menu
                  3. Job list menu
Documentation  6. Documentation menu
                  7. Convert model panel designs (YCVTMDLPNL)
Model          8. Display all access paths
                  9. Display all functions
                  10. Display model values (YDSPMDLVAL)
                  11. Edit model profile (YEDTMDLPRF)
                  12. Work with model lists (VWRKMDLLST)
                  13. Edit model list (YEDTMDLLST *SESSION)
                  14. Impact analysis menu
Change Control 21. Go to 2ECM menu
                  Option: 2 (press F4 to prompt commands)
F3=Exit F6=Messages F8=Submitted jobs F9=Command line F10=Display job log

```

Press Enter.

Select the Convert condition values to database file option.

```
DISPLAY CONVERT MODEL DATA MENU      My model
      1. Convert model messages to database file.
      2. Convert condition values to database file.
      3. Convert distributed files to database file.

Option: 2

F3=Exit  F6=Messages  F8=Submitted jobs  F9=Command line
```

Press Enter to prompt the YCVTCNDVAL command.

YCVTCNDVAL Command Prompt

CA 2E supplies default values for the CA 2E design model library and the generated library. Accept the defaults.

```
Convert Condition Values (YCVTCNDVAL)
Type choices, press Enter.
Library for data model . . . . . *MDLLIB      Name, *MDLLIB, *CURLIB
Library for generation . . . . . *GENLIB      Name, *GENLIB, *CURLIB
Conversion option . . . . . *ALL      *ALL, *MDLLST

Bottom
F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F13=How to use this display
F24=More keys
```

Press Enter to execute the YCVTCNDVAL command.

Confirming Conversion of Condition Values

Once the values allowed for the status fields in your model have been converted to the database file, you will be returned to the Display Convert Model Data Menu. A message appears at the bottom of the panel to indicate that the conversion is complete.

```

DISPLAY CONVERT MODEL DATA MENU      My model

1. Convert model messages to database file.
2. Convert condition values to database file.
3. Convert distributed files to database file.

Option: █

F3=Exit F6=Messages F8=Submitted jobs F9=Command line
Condition values from model MYMDL converted to library MYGEN
    
```

Press F3 twice to return to the Edit Database Relations panel.

Exiting the CA 2E Design Model

When all the objects have been created, your program for editing the HORSE file is complete.

Press F3 to exit your design model.

```

EDIT DATABASE RELATIONS                My model
=>                                     Rel lvl: FIL
? Typ Object                           Relation Seq Typ Referenced object
█ FIL Course                            Known by   ___ FLD Course code
___ FIL Horse                            Known by   10 FLD Horse code
___ FIL Horse                            Refers to  60 FIL Horse
    For: Dam                               Sharing: *ALL
___ FIL Horse                            Refers to  70 FIL Horse
    For: Sire                               Sharing: *ALL
___ FIL Jockey                            Known by   ___ FLD Jockey code
___ FIL Race                              Owned by   ___ FIL Course
___ FIL Race                              Known by   ___ FLD Race date
___ FIL Race                              Known by   ___ FLD Race time
___ FIL Race Entry                        Owned by   ___ FIL Race
___ FIL Race Entry                        Known by   ___ FLD Entry number
___ FIL Race Entry                        Refers to  ___ FIL Horse
___ FIL Race Entry                        Refers to  ___ FIL Jockey

                                           Bottom
Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys
    
```


Calling the Program

Once the compilations you have submitted have completed successfully you can test the Edit Horse and Edit Course programs. A message is sent to your message queue when each compilation finishes.

Call your Edit Horse program from any command entry line by using the i OS CALL command to invoke your program, for example, MYAEFR, as shown below. From within your model, you can display a command entry line by pressing F9 from the Display Services menu.

Note: If you do not know the name of your Edit Horse program, you can obtain it from the Edit Function Details panel or the Display all functions option on the Display Services Menu.

When you call your program you need to specify a dummy *Return code parameter. All CA 2E programs require a dummy parameter to be passed to the program (' ' or "). This return code can be used to communicate between programs in more complex applications.

Type the program name that corresponds to your Edit Horse function and return code.

```

MAIN                               2E Main Menu
Level . : 1                          System: 2EDV1
Select one of the following:

Design Model          1. Display Designer (*DSNR) menu
                       2. Display Programmer (*PGMR) menu
                       3. Display User (*USER) menu

                       8. Work with Model Object Lists
                       9. Change to work with another model

Commands           50. 2E commands in alphabetical order

                       51. Commands to set up or alter a model
                       52. Commands to copy a model
                       53. Commands to create an application
                       54. Commands to document a model

Selection or command More...
===> call myaeefr ' '

F3=Exit  F6=Messages  F9=Prev. request  F10=Cmd Entry  F14=Submitted jobs
Maximum capability to access model MYMDL is *DSLK.
    
```

Press Enter.

Note: To test complex programs, you can use the CA 2E Call a Program (Y2CALL) command. This command loads your model and determines the parameters required by an external function directly from details contained in the model. You can provide values for all input-capable fields and you can re-use these values for subsequent calls. You can also retrieve and display output parameters when the called program ends.

The Edit Horse Function Panel

An empty panel will be displayed. The Edit File function operates in two alternate modes, one to add new records (New mode) and one to change existing records (Open mode). Use the F9 function key to toggle between the two modes.

Note that the program mode is Open. Since there are no existing records to update, you first need to change to New mode to add records to the file.

```
File  Selector  Help
-----
MYAHEFR  OPEN                               2/03/95 15:50:31
                                Edit Horse
Horse code .  █
Select items, then select an action.

F3=Exit  F5=Reset  F9=New  F10=Actions
No data to display.
```

Press F9 to switch to New mode to add data to the HORSE file.

Adding Data to the HORSE File

An empty input panel is displayed. Note that the program mode is New. This is where you may add new data. The panel should have the design you created and data should be validated according to the rules you specified in the design. Test this out by entering invalid values. Also try pressing F4 for the Horse gender field to display a selection list of available values.

To add data to the database file, type horse details.

```

File  Selector  Help
-----
MYAEEFR  NEW                                     10/04/95 15:47:14
                                     Edit Horse

Select items, then select an action.

Opt  Horse  Horse name  Horse  Horse value  Date of
code                               gender
-   BDNFIR  Bonfire      M      5000  020188
    Dam
    Sire
-   DOBBIN  Faithful Dobbin  F      3500  053186
    Dam
    Sire
-   PEGASU  Pegasus      M      3000  062392
    Dam
    Sire
F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press Enter.

Confirming Data Entries for the Horse File

You will be prompted with a Confirm prompt before the update is completed. As you saw in the function option topic of this tutorial, the confirm prompt is an optional feature of a function. You could omit it from the design if desired.

Earlier in the tutorial, in the Function Options topic, you set the initial value of the Confirm prompt to Y. Verify that the initial value of the Confirm prompt is Y.

```

File  Selector  Help
-----
MYAEEFR  NEW                                10/04/95 15:50:47
                                Edit Horse

Select items, then select an action.

Opt  Horse  Horse name          Horse  Horse value  Date of
   code                gender                birth
-   BONFIR  Bonfire                M      5000.00      20188
   Dam _____  Dam Date of birth _____
   Sire _____  Sire Date of birth _____

-   DOBBIN  Faithful Dobbin        F      3500.00      53186
   Dam _____  Dam Date of birth _____
   Sire _____  Sire Date of birth _____

-   PEGASU  Pegasus                M      3000.00      62392
   Dam _____  Dam Date of birth _____
   Sire _____  Sire Date of birth _____

F3=Exit  F5=Reset  F9=Open  F10=Actions
                                CONFIRM: Y (Y/N)
    
```

Press Enter.

Note that once added, the key fields cannot be changed except by deletion.

After the new data has been successfully added, another empty subfile page is displayed, ready for more entries.

```

File  Selector  Help
-----
MYAEEFR  NEW                                10/04/95 15:52:45
                                Edit Horse

Select items, then select an action.

Opt  Horse  Horse name          Horse  Horse value  Date of
   code                gender                birth
█   _____  _____          -   _____  _____
   Dam _____  Dam Date of birth _____
   Sire _____  Sire Date of birth _____

-   _____  _____          -   _____  _____
   Dam _____  Dam Date of birth _____
   Sire _____  Sire Date of birth _____

-   _____  _____          -   _____  _____
   Dam _____  Dam Date of birth _____
   Sire _____  Sire Date of birth _____

F3=Exit  F5=Reset  F9=Open  F10=Actions
                                +
    
```

Switching from New to Open Mode

Press F9 to switch to Open mode to view the records you just added to the database.

Now that you have several horses in your database, you can make them parents. Type the details of the Dam and Sire of Pegasus.

```

File  Selector  Help
-----
MYAEEFR  OPEN                               10/04/95 15:54:48
                                Edit Horse
Horse code .  _____
Select items, then select an action.

Opt  Horse  Horse name                Horse  Horse value  Date of
code                                gender
-   BONFIR  Bonfire                      M      5000.00  20188
    Dam _____                Dam Date of birth
    Sire _____                Sire Date of birth

-   DOBBIN  Faithful Dobbin              E      3500.00  53186
    Dam _____                Dam Date of birth
    Sire _____                Sire Date of birth

-   PEGASU  Pegasus                      M      3000.00  62392
    Dam DOBBIN                    Dam Date of birth
    Sire BONFIR                    Sire Date of birth

F3=Exit  F5=Reset  F9=New  F10=Actions
    
```

Press Enter to retrieve the values for the four virtual fields you added, Dam name, Sire name, Dam Date of birth, and Sire Date of birth.

```

File  Selector  Help
-----
MYAEEFR  OPEN                               10/04/95 15:56:04
                                Edit Horse
Horse code .  _____
Select items, then select an action.

Opt  Horse  Horse name                Horse  Horse value  Date of
code                                gender
-   BONFIR  Bonfire                      M      5000.00  20188
    Dam _____                Dam Date of birth
    Sire _____                Sire Date of birth

-   DOBBIN  Faithful Dobbin              E      3500.00  53186
    Dam _____                Dam Date of birth
    Sire _____                Sire Date of birth

-   PEGASU  Pegasus                      M      3000.00  62392
    Dam DOBBIN Faithful Dobbin    Dam Date of birth  5/31/86
    Sire BONFIR Bonfire           Sire Date of birth 2/01/88

F3=Exit  F5=Reset  F9=New  F10=Actions

                                CONFIRM:  (Y/N)
    
```

Press Enter to accept the default value of Y for the Confirm prompt.

Exiting the Edit Horse Program

Exit your program by pressing F3.

```
File  Selector  Help
-----
MYAEEFR  OPEN                               10/04/95 15:56:46
                                Edit Horse
Horse code . █
Select items, then select an action.

Opt  Horse  Horse name  Horse  Horse value  Date of
code                                gender
-   BONFIR  Bonfire      M      5000.00  20188
    Dam _____  Dam Date of birth
    Sire _____  Sire Date of birth

-   DOBBIN  Faithful Dobbin  E      3500.00  53186
    Dam _____  Dam Date of birth
    Sire _____  Sire Date of birth

-   PEGASU  Pegasus      M      3000.00  62392
    Dam DOBBIN Faithful Dobbin  Dam Date of birth  5/31/86
    Sire BONFIR Bonfire      Sire Date of birth  2/01/88

F3=Exit  F5=Reset  F9=New  F10=Actions
```

Exercises

Do the following exercises in the order shown. If you did not write down the program names you can obtain them from the Edit Function Details panel or the Display all functions option on the Display Services Menu.

1. Call the Edit Course program and add some race courses.
2. Call the Edit Jockey program to add some jockeys.

Test the Select Stallions and Select Mares functions, by calling the Edit Horse program and typing ? or pressing F4 in the Sire and Dam fields.

Chapter 6: Maintaining Your Application

This chapter introduces the following topics:

- Application Maintenance
- Prototyping (Animation)
- Model Object List Processing
- Function Versioning
- Model Object Cross References
- Impact Analysis

Note: These topics are not needed to complete the tutorial. In addition, some of the concepts covered are advanced and may be more suitable after you complete the *Advanced Functions* and *Report Functions* chapters. As a result you can safely skip them now and return to them after completing the *Report Functions* chapter.

This section contains the following topics:

- [Application Maintenance](#) (see page 244)
- [Animating an Interactive Device Design](#) (see page 244)
- [Working with Model Object Lists](#) (see page 265)
- [Function Versioning](#) (see page 287)
- [Model Object Cross References](#) (see page 312)
- [Impact Analysis](#) (see page 323)

Application Maintenance

The life of an application does not end once development is complete. Over time, the business requirements may change or users may request additional functionality. These application updates can be accomplished easily by applying the same principles and procedures that have been discussed so far.

For example, if you change the length of a field, CA 2E automatically modifies all files and functions that use the changed field, including associated panels and reports. You will need to examine the panel and report designs to ensure that they have not exceeded their limits, and then regenerate the files and functions. The Submit model create process provides options to save data prior to generation and compile.

To aid you in managing changes and identifying the impact of a change on your model, CA 2E provides a set of powerful tools that are the subject of the rest of this chapter.

Animating an Interactive Device Design

Before making a change, you can test and demonstrate the proposed device design using a process called *prototyping* or *animation*. In this topic you will use CA 2E animation to simulate the link between the Edit Horse function and the Display Racing results function.

New terms introduced

- Animation
- Prototyping
- CA 2E Toolkit

New panels introduced

- Animate Function Panels
- Open Functions
- Toolkit Work with Panel Title Details
- Toolkit Work with Panel Command Key Usage
- Toolkit Edit Choices
- Toolkit Edit Actions

Overview of CA 2E Animation

CA 2E animation provides a direct link between CA 2E and the Toolkit prototyping facilities. *Toolkit* is a set of implementation, support, and system utilities that include menu design, panel design, prototyping, documentation aids, and object list processing. CA 2E animation lets you transfer control to Toolkit, where you can interactively simulate your CA 2E panel designs, and then easily return to CA 2E.

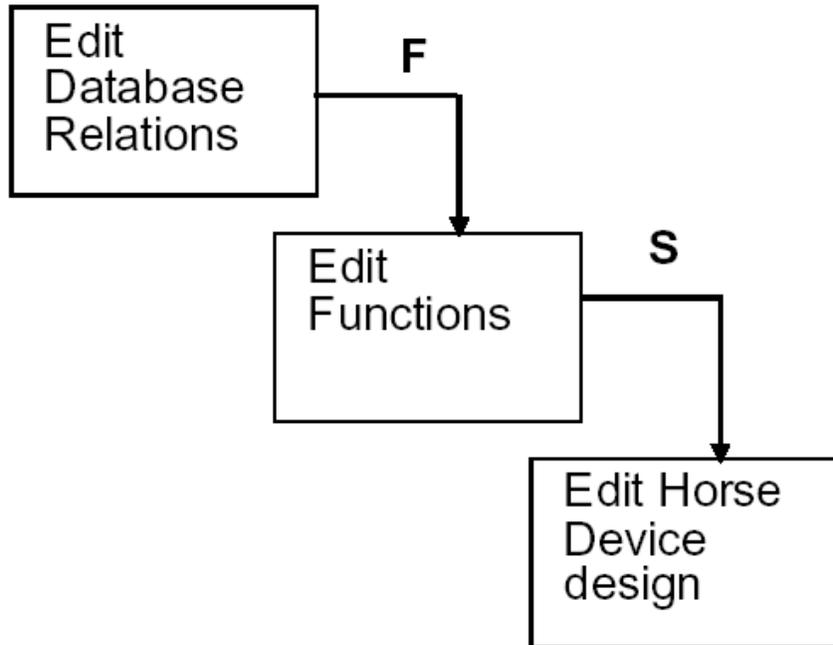
You can animate a function before you make any changes to its default action diagram. This lets you thoroughly test your device design before you commit to specific programming logic, which is more difficult and time-consuming to change. In addition, you do not need to generate and compile a function before you animate it.

For example, you can use animation to demonstrate a proposed design to end users for their review and approval. You can immediately implement any suggestions for improvement of the device design using the CA 2E Device Design Editor and then return to Toolkit to demonstrate the updated design. You can repeat this process until you are satisfied with the design. At that point, you can begin editing the action diagram to implement your design.

Animate the Edit Horse Device Design

This step demonstrates the process required to animate the link between the Edit Horse and Display Racing results functions.

Begin by displaying the device design for the Edit Horse function. Here's a reminder.



```
File  fUction  Selector  Help
-----
*PROGRAM  *PGMMOD                                DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code . _____
Select items, then select an action.

Opt  Horse  Horse name                Horse  Horse  Date of
code code  name                        gender value  birth
-----
-   Dam  _____  00000000000000000000000000000000  Dam  Date of birth  66/66/66
   Sire  _____  00000000000000000000000000000000  Sire  Date of birth  66/66/66
-
   Dam  _____  00000000000000000000000000000000  Dam  Date of birth  66/66/66
   Sire  _____  00000000000000000000000000000000  Sire  Date of birth  66/66/66
-
   Dam  _____  00000000000000000000000000000000  Dam  Date of birth  66/66/66
   Sire  _____  00000000000000000000000000000000  Sire  Date of birth  66/66/66

F3=Exit  F5=Reset  F9=Open  F10=Actions
```

Press F2 to display the Animate Function Panels panel.

```

Animate Function Panels                My model
Convert Model Panel. : Y (Y-Yes,N-No)  Convert all panels : Y (Y-Yes,N-No)
Replace Navigation : N (Y-Yes,N-No)
Replace Action Bar : N (Y-Yes,N-No)
Clear Narrative. . . : N (Y-Yes,N-No)
Clear Test Data. . . : N (Y-Yes,N-No)

Panel Name(s). . . . : *SRCMBR      *SRCMBR, *SELECT, *panel, name
File . . . . . : YDSHPNL      Name
Library. . . . . : *MDLLIB      *MDLLIB, *GENLIB, *LIBL, name
Member . . . . . : *FILE       *FILE, name

Display. . . . . : Y (Y-Yes,N-No)
Display Option . . . : 1 1-DSPDATA, 2-DSPATR, 3-CHGDTA, 4-WRKPANL

Return to this device design . . . . . : N (Y-Yes,N-No)

Enter=Execute   F3=Exit
    
```

Animate Functions Panel

This panel is the link between CA 2E and Toolkit. It lets you convert a CA 2E device design to a Toolkit panel design and optionally transfer control to Toolkit. Use options on this panel to specify the tasks you want to accomplish in Toolkit; for example, you can

- Display and work with Toolkit panel designs
- View field and display attributes
- Enter sample data
- Animate panels, windows, and action bars from the current CA 2E device design
- Demonstrate and test navigation using function keys, subfile selection, and action bars

Animating Edit Horse

In this step you will convert the Edit Horse device design to a Toolkit panel design by accepting the default of Y for the Convert Model Panel field. You also need to convert the CA 2E command key and action bar navigation so you can simulate the link between the two functions. To enter sample data, you need to change the Display Option field to 3 (CHGDTA).

Type **Y** for Replace Navigation, **Y** for Replace Action Bar, and **3** for the Display Option field.

```
Animate Function Panels          My model
Convert Model Panel . . . . . : Y (Y-Yes,N-No)  Convert all panels : Y (Y-Yes,N-No)
Replace Navigation . . . . . : Y (Y-Yes,N-No)
Replace Action Bar . . . . . : Y (Y-Yes,N-No)
Clear Narrative . . . . . : N (Y-Yes,N-No)
Clear Test Data . . . . . : N (Y-Yes,N-No)

Panel Name(s) . . . . . : *SRCMBR *SRCMBR, *SELECT, *panel, name
File . . . . . : YDSNPHL Name
Library . . . . . : *MDLLIB *MDLLIB, *GENLIB, *LIBL, name
Member . . . . . : *FILE *FILE, name

Display . . . . . : Y (Y-Yes,N-No)
Display Option . . . : 3 1-DSPDTA, 2-DSPATR, 3-CHGDTA, 4-WRKPNL

Return to this device design . . . . . : N (Y-Yes,N-No)

Enter=Execute  F3=Exit
```

Press Enter to display the Toolkit panel design corresponding to your CA 2E device design. Notice the messages at the bottom of the panel as CA 2E converts the device design and the function key and action bar navigation.

Entering Sample Data for Edit Horse

You can now enter sample data in the input-capable fields. These are indicated below by underscores. Output-only fields are shown in black.

Note: The Toolkit panel design reflects the colors or other display attributes you included in your CA 2E

device design.

```

File  fUction  Selector  Help
-----
*PROGRAM  *PGMMOD                      DD/MM/YY HH:MM:SS
Edit Horse
Horse code .  █
Select items, then select an action.
Opt Horse  Horse name          Horse  Horse value  Date of
code      name                  gender  value         birth
-----
-  Dam     _____             _____  _____  _____
  Sire    _____             _____  _____  _____
-  Dam     _____             _____  _____  _____
  Sire    _____             _____  _____  _____
-  Dam     _____             _____  _____  _____
  Sire    _____             _____  _____  _____
                                     +
F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Type the following sample data. Use the Tab and Field Exit keys as you would on a real panel.

```

File  fUction  Selector  Help
-----
*PROGRAM  *PGMMOD                      DD/MM/YY HH:MM:SS
Edit Horse
Horse code .  _____
Select items, then select an action.
Opt Horse  Horse name          Horse  Horse value  Date of
code      name                  gender  value         birth
-----
-  BONFIR Bonfire             M         5000      020188
  Dam     _____             _____  _____  _____
  Sire    _____             _____  _____  _____
-  DOBBIN Faithful Dobbin     F         3500      053186
  Dam     _____             _____  _____  _____
  Sire    _____             _____  _____  _____
-  PEGASU Pegasus             M         3000      062392
  Dam     BONFIR             _____  _____  _____
  Sire    DOBBIN             _____  _____  _____
                                     +
F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press Enter to confirm your entries. This data will be retained until you choose to Clear Test Data on the Animate Function Panels panel. Press F3 to return to the CA 2E device design for Edit Horse.

Editing and Maintaining Multiple Functions

In the next step you will animate the Display Racing results function using the same process you just used for the Edit Horse function. Since you will need to access the Edit Horse function again later in this process, it will save time not to exit and close it while you animate the Display Racing results function. The Open Functions panel lets you maintain several functions simultaneously.

From the Edit Horse device design, press F3 to exit to the Edit Function Devices panel.

```
EDIT FUNCTION DEVICES                My model
Function name. . : Edit Horse          Type : Edit file
Received by file : Horse              Acpth: Retrieval index

? Title
Screen title..... ■ Edit Horse

SEL: Z-Scr/rpt design, N-Narrative, A-Animate
F3=Exit F5=Action diagram F15=Open Functions
```

Open Functions Panel

Press F15 to access the Open Functions panel. You can access this panel from many CA 2E panels; for example, option O on the Edit Functions panel lets you open multiple functions. This panel lets you open, edit, and maintain several functions simultaneously; in other words, you do not need to exit and close one function before you open another function for editing. This capability can save a significant amount of time. You can switch quickly and easily between the action diagrams, device designs, generated source, and parameter definitions for all open functions.

Note that the Edit Horse function is listed on the Open Functions panel since you have not yet exited and closed it. To open another function, type the name of the file and the name of the function in the File and Function fields. If you are uncertain of the names, type ? in these fields instead to display selection lists. You can also type * for the File field if the function you wish to open is attached to the same file as the first open function listed, in this example, the HORSE file.

In this case, you want to open the Display Racing results function on the RACE ENTRY file, type the following names:

```

OPEN FUNCTIONS                               My Model
Edit Function Action Diagram,
File      Race Entry                          Function  Display Racing results
OR enter options for the following:
? File    *2E reserved pgm data              Function  *Notepad      Type      GEN name
- Horse   Edit Horse                          *Notepad      EXCINTFUN  *N/A
-                               Edit Horse                          EDTFIL    MYAEEFR

SEL: A-Animate, P-Parms, F-Action diagram, S-Device Design, E-STRSEU, X-Exit
F3=Exit All Open Functions  F5=Refresh
    
```

Press Enter to open the Display Racing results function and display its action diagram. Press F15 to return to the Open Functions panel.

Note: Display Racing results now appears on the list. From this panel you can edit a function’s device design, action diagram, or parameters; you can also animate the function.

Animating the Display Racing Results Function

Type **A** in the Subfile selector for the Display Racing results function as shown to animate this function.

```
OPEN FUNCTIONS                               My Model
Edit Function Action Diagram,
File _____ Function _____
OR enter options for the following:
? File          Function          Type          GEN name
- *2E reserved pgm data  *Notepad      EXCINTFUN     *N/A
- Horse        Edit Horse      EDTFIL        MYAEEFR
A Race Entry   Display Racing results  DSPFIL        MYALDFR

SEL: A-Animate, P-Parms, F-Action diagram, S-Device Design, E-STRSED, X-Exit
F3=Exit All Open Functions  F5=Refresh
```

Press Enter to display the Animate Function Panels panel.

Converting Command Key Navigation

In this step you will convert both the device design and the command keys defined for the CA 2E device design, and edit the command key assignments in Toolkit.

To accomplish this, type **Y** for Replace Navigation and type **4** (WRKPNL) for the Display Option.

Press Enter. The CA 2E device design for the Display Racing results function is converted to a Toolkit panel design and control is transferred to Toolkit.

Working with Toolkit Panel Designs

The Toolkit Work with Panel Titles panel displays. You can use this panel to edit the Toolkit panel design, including the panel layout, command keys, and action bar. Note the following on this panel.

The CA 2E related program name at the bottom of the panel; in this case, MYALDFR. This is the program implementation name of the CA 2E function corresponding to this Toolkit panel design. It serves as the link back to the CA 2E function. If the function is not already open on return to CA 2E, it is automatically added to the Open Functions panel before its device design is displayed.

The name of the panel design; in this case, MYALDFR1. By default this is the CA 2E program implementation name followed by 1. You will need this name when you set up the link in the Edit Horse Toolkit panel design.

Because you requested that command key navigation be replaced during the conversion, type **3** for the Option field as shown to view the results of the command key conversion.

Work with Panel Title Details

```

Panel. . . . . : MYALDFR1      Next panel. . . . : _____
Title . . . . . : Display Racing results _____
Print sequence. : _____
Fixed header. . : _ (Y,blank)
Fixed Footer. . : _ (Y,blank)
Window. . . . . : _ (Y,blank)
Action Bar. . . : Y (Y,blank)

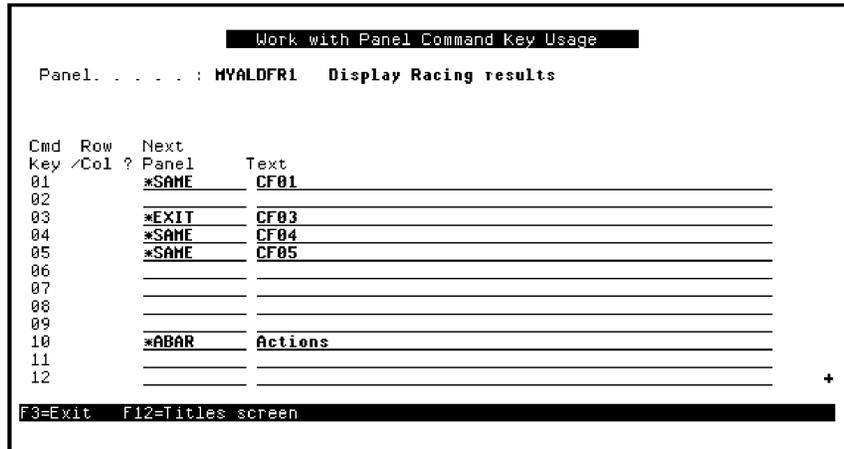
Option. . . . . : 3 1-Panel, 2-Narrative, 3-Command keys,
                    5-Window, 6-Action Bar

2E related program name . . . . . : MYALDFR _____
    
```

F3=Exit

Toolkit Command Key Navigation

This panel shows which panel is to be displayed when a command key is pressed during program simulation in Toolkit. Entries are shown only for command keys defined for the function in CA 2E.



The possible values for the Next Panel column are:

Value	Description
*PRV	Display the previous panel
*SAME	Redisplay the current panel
*EXEC	Execute the command string shown in the Text column
*EXIT	Exit the program
*ABAR	Activate the action bar
name	Display the named Toolkit panel design

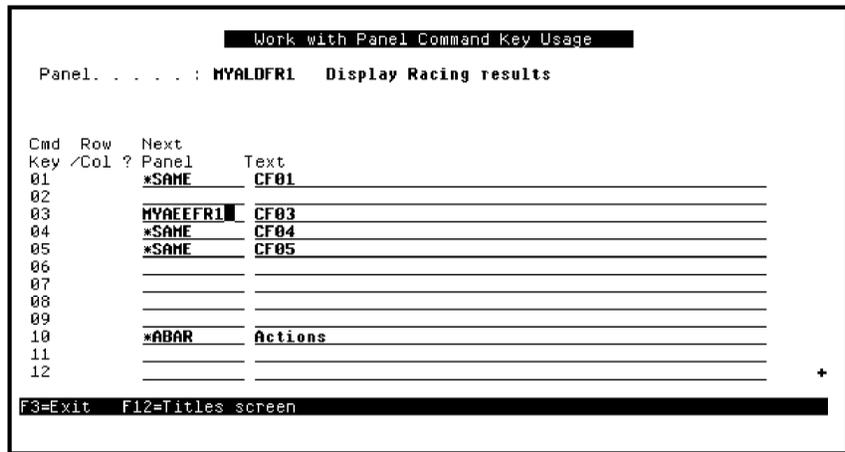
If you had not converted the command key navigation when you converted the Display Racing results function, only the F3 command key would be defined. This is done by default to provide a way to return to CA 2E that you can easily remember. You can also return to CA 2E by pressing the Home key.

Note: Refer to the documentation for your terminal or computer to learn which key is the Home key on your system.

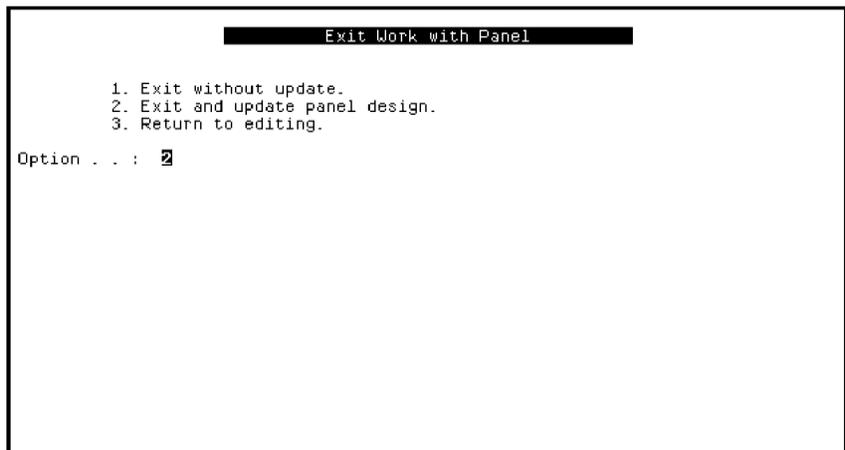
Reassigning a Command Key in Toolkit

Since the Display Racing results function is called from the Edit Horse function, the F3 command key should return to Edit Horse. Type the name of the Toolkit panel design that corresponds to the Edit Horse function in the Next Panel column for the F3 command key as shown. By default this is the function's implementation name followed by a 1; for example, MYAEEFR1.

Type the Toolkit panel design name that corresponds to your Edit Horse function. You can also type a ? to select from a list of Toolkit panel designs.



Press Enter to confirm your changes. Press F3 to exit.



Press Enter to update the panel design and return to the CA 2E Open Functions panel.

Setting Up Action Bar Navigation for Edit Horse

In this step you will set up the command key and action bar navigation for the Edit Horse function so you can simulate the link between the Edit Horse and the Display Racing results functions using Toolkit.

Type **A** in the Subfile selector to animate the Edit Horse function.

```

OPEN FUNCTIONS                               My Model
Edit Function Action Diagram,
File                                         Function
-----
OR enter options for the following:
? File                                     Function      Type          GEN name
_ *2E reserved pgm data                  *Notepad      EXCINTFUN     *N/A
^ Horse                                  Edit Horse    EDTFIL        MYAEEFR
_ Race Entry                             Display Racing results  DSPFIL        MYALDFR

SEL: A-Animate, P-Parms, F-Action diagram, S-Device Design, E-STRSEU, X-Exit
F3=Exit All Open Functions  F5=Refresh
    
```

Press Enter.

Because you have already converted this panel design, including the command key and action bar navigation, you can change the value of the Convert Model Panel to **N**.

Type **N** for Convert Model Panel and change the Display Option to **4** (WRKPNL) to work with the Toolkit panel design.

```

Animate Function Panels                       My model
Convert Model Panel : N (Y-Yes,N-No)  Convert all panels : Y (Y-Yes,N-No)
Replace Navigation : N (Y-Yes,N-No)
Replace Action Bar : N (Y-Yes,N-No)
Clear Narrative. . : N (Y-Yes,N-No)
Clear Test Data. . : N (Y-Yes,N-No)

Panel Name(s). . . : *SRCHBR          *SRCHBR, *SELECT, *panel, name
File . . . . . : YDSNPHL             Name
Library. . . . . : *MDLLIB          *MDLLIB, *GENLIB, *LIBL, name
Member . . . . . : *FILE            *FILE, name

Display. . . . . : Y (Y-Yes,N-No)
Display Option . . : 4 1-DSPDTA, 2-DSPATR, 3-CHGDTA, 4-WRKPNL

Return to this device design . . . . . : N (Y-Yes,N-No)

Enter=Execute  F3=Exit
    
```

Press Enter.

Assigning Action Bar Navigation

You need to change the action bar navigation so the Display Racing results Toolkit panel design displays when you select it from the Selector Choice menu on the Edit Horse panel design. Type **6** in the Option field to set up the action bar navigation.

```

Work with Panel Title Details

Panel . . . . . : MYAEFR1      Next panel. . . : _____
Title . . . . . :  Edit Horse
Print sequence. : _____
Fixed header. . : _ (Y,blank)
Fixed Footer. . : _ (Y,blank)
Window. . . . . : _ (Y,blank)
Action Bar. . . :  Y (Y,blank)

Option. . . . . :  3 1-Panel, 2-Narrative, 3-Command keys,
                    5-Window, 6-Action Bar

2E related program name . . . . . :  MYAEFR

F3=Exit
    
```

The Toolkit Edit Choices panel shows the action bar choices that were defined on the CA 2E device design. You need to edit actions for the Selector Choice menu.

Type **A** to edit the actions for the Selector Choice menu.

```

Edit Choices

Panel name . . . . . : MYAEFR1
File . . . . . : VDSNPNL
Library. . . . . : MYMDL
Member . . . . . : VDSNPNL

Choice Sequence . . . . . (position)

Type options, press Enter.
A=Actions D=Delete

? Sequence Mnemonic Text
- 1 F File _____
- 4 U fUnction _____
A 5 S Selector _____
- 99 H Help _____

F3=Exit F4=Prompt F9=Go to 'Add' mode F12=Titles screen
    
```

Press Enter to display the Toolkit Edit Actions panel.

Note that the Next Panel column contains *SAME. This means that, by default, if you select Display Racing results from the action bar while simulating your program, the Edit Horse panel would be displayed again. Instead, you want to display the Toolkit panel design for the Display Racing results function.

```
                                Edit Actions

Panel name . . . . : MYAEEFR1
Choice Sequence . . : 5
Choice Text . . . . : Selector

Action number .   █ (position)

Type options, press Enter.
C=Command String  D=Delete

? Number  Text                               Next Panel
_  1      Display Racing results             *SAME

F3=Exit  F4=Prompt  F9=Go to 'Add' mode
```

Type the name of the Toolkit panel design assigned to the Display Racing results function in the Next Panel column as shown. By default, this is the CA 2E program implementation name followed by a 1; in this example, MYALDFR1 or type ? for a selection list of Toolkit panel designs.

```
                                Edit Actions

Panel name . . . . : MYAEEFR1
Choice Sequence . . : 5
Choice Text . . . . : Selector

Action number .   _ (position)

Type options, press Enter.
C=Command String  D=Delete

? Number  Text                               Next Panel
_  1      Display Racing results             MYALDFR1

F3=Exit  F4=Prompt  F9=Go to 'Add' mode
```

Press Enter to confirm the change. Press F3 to return to the Edit Choices menu.

```

Edit Choices

Panel name . . . . . : MYAEEFR1
File . . . . . : VDSNPNL
Library . . . . . : MVMIDL
Member . . . . . : VDSNPNL

Choice Sequence . █ (position)

Type options, press Enter.
A=Actions  D=Delete

? Sequence Mnemonic Text
- 1 F File
- 4 U fUction
- 5 S Selector
- 99 H Help

F3=Exit  F4=Prompt  F9=Go to 'Add' mode  F12=Titles screen
    
```

Press F3 to exit.

```

Exit Work with Panel

1. Exit without update.
2. Exit and update panel design.
3. Return to editing.

Option . . : 2
    
```

Press Enter to exit and update the Toolkit panel design.

Animating Edit Horse

Press F2 to display the Animate Function Panels panel. Since you have already converted the CA 2E device design to a Toolkit panel design you can either accept the defaults or type **N** for the Convert Model panel field. Typing **N** can save time. In this case accept the defaults.

```

Animate Function Panels                My model
Convert Model Panel. : Y (Y-Yes,N-No)  Convert all panels : Y (Y-Yes,N-No)
Replace Navigation : H (Y-Yes,N-No)
Replace Action Bar : H (Y-Yes,N-No)
Clear Narrative. . : H (Y-Yes,N-No)
Clear Test Data. . : H (Y-Yes,N-No)

Panel Name(s). . . . : *SRCMBR *SRCMBR, *SELECT, *panel, name
File . . . . . : YDSHPNL Name
Library. . . . . : *MDLLIB *MDLLIB, *GENLIB, *LIBL, name
Member . . . . . : *FILE *FILE, name

Display. . . . . : Y (Y-Yes,N-No)
Display Option . . : 1 1-DSPDTA, 2-DSPATR, 3-CHGDTA, 4-WRKPNL

Return to this device design . . . . . : H (Y-Yes,N-No)

Enter=Execute F3=Exit
    
```

Press Enter. The Toolkit panel design for the Edit Horse function displays showing the sample data you entered earlier. Input-capable fields are indicated by underscores; output-only fields are shown in black.

Activate the Action Bar

To demonstrate the link between the two functions type / against one of the subfile records and press F10 to activate the action bar.

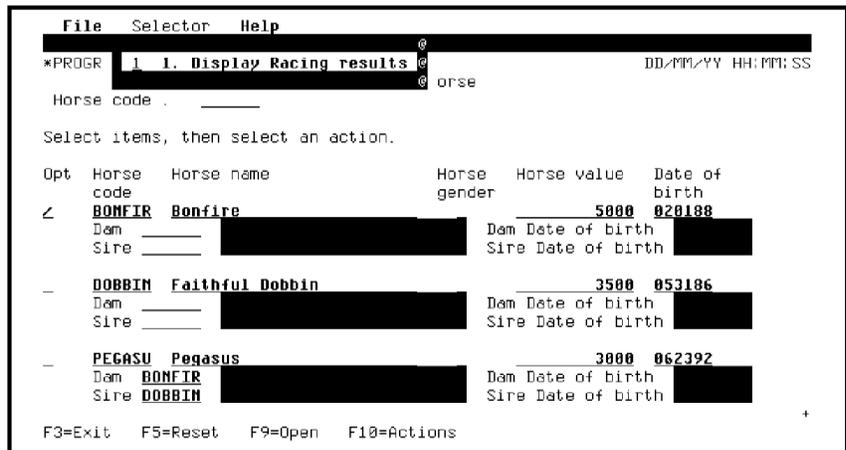
```

File Selector Help
*PROGRAM *PGMMOD                               DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code . _____
Select items, then select an action.

Opt Horse Horse name           Horse gender Horse value Date of
code                                     birth
/ BONFIR Bonfire                M           5000   020188
  Dam _____ Dam Date of birth _____
  Sire _____ Sire Date of birth _____
- DOBFIN Faithful Dobbin        F           3500   053186
  Dam _____ Dam Date of birth _____
  Sire _____ Sire Date of birth _____
- PEGASU Pegasus              M           3000   062392
  Dam _____ Dam Date of birth _____
  Sire _____ Sire Date of birth _____ +

F3=Exit F5=Reset F9=Open F10=Actions
    
```

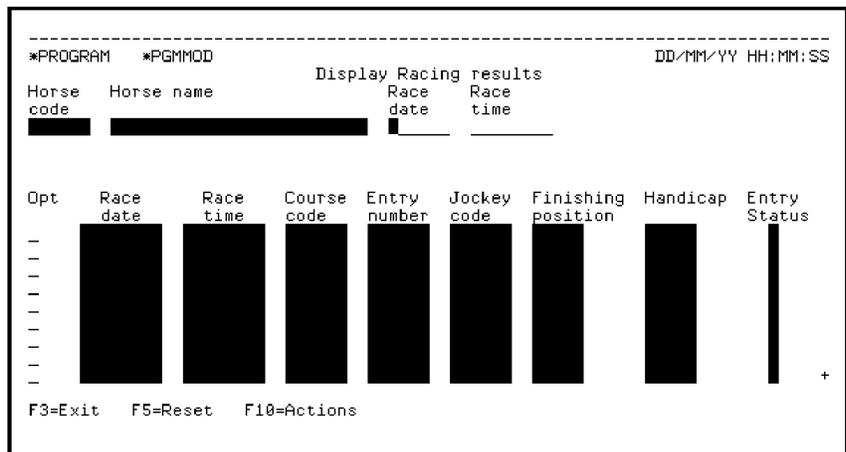
Type **S** to select the Selector Choice menu from the action bar; note that it includes Display Racing results as an action. Type **1** to select Display Racing results.



Press Enter.

Display Racing Results Panel Design

The Toolkit panel design for the Display Racing results function displays. Input-capable fields are indicated by underscores; output-only fields are shown in black.



Next test the command key navigation you set up for the Display Racing results panel design by pressing F3. This should cause a return to the Toolkit panel design for Edit Horse.

```

File  fUnction  Selector  Help
-----
*PROGRAM  *PGM10D                      DD/MM/YY HH:MM:SS
                                Edit Horse
Horse code .  █
Select items, then select an action.

Opt  Horse  Horse name          Horse  Horse value  Date of
code  code          gender          gender          birth
-----
-  BONFIR  Bonfire                M          5000          020188
  Dam _____ Dam Date of birth _____
  Sire _____ Sire Date of birth _____
-  DOBBIH  Faithful Dobbin        F          3500          053186
  Dam _____ Dam Date of birth _____
  Sire _____ Sire Date of birth _____
-  PEGASU  Pegasus                M          3000          062392
  Dam _____ Dam Date of birth _____
  Sire _____ Sire Date of birth _____
+

F3=Exit  F5=Reset  F9=Open  F10=Actions
  
```

Press F3 to return to the CA 2E device design for the Edit Horse function.

You could now make design changes to the device design and repeat the animation process until you are satisfied with the results.

Note: If you have defined command key or action bar navigation in Toolkit, do **not** choose the options to replace action bar or command key navigation when you reanimate. In other words, accept the defaults for the Replace options on the Animate Function Panels panel.

Exiting Both Functions

Press F3 to exit the Device Design Editor. At the Edit Function Devices panel press F15 to return to the Open Functions panel. From this panel you can either exit all open functions, or you can exit functions individually using the X Subfile selector option. In this case, you will exit all open functions.

```
OPEN FUNCTIONS                               My Model
Edit Function Action Diagram,
File _____ Function _____
OR enter options for the following:
? File           Function           Type           GEN name
_ *2E reserved pgm data *Notepad       EXCINTFUN     *N/A
_ Horse          Edit Horse      EDTFIL        MYAEEFR
_ Race Entry     Display Racing results DSPFIL        MYALDFR

SEL: A-Animate, P-Parms, F-Action diagram, S-Device Design, E-STRSEU, X-Exit
F3=Exit All Open Functions  F5=Refresh
```

Press F3 to exit all open functions. You will proceed through the following steps.

The Exit Function Definition panel displays a second time for the Edit Horse function. Press Enter to accept the defaults.

The Exit Function Definition panel displays first for the Display Racing results function. Press Enter to accept the defaults.

The Edit Functions panel for the HORSE file displays. Press F3 to exit and return to the Edit Database Relations panel.

Press F3 to exit the model.

Working with Model Object Lists

This topic introduces the CA 2E model object list utility.

New terms introduced

- Model object
- Model object type
- Model object list
- Model object list entry
- Session list
- All Objects list (*ALLOBJ)

New panels introduced

- Edit Model Object List
- Display Model Object
- Work with Model Lists
- Subset Model Objects
- Position the List window

Objectives

To introduce the Edit Model Object List panel, to use some of its options and capabilities, and to encourage you to explore the model object list facilities.

Note: This topic presents only examples of ways to use model object lists. After you complete these examples be sure to experiment on your own until you feel comfortable with this tool. Refer to the CA 2E guide, *Generating and Implementing Applications* for more information.

Overview of Model Objects and Model Object Lists

By definition a *model object* is anything in the model that you can refer to by name; for example, a file (HORSE) or a function (Edit Horse).

Model Object Types

Within CA 2E there are seven types of model objects, many of which you have defined and used in this tutorial. Each *model object type* has a 3-letter identifier as shown in the following table.

Model Object	Model Object Type
Files	FIL
Fields	FLD
Conditions	CND
Access Paths	ACP
Functions	FUN
Messages	MSG
Arrays	ARR
Application Areas	APP

Model Object Lists

A *model object list* is a logical grouping of model objects. The way in which you use model object lists is limited only by your imagination. For example, a model object list might consist of all

- Model objects changed since a specified date
- Model objects related to a particular development project
- Access paths and functions that need to be generated and compiled as a result of a change to the model
- Model objects needed to implement the accounts payable feature of your application
- Functions called by an external function in which an execution error occurred
- Model objects that use a specified model object

Since a model object list can be used in many ways, it can be referred to by other names based on the way in which it is used. For example, a specific model object list might be called a session list, copy list, change list, or model list, for short. In reality, these are all just variations on the same concept.

Model Object List Entry

A model object list is comprised of a set of references to model objects within the model. Each reference is known as a *model object list entry* or *list entry* for short. Each list entry contains information about a model object at the time the list entry was created. In other words, it provides a persistent historic record of the object at the time the list entry was created.

Editing Your Session List

At the beginning of this tutorial, you created a session list with the same name as your model profile. A *session list* is a model object list to which all model objects you change, add, or delete during a session are logged. Your session list should now contain all objects you added or changed while working on the horse racing model.

From the CA 2E Designer (*DSNR) Menu, select the Edit Session List (changed objects) option.

```

DSNR                      2E Designer (*DSNR) Menu
Level . : 1
System:                   2EDV1

Select one of the following:

  Enter Model              1. Edit Database Relations
                          2. Services Menu
                          3. Edit Default Model Object List
                          4. Edit Session List (changed objects)
                          5. Work with Model Objects
                          6. Load model and display command line
                          8. Work with Model Object Lists
                          9. Change to work with another model

  Open Access:            ? 10. Change Open Access Model Value
  enter with *NO         11. Edit Database Relations
                          12. Services Menu
                                                                More...

Selection or command
===> 4
F3=Exit  F6=Messages  F9=Prev. request  F10=Cmd Entry  F14=Submitted jobs _

```

Press Enter.

The Edit Model Object List panel displays showing all model objects you changed during the tutorial.

List Entry Differs from Model Object

Press Roll Up until you see the list entry for Dam Horse name. Note the number 8 to the right of the Subfile selector. This indicates that information for the list entry on your session list differs from that of the actual model object that the list entry represents. Recall that earlier in the tutorial, you changed the name of this field from Dam Horse name to Dam name.

```

Edit Model Object List

Model . . . : MYMDL
List . . . : JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select      2=Edit      3=Copy      4=Delete entry
5=Display     8=Details     9=Deselect  10=Action diagram

Opt   Object                Type  Atr  Owner
---   ---
 8   Dam Horse name         FLD   REF
    Dam younger than horse  MSG   ERR  *Messages
    Date of birth           FLD   DT#
    Delete Course           FUN   DBF  Course
    Delete Horse            FUN   DBF  Horse
    Delete Jockey           FUN   DBF  Jockey
    Delete Race             FUN   DBF  Race
                                           More...

Parameters or command
===>
F3=Exit      F4=Prompt    F5=Refresh   F6=Build     F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Note: CA 2E allows this difference to occur so you can use your model object list as a historical record.

You can update the model object list entry to reflect the current information for the actual model object. To do so, type **33** for the Subfile selector for Dam Horse name.

```

Edit Model Object List

Model . . . : MYMDL
List . . . : JAR_____ List JAR in MYMDL created by user JAR.

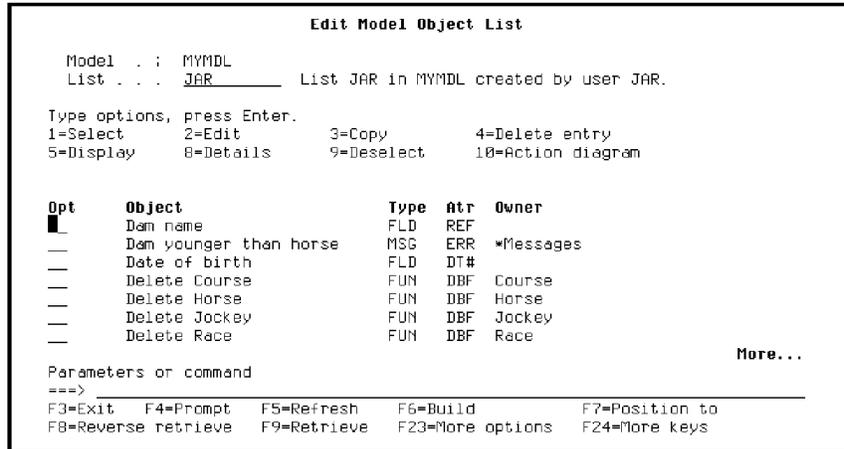
Type options, press Enter.
1=Select      2=Edit      3=Copy      4=Delete entry
5=Display     8=Details     9=Deselect  10=Action diagram

Opt   Object                Type  Atr  Owner
---   ---
33   Dam Horse name         FLD   REF
    Dam younger than horse  MSG   ERR  *Messages
    Date of birth           FLD   DT#
    Delete Course           FUN   DBF  Course
    Delete Horse            FUN   DBF  Horse
    Delete Jockey           FUN   DBF  Jockey
    Delete Race             FUN   DBF  Race
                                           More...

Parameters or command
===>
F3=Exit      F4=Prompt    F5=Refresh   F6=Build     F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Press Enter. The list entry is updated from the detail information for the actual model object. In this case, the name of the list entry changes to match the name of the model object it represents.

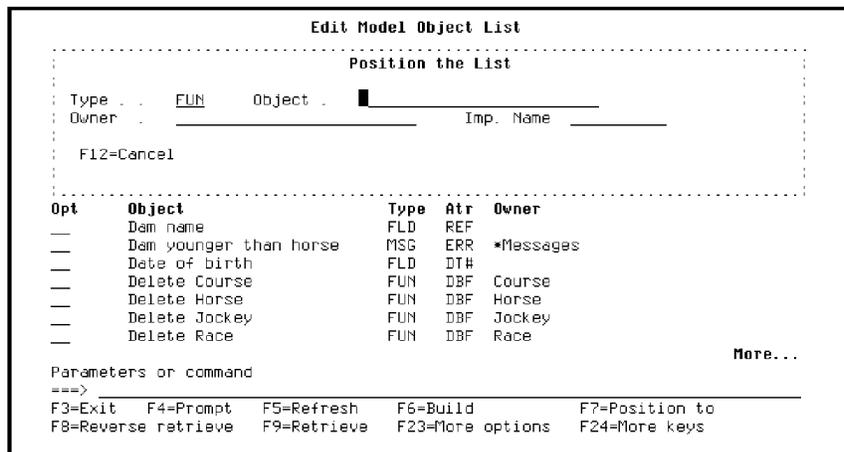


Positioning a Model Object List

You can position the model list displayed to a specific object type, object name, owner, or implementation name. This topic presents a few examples of ways to use positioning. Feel free to experiment on your own.

Press F7 to display the Position the List window. The values you enter in this positioner window also determine the order in which the model objects display.

Type **FUN** (function).



Press Enter.

Note that the list is now positioned at the first model object of type FUN. The following model objects are displayed alphabetically by type, and for each type, alphabetically by object name. Note the message displayed at the bottom of the panel indicating this.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR      List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select      2=Edit      3=Copy      4=Delete entry
5=Display     8=Details    9=Deselect  10=Action diagram

Opt   Object           Type Atr Owner
---    ---
1      Change Course      FUN  DBF  Course
---    ---
      Change Horse        FUN  DBF  Horse
---    ---
      Change Jockey       FUN  DBF  Jockey
---    ---
      Change Race         FUN  DBF  Race
---    ---
      Change Race Entry   FUN  DBF  Race Entry
---    ---
      Create Course       FUN  DBF  Course
---    ---
      Create Horse        FUN  DBF  Horse
---    ---

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
Data displayed in Object Type/Object Name order.
More...
    
```

Scroll through the list to verify this.

Press F7 again. Blank out the Type field and type **HORSE** for Owner.

```

Edit Model Object List

Position the List

Type . .      Object .
Owner . HORSE  Imp. Name

F12=Cancel

Opt   Object           Type Atr Owner
---    ---
      *ALL values      CND  LST  Horse gender
---    ---
      *ALL values      CND  LST  Jockey gender
---    ---
      *ALL values      CND  LST  Going conditions
---    ---
      *ALL values      CND  LST  Entry Status
---    ---
      Change Course     FUN  DBF  Course
---    ---
      Change Horse      FUN  DBF  Horse
---    ---
      Change Jockey     FUN  DBF  Jockey
---    ---

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
More...
    
```

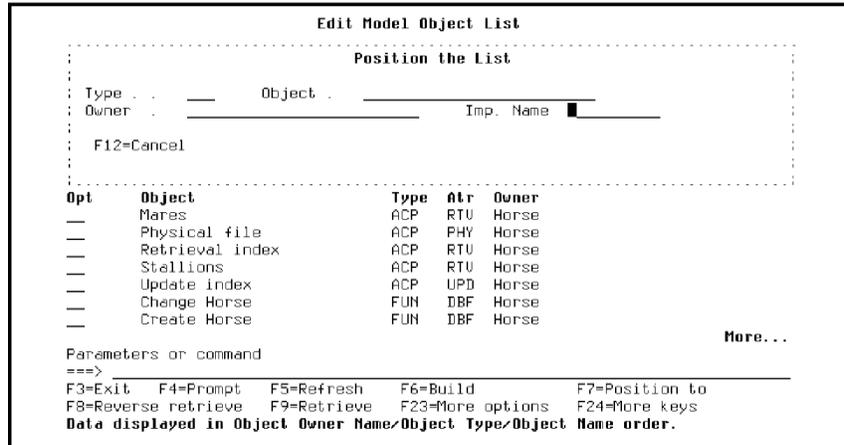
Press Enter.

Note that the list is now positioned at the first model object that has HORSE as its owner. Note the message at the bottom of the panel. The following model objects are displayed alphabetically by Owner, and for each Owner, alphabetically by Object Type, and then by Object Name. Scroll through the list to verify this.

Returning to the Top of the List

You can also use the positioner window to return quickly to the top of the model list displayed.

Scroll down so the list is not positioned at the top. Press F7 again. Blank out all fields.



Press Enter. The list will be repositioned to the top of the list in order by object name and type.

Opening Multiple Functions at One Time

Suppose you want to work with each of the Select Record functions on your model list; for example, to edit their device designs or action diagrams. Press F23 three times to view additional Subfile selector options. Option 30 lets you open several functions at once.

Type **30** in the Subfile selector of the first function displayed, Select Course.

Next, press F24 to view additional command keys. The F13 command key automatically repeats the Subfile selector option you entered for all following subfile records to the end of the list.

Press F13 to repeat option 30 for each function displayed.

```

                                Edit Model Object List

Model . . : MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

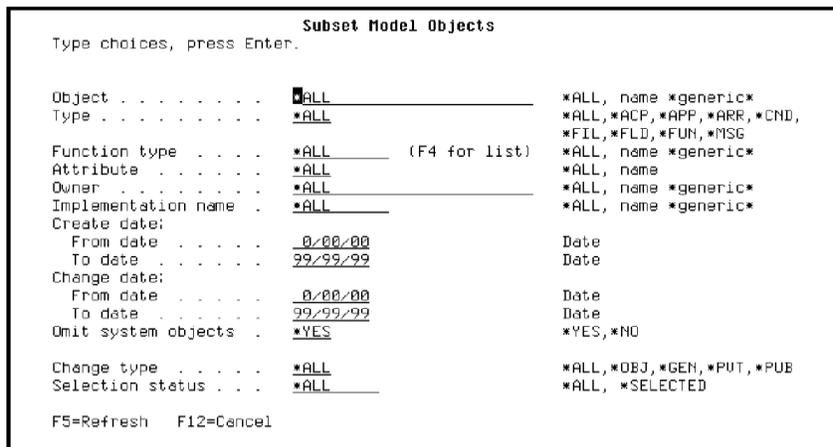
Type options, press Enter.
24=Delete object   25=Document function   26=Redirect       28=Checkout
30=Open function   31=Object locks         33=Refresh entry

Opt   Object                Type Atr Owner
 30     Select Course          FUN   RPG   Course
 30     Select Horse          FUN   RPG   Horse
 30     Select Jockey         FUN   RPG   Jockey
 30     Select Mares         FUN   RPG   Horse
 30     Select Race          FUN   RPG   Race
 30     Select Stallions     FUN   RPG   Horse

Parameters or command Bottom
===>
F10=Execute list  F11=Alt view  F12=Cancel  F13=Repeat  F14=Filter
F15=Check list   F17=Subset    F18=Change model profile  F24=More keys
Option 30 was repeated to the end of the list.
```


Displaying the Unsubsetting Model List

Because only SELRCD functions are displayed, press F17 to display the Subset Model Objects panel. Press F5 to restore the default values for all fields.



Press Enter to display the original unsubsetting list.

Editing Model Objects

Subfile selector option 2 on the Edit Model Object List panel accesses the appropriate CA 2E editing panel according to the type of the selected model object. The following table shows examples for object types and panels you have used earlier in this tutorial.

Model Object Type	Tutorial Panel
Type	CA 2E Editing Panel Displayed
ACP	Edit Access Path Details
CND	Edit List Condition for LST Edit Field Condition Details for VAL
FIL	Edit File Details
FLD	Edit Field Details
FUN	Edit Function Details
MSG	Edit Message Function Details

If you type 2 for the Subfile selector of several model objects of differing types, CA 2E displays the appropriate editing panel for each model object, one at a time.

Exercise

Type **2** in the Subfile selector for model objects of several different types of model objects and press Enter. Notice which CA 2E editing panel displays in each case. Press F3 to return to the Edit Model Object List panel.

Editing Conditions for Entry Status

You can also edit only specific objects by subsetting the model list first. Suppose you want to view and possibly change the condition values you defined for the Entry Status field on the RACE ENTRY file. For example, you can change the condition names and status values. Note that you cannot add a new condition in this way since you need to use the Edit Database Relations panel to create a model object.

Press F17 to display the Subset Model Objects panel. Type ***CND** for the Type field, **VAL** for the Attribute field, and **Entry Status** for the Owner field.

```

Subset Model Objects
Type choices, press Enter.

Object . . . . . *ALL
Type . . . . . *CND
Function type . . . . *ALL (F4 for list)
Attribute . . . . . VAL
Owner . . . . . Entry Status
Implementation name . *ALL
Create date:
  From date . . . . . 0/00/00
  To date . . . . . 99/99/99
Change date:
  From date . . . . . 0/00/00
  To date . . . . . 99/99/99
Omit system objects . *YES
Change type . . . . . *ALL
Selection status . . . *ALL

*ALL, name *generic*
*ALL, *ACP, *APP, *ARR, *CND,
*FIL, *FLD, *FUN, *MSG
*ALL, name *generic*
*ALL, name
*ALL, name *generic*
*ALL, name *generic*
Date
Date
Date
Date
*YES, *NO
*ALL, *OBJ, *GEN, *PUT, *PUB
*ALL, *SELECTED

F5=Refresh F12=Cancel

```

Press Enter twice to display the subsetted list.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR List JAR in MYMDL created by user JAR.

Type options, press Enter.
24=Delete object 25=Document function 26=Redirect 28=Checkout
30=Open function 31=Object locks 33=Refresh entry

Opt Object Type Attr Owner
_ Disqualified CND VAL Entry Status
_ Finished CND VAL Entry Status
_ Not yet run CND VAL Entry Status
_ Scratched CND VAL Entry Status

Parameters or command
===>
F10=Execute list F11=Alt view F12=Cancel F13=Repeat F14=Filter
F15=Check list F17=Subset F18=Change model profile F24=More keys
This is a subsetted list.

Bottom

```

Exercise

View and optionally change each condition value. Namely, type **2** for the first condition value displayed, and then press F13 to repeat this option for the rest of the condition values. Press Enter to display the Edit Field Condition Details panel for each condition value. Press F3 to exit each editing panel and finally to return to the Edit Model Object List panel.

Displaying the Unsubsetting Model List

From the Edit Model Object List panel, press F17 to display the Subset Model Objects panel. Press F5 to restore the default values for all fields and press Enter to display the original unsubsetting list.

Editing Relations and Creating Objects

As already mentioned you cannot edit relations or create model objects using the Edit Model Object List panel. If you need to edit a relation or create a model object, you can transfer temporarily to the Edit Database Relations panel by entering the Edit Model (YEDTMDL) command on the command line.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
24=Delete object      25=Document function    26=Redirect          28=Checkout
30=Open function     31=Object locks        33=Refresh entry

Opt   Object                Type Atr Owner
---    ---
---    *ALL values             CND   LST   Horse gender
---    *ALL values             CND   LST   Jockey gender
---    *ALL values             CND   LST   Going conditions
---    *ALL values             CND   LST   Entry Status
---    Change Course           FUN   DBF   Course
---    Change Horse            FUN   DBF   Horse
---    Change Jockey           FUN   DBF   Jockey

Parameters or command
===> YEDTMDL
F10=Execute list  F11=Alt view  F12=Cancel  F13=Repeat  F14=Filter
F15=Check list   F17=Subset    F18=Change model profile  F24=More keys
    
```

Press Enter.

EDIT DATABASE RELATIONS		My model		
Rel lvl:	Relation	Seq	Typ	Referenced object
?	Typ Object			
█	FIL Course	Known by		FLD Course code
—	FIL Course	Has		FLD Course name
—	FIL Horse	Known by	10	FLD Horse code
—	FIL Horse	Has	20	FLD Horse name
—	FIL Horse	Has	30	FLD Horse gender
—	FIL Horse	Has	40	FLD Horse value
—	FIL Horse	Has	50	FLD Date of birth
—	FIL Horse	Refers to	60	FIL Horse
	For: Dam			Sharing: *ALL
—	FIL Horse	Refers to	70	FIL Horse
	For: Sire			Sharing: *ALL
—	FIL Jockey	Known by		FLD Jockey code
—	FIL Jockey	Has		FLD Jockey name
—	FIL Jockey	Has		FLD Jockey gender
—	FIL Race	Owned by		FIL Course

More...

Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
 F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys

When you finish editing relations, press F3 to return to the Edit Model Object List panel.

Deleting a Model List Entry

The Edit Model Object List panel provides two deletion options. Option 24 deletes the actual model object from the model; option 4 deletes a list entry from the displayed model object list. When you delete a model object list entry (option 4), CA 2E displays a confirm panel for each selected list entry.

Note that you cannot delete a model object if it is used by other objects in the model. CA 2E provides impact analysis tools to help you determine whether and how a model object is used by other model objects. Impact analysis is discussed later in this chapter.

Note: Because you can use a model object list as a historic record for your model, it can contain entries for model objects that you have deleted from the model. These list entries are indicated by an X to the right of the Subfile selector.

For practice you will delete a list entry from your session list in this step. You will replace it later so your session list continues to represent all changes to your model. Remember, you are deleting a list entry, not the model object.

Enter **4** in the Subfile selector for the Change Course internal function.

```

                                Edit Model Object List

Model . . . MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
24=Delete object      25=Document function    26=Redirect      28=Checkout
30=Open function     31=Object locks         33=Refresh entry

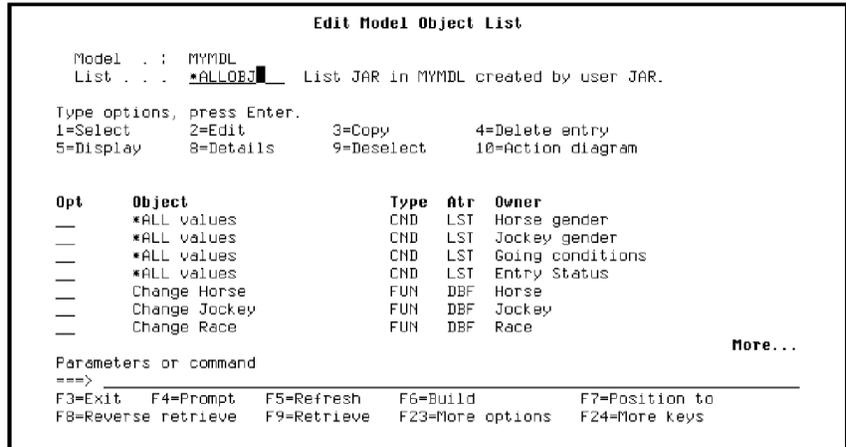
Opt   Object                Type Atr Owner
---    ---
---    *ALL values              CND   LST   Horse gender
---    *ALL values              CND   LST   Jockey gender
---    *ALL values              CND   LST   Going conditions
---    *ALL values              CND   LST   Entry Status
4    Change Course             FUN   DBF   Course
---    Change Horse             FUN   DBF   Horse
---    Change Jockey            FUN   DBF   Jockey

Parameters or command
===>
F10=Execute list    F11=Alt view    F12=Cancel    F13=Repeat    F14=Filter
F15=Check list     F17=Subset     F18=Change model profile    F24=More keys
    
```


Accessing the All Objects List

One way to access the All Objects List is to type ***ALLOBJ** in the List field at the top of the Edit Model Object List panel.

Type ***ALLOBJ** for the List field.



Press Enter.

The List field now contains ***ALLOBJ**. This means there is a one-to-one correspondence between the model objects displayed and the actual model objects that comprise your model. In particular, note that the model object you deleted from your session list, namely, Change Course, appears on the All Objects List.

How ***ALLOBJ** and Model Lists Differ

Technically, the All Objects list is not really a model object list; however, it is often useful to think of it as a list. In general, you can use the Edit Model Object List panel to work with the All Objects List as you would a named model object list. However, since the All Objects list represents actual model objects, note the following exceptions.

You can delete a model object, but you cannot delete a list entry. In other words, you can use option 24, but not option 4.

You cannot add a model object to the All Objects list since that requires creating a model object.

While the All Objects list contains all active model objects, named model object lists typically represent a subset of all model objects in the model.

Displaying Alternate Views of Detail Information

The Edit Model Object List panel provides five alternate views of detail information for each model object. The information shown in the five views is dynamic when you are working with the All Objects list; in other words, if you update a model object, CA 2E automatically updates the information displayed to reflect the change. For named model object lists, the information displayed is static and reflects the state of the model object at the time it was added to the model object list.

The following views are available:

- Basic information
- Implementation information
- Component Change information
- Change information
- Check out information

Details about each of these views are beyond the scope of this tutorial. To learn more, see the CA 2E module, *Generating and Implementing Applications*.

Exercise

Press F11 to view the five alternate views of information from the detail for the model objects displayed. Some of this information depends on the type of the model object so you should scroll through the list while viewing each alternate view.

Restoring the Deleted Session List Entry

In this step you will restore the Change Course function to your session list. Subfile selector option 11 lets you select model objects to be added to another model object list. The default for this alternate list is the Model list for commands specified in your model profile. In your case it is the same as your session list.

Type **11** in the Subfile selector for the Change Course model object.

```

                                Edit Model Object List

Model . . : MYMDL
List . . . *ALLOBJ  *All objects list for model MYMDL.

Type options, press Enter.
11=Add to alternate list      13=Parameters      14=GEN batch
15=GEN interactive           16=Y2CALL          17=Device design

Opt   Object                    Type  Attr  Owner
---   ---                       ---   ---   ---
---   *ALL values                CND   LST   Horse gender
---   *ALL values                CND   LST   Jockey gender
---   *ALL values                CND   LST   Going conditions
---   *ALL values                CND   LST   Entry Status
11   Change Course              FUN   DBF   Course
---   Change Horse              FUN   DBF   Horse
---   Change Jockey             FUN   DBF   Jockey
                                           More...

Parameters or command
===>
F3=Exit   F4=Prompt  F5=Refresh  F6=Build   F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
    
```

Press Enter. A message at the bottom of the panel indicates that the model object has been added to your session list.

Note: Alternatively you can press F4 instead of Enter to prompt option 11. This lets you enter the name of another alternate list or *SELECT to select from a list of all model object lists.

Accessing Other Model Lists

You can type the name of a model list in the List field on the Edit Model Object List panel to transfer quickly among model object lists defined for your model. You can also press F4 to prompt a selection list of all model object lists you have defined.

Returning to Your Session List

Type the name of your session list in the List field as shown. Be sure to substitute the name of your session list.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR *All objects list for model MYMDL.

Type options, press Enter.
1=Select 2=Edit 3=Copy 4=Delete entry
5=Display 8=Details 9=Deselect 10=Action diagram

Opt Object Type Attr Owner
_ *ALL values CND LST Horse gender
_ *ALL values CND LST Jockey gender
_ *ALL values CND LST Going conditions
_ *ALL values CND LST Entry Status
_ Change Course FUN DBF Course
_ Change Horse FUN DBF Horse
_ Change Jockey FUN DBF Jockey

Parameters or command
==>
F3=Exit F4=Prompt F5=Refresh F6=Build F7=Position to
F8=Reverse retrieve F9=Retrieve F23=More options F24=More keys
'Course/Change Course/*FUN' added to list MYMDL/JAR.
More...

```

Press Enter. Note that Change Course has been restored to your session list.

Working with Model Object Lists

The Work with Model Lists panel lets you manage the model object lists in your model. You can access this panel from the CA 2E Designer (*DSNR) Menu, the Display Services Menu, or by typing the Work with Model Lists (**YWRKMDLLST**) command on a command line

Type **YWRKMDLLST** on the command line.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select 2=Edit 3=Copy 4=Delete entry
5=Display 8=Details 9=Deselect 10=Action diagram

Opt Object Type Attr Owner
_ *ALL values CND LST Horse gender
_ *ALL values CND LST Jockey gender
_ *ALL values CND LST Going conditions
_ *ALL values CND LST Entry Status
_ Change Course FUN DBF Course
_ Change Horse FUN DBF Horse
_ Change Jockey FUN DBF Jockey

Parameters or command
==> YWRKMDLLST
F3=Exit F4=Prompt F5=Refresh F6=Build F7=Position to
F8=Reverse retrieve F9=Retrieve F23=More options F24=More keys
More...

```

Press Enter. The Work with Model Lists panel displays showing all the model lists defined for your model. In your case, only your session list will be shown. The following is an example of how this panel might look in a working model.

```
Work with Model Lists
Model . . : MYMDL
List . . : _____ <-Position

Type options, press Enter.
2=Edit      3=Copy      4=Remove      5=Display
8=List details  9=Clear list  10=Execute list  13=Change description

Opt List name List description
■ AP Accounts Payable
— AR Accounts Receivable
— COMMANDS Default model list for commands
— EDITKEY Model objects needing edit - Course code change
— EDTLST Model objects needing edit to fix PR295
— FUNCTIONS Changed functions for AP change
— GENERATE Model objects to generate - Course code change
— JAR List JAR in MYMDL created by user JAR.
— PMH List PMH in MYMDL created by user PMH.
— PR3049 Changed model objects for PR3049

More...
F3=Exit F5=Refresh F6=Build F9=Command line F11=Alt view F12=Cancel
F10=Create empty list F23=More options
```

For any list displayed you can do the following:

- View the list entries
- Edit the list
- Clear all entries from the list
- Copy the list to another list
- Change the list's descriptive text
- Remove the list

If you type option 2 in the Subfile selector of any list, the Edit Model Object List panel displays for the selected list. As a result, this panel provides another method of entering your model.

Press F3 to return to the Edit Model Object List panel for your session list.

Function Versioning

This topic describes how to create and test a version of a function.

Note: You can create versions for both functions (FUN) and messages (MSG); however, this topic discusses only function versions.

New terms introduced

- Version
- Group
- Current
- Redirection

New panel introduced

- Work with Versions

New commands introduced

- Create Model Version
- Compare Model Objects
- Redirect Model Object

Objectives

To create a version of the Edit Horse function, edit its action diagram, test the change, and replace the original function with the new version.

Overview of Versions

A *version* of a function is similar to a copy of the function. The major difference is that a copy is completely independent of the original function. Although a version is also a separate model object, CA 2E maintains an internal link between a function and its versions. A function can have an unlimited number of versions.

A function and its versions are known as a *group*. The interactive Work with Versions panel lets you view and work with a group of versions.

In any group of versions, one of the versions in the group may be *current*. The current version is the version that is active in the model; in other words, it is the function that is referenced by other objects in the model and that appears on CA 2E editing panels.

Benefits of Versions

Three benefits of using versions are:

- You can test changes on a version of a function without interfering with the functionality of the existing model.
- When you finish testing a new version of a function and make it active (current) in the model, the original function remains unchanged and can easily be made active again if needed.
- Only the currently active version of a function is displayed on CA 2E editing panels. As a result, the panels are not cluttered with inactive versions.

A Reason NOT to Use Versions

When you make a version of a function current in the model, CA 2E globally changes all the model objects that referenced the original function to reference the version instead. If not all of the referencing model objects need the changed functionality, you should create a new function rather than a version. After updating and testing the new function, you would then need to update references to the new function manually.

Using Versions to Update an Existing Function

Following are the steps needed to update and test changes for a working external function using CA 2E's versioning feature. You will use this process to add an action to the action diagram for the Edit Horse function.

1. Create a version of the function you want to change.
2. Edit the version.
3. For an external function, generate the source and create the program object for the version.

Note: Internal functions and messages do not result in separate program objects. As a result, the testing process for them is more complex and beyond the scope of this tutorial. Refer to the CA 2E module, *Generating and Implementing Applications*, for more information.

4. Test the version by calling the program object.
5. When you are satisfied that the version works properly, make the version current.
6. If errors occur, make the original function current again.

Accessing the Session List

The Edit Model Object List panel should be displayed on your screen for your session list. If it is not, from the Designer Menu, type **4** on the Selection line as shown to select the Edit Session List (changed objects) option.

```

DSNR                      2E Designer (*DSNR) Menu
Level . . : 1
System:      ZEDW1

Select one of the following:

Enter Model          1. Edit Database Relations
                     2. Services Menu
                     3. Edit Default Model Object List
                     4. Edit Session List (changed objects)
                     5. Work with Model Objects
                     6. Load model and display command line
                     8. Work with Model Object Lists
                     9. Change to work with another model

Open Access:      ? 10. Change Open Access Model Value
enter with *NO    11. Edit Database Relations
                     12. Services Menu

Selection or command
===> 4

F3=Exit  F6=Messages  F9=Prev. request  F10=Cmd Entry  F14=Submitted jobs
Maximum capability to access model MYMDL is *DSLK.

```

Press Enter to display the Edit Model Object List panel for your session list.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR      List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select  2=Edit      3=Copy      4=Delete entry
5=Display 8=Details   9=Deselect  10=Action diagram

Opt   Object           Type Atr Owner
 1     *ALL values       CND   LST  Horse gender
 2     *ALL values       CND   LST  Jockey gender
 3     *ALL values       CND   LST  Going conditions
 4     *ALL values       CND   LST  Entry Status
 5     Change Course     FUN   DBF  Course
 6     Change Horse      FUN   DBF  Horse
 7     Change Jockey     FUN   DBF  Jockey

Parameters or command
===>

F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Positioning to the Edit Horse

Since you are going to create a version of the Edit Horse function, you first need to locate it. One way to do so is by using the F7 command key, which lets you position and sort entries for the displayed model object list.

Press F7 to display the Position the List window. There are several ways in which you can specify information on this window in order to locate the function you need. For example,

- If you know the name of the function, simply type the name in the Object field
- If you know the implementation name of the function (the program name), type the name in the Imp. Name field
- If you know the name of the file that owns the function, type the name of the file in the Owner field and scroll down to locate the function

Note that you can type partial names in the Object, Owner, and Imp. Name fields on the Position the List window; for example, if you type **H** or **H*** for the Object field, the list will be positioned at the first object name that begins with the letter H.

Because you know the function name, type **Edit Horse** in the Object field as shown.

Press Enter.

Creating a Version for Edit Horse

To create a version you first need to access the Work with Versions panel for the selected function. Press F23 twice to view additional Subfile selector options. The appropriate option is 19.

Type **19** in the Subfile selector for the Edit Horse function.

```

                                Edit Model Object List
Model . . : MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
18=Device structure      19=Work with versions      20=Access path
21=Narrative/object     22=Narrative/owner       23=STRSEU

Opt   Object                Type Atr Owner
19     Edit Horse                FUN  RPG  Horse
█     Edit Jockey                FUN  RPG  Jockey
—     Edit Race                  FUN  RPG  Race
—     Entry number              FLD  CDE
—     Entry Status              FLD  STS
—     Female                     CND  VAL  Jockey gender
—     Finished                   CND  VAL  Entry Status
                                           More...

Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F6=Build   F7=Position to
F8=Reverse retrieve F9=Retrieve   F23=More options F24=More keys

```

Press Enter.

Working with Versions

The Work with Versions panel provides a set of options for working with a group of versions. Use it to perform tasks on versions, such as,

- Create a new version
- Edit
- Delete
- Display
- View detail
- Generate
- Impact analysis

The versions are displayed on this panel in reverse chronological order; in other words, the most recently created version appears at the top of the list of entries. The current version is shown highlighted with an * to the right of the Subfile selector, and the Status column contains the word Current. Since you have not yet created versions for Edit Horse, only one entry is listed.

To create a new version for the Edit Horse function, type **3** in the Subfile selector.

```
Work with Versions
Type options, press Enter.
2=Edit  3=Create version  4=Delete object  5=Display  8=Details
10=Action diagram      12=Resolve conflicts  13=Parameters

Opt  Object          Version      Implementation  Status
 3  * Edit Horse     Development  HYAEEFR         Current

F3=Exit  F5=Refresh  F11=Alt view  F12=Cancel  F23=More options

Bottom
```

Press Enter.

Naming the Version

The prompt panel for the Create Model Version (YCRTMDLVSN) command displays. By default, CA 2E automatically generates a name for the version based on the name of the original function. The automatically generated name consists of the original function name followed by seven digits to ensure uniqueness; for example, Edit Horse1101481. In addition, by default, the original function retains its name and remains current (active).

In this example, you will specify a version name and accept the other defaults. Type **Edit Horse - Version 1** in the To model object name field.

```

Create Model Version (YCRTMDLVSN)
Type choices, press Enter.
From model object name:
Object owner . . . . . > Horse          Character value...
Object name . . . . . > 'Edit Horse'    Character value
Object type . . . . . > *FUN           *FUN, *MSG
To model object name . . . . . Edit Horse - Version 1
Make model object current . . . . . *NO      *NO, *YES
Transfer model object name . . . . . *NO      *NO, *YES

F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F13=How to use this display
F24=More keys

```

Press Enter. Note the messages at the bottom of the panel as CA 2E creates the new version.

Implementation Name for the New Version

The new version you just created, Edit Horse - Version 1, now appears at the top of the list on the Work with Versions panel. Note that a new implementation name has been assigned to the version; in other words, the version is a separate object in the model. However, since the version is not current, you will not see it on CA 2E editing panels.

Using a Substitution Variable

Note the &1 in the No. column; this is the substitution variable that represents the Horse name parameter. You will use this substitution variable to include the selected horse's name in the text of the message. Recall that you used this process earlier in the tutorial when you defined error messages for the condition that compared a horse's date of birth with those of its parents.

The original message text is "Racing results displayed." Add "for &1" to the end of this text.

```

EDIT MESSAGE FUNCTION DETAILS          My model
File name . . . . : *Messages
Message . . . . . : Racing results displayed
Message type . . . : INF (INF,ERR,STS,CMP)
Message id . . . . : USR0013          Override message file. : *LIBL
                                      Default message file . : QUSRMSG  MYGEN
Severity . . . . . : 20
Message text: Racing results displayed for &1
-----
Parameters . . . . :
No.  Field              Type  Length
&1  Horse name          TXT   25

F3=Exit  F7=Second level text  F8=Change name
    
```

Press Enter to return to the Edit Message Functions panel.

Selecting the New Message

You still need to select this message function for inclusion in the Edit Horse function. Type X in the Subfile selector.

```

EDIT MESSAGE FUNCTIONS                  My model
File . . . . : *Messages                Default msg file. . : QUSRMSG
                                      Generation library. : MYGEN
Message
_____ <== Position
? Message              Type  Msgid   Ovr Msgf
X Racing results displayed  INF  USR0013
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
SEL: Z-Details, P-Param, N-Narr, D-Delete, C-Copy, L-Locks, U-Usage, X-Select.
F3=Exit  F5=Reload  F7=Change seq.  F9=Add message  F21=Convert messages
    
```


Checking the Default Parameters

Note the message at the bottom of the window indicating that parameters have been defaulted. In most cases the default parameters shown are correct. However, you should review the information displayed before you accept the defaults.

In this case, the defaults are correct; namely, Horse name is an input (I) parameter and the source of its value is the RCD (Subfile record) context. Press Enter to accept the defaults and return to the Action Diagram Editor.

```

EDIT ACTION DIAGRAM          Edit    MYMDL      Horse
FIND=>                        Edit Horse - Version 1

___ > USER: Validate subfile record relations
___
___ .---
___ .-CASE                      <<<
___ .-RCD.Dam Date of birth GE RCD.Date of birth <<<
___ . Send error message - 'Dam younger than horse' <<<
___ .-ENDCASE                    <<<
___ .-CASE                      <<<
___ .-RCD.Sire Date of birth GE RCD.Date of birth <<<
___ . Send error message - 'Sire younger than horse' <<<
___ .-ENDCASE                    <<<
___ .-CASE                      <<<
___ .-RCD.*SFLSEL is *Zoom#1    <<<
___ . Display Racing results - Race Entry *      <<<
___ . PGM.*Defer confirm = CHD.Defer confirm     <<<
___ . PGM.*Reload subfile = CHD.*YES             <<<
___ . Send information message - 'Racing results displayed' <<<
___ .-ENDCASE                    <<<
___ .---
F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
    
```

Note that the call to the information message function, Racing results displayed, has been inserted in the action diagram.

Returning to the Action Diagram

Press F13 to exit and display the Exit Function Definition panel.

```

EXIT FUNCTION DEFINITION          My model

Type choices, press Enter.

Change/create function. . . . Y                      Y=Yes, N=No
  Function name . . . . . Edit Horse - Version 1   Name
  Access path name. . . . Retrieval index          Name
  File name . . . . . Horse                       Name
  Function type . . . . . Edit file

Print function. . . . . N                            Y=Yes, N=No
Return to editing . . . . . N                        Y=Yes, N=No
Submit generation . . . . . N                        Y=Yes, N=No

F5=Refresh  F12=Cancel  F15=Open Functions
    
```

Press Enter to accept the defaults and return to the Work with Versions panel.

Press F3 to return to the Edit Model Object List panel. Note that a **0** displays to the right of the Subfile selector of the Edit Horse - Version 1 list entry to indicate that it is a non-current version.

Submitting the Function Version for Generation

You can submit generation requests and process job lists directly from the Edit Model Object List panel. Press F23 to see additional Subfile selector options. The appropriate option for submitting access paths and functions for batch generation is 14.

Type **14** in the Subfile selector for the Edit Horse - Version 1 function.

```

                                Edit Model Object List
Model . . . MYMDL
List . . . JAR          List JAR in MYMDL created by user JAR.

Type options, press Enter.
11=Add to alternate list      13=Parameters      14=GEN batch
15=GEN interactive           16=Y2CALL          17=Device design

Opt   Object                Type Atr Owner
---     ---                    ---   ---   ---
---     Delete Race Entry       FUN   DBF   Race Entry
---     Display Racing results   FUN   RPG   Race Entry
---     Disqualified             CND   VAL   Entry Status
---     Distance                 FLD   QTY
---     Edit Course              FUN   RPG   Course
---     Edit Horse               FUN   RPG   Horse
14 0  Edit Horse - Version 1   FUN   RPG   Horse

Parameters or command
==>
F3=Exit   F4=Prompt   F5=Refresh   F6=Build   F7=Position to
F8=Reverse retrieve   F9=Retrieve   F23=More options   F24=More keys
More...

```

Press Enter. A message at the bottom of the panel indicates that the request for batch generation has been submitted.

Viewing Job List Commands

You also have access to a set of job list commands from the Edit Model Object List panel. This includes the Submit Model Create Requests (YSBMMDLCRT) command, which you previously accessed from the Display Services Menu. Press F24 twice to view additional command keys. The appropriate command key is F19.

Press F19 to display the Job List Commands Menu. Type **1** on the Selection line to select the YSBMMDLCRT command.

```

Edit Model Object List
-----
Job List Commands Menu
Model . : MYMDL
Select one of the following:
1. YSBMMDLCRT Submit model create requests
2. YBLDJOBLST Build a job list
3. YDSPJOBLST Display a job list
4. YCUTMDLLST Convert a model list
5. YCUTJOBLST Convert a job list
6. YCHKJOBLE Check job list entries
7. YCRTJOBLE Create a job list entry
Selection or command
==> 1
F3=Exit F4=Prompt F8=Rev retrieve F9=Retrieve F12=Cancel
-----
==>
F19=Job list menu F20=Usages F21=Print F22=References
F23=More options F24=More keys
    
```

Press Enter.

When the prompt screen for the YSBMMDLCRT command displays, press Enter again to accept the defaults and display the job list.

```

SUBMIT MODEL GENERATIONS & CREATES. My model
                                           GENLIB: MYGEN
? Member      Type Act Status  Text
■ MYAPEFRD    DSPF GEN      Edit Horse - Version 1  Edit file
- MYAPEFRH    PHL  GEN      Edit Horse - Version 1  Edit file
- MYAPEFR      RPG  GEN      Edit Horse - Version 1  Edit file

SEL: G-Rqs GEN, C-Rqs CRT, E-STRSEU, D-Drop, JOB(1-DSP, 4-HLD, 6-RLS, 9-CNL)
F3=Exit F5=Reload F6=Msgs F8=Submitted jobs F9=Command line ENTER=Submit
    
```

Press Enter twice to submit the request to the job queue. Check the status of the job as described in the *Generating, Compiling, and Executing* chapter. Once the generation and compilation completes successfully, you can test Edit Horse - Version 1 to see if the new message displays.

Press F3 twice to return to the Edit Model Object List panel.

Displaying Alternate Views

If you do not know the implementation name for Edit Horse - Version 1, you can use the F11 command key to view additional information for the model objects displayed. Five alternate views are available; however, this tutorial discusses only the first two. You can press F11 five times to see all five views.

Press F11 to display the alternate view showing the implementation name. Note the name that corresponds to Edit Horse - Version 1, MYAPEFR on the panel below.

Testing Edit Horse - Version 1

On the Command line, type the following to test Edit Horse - Version 1. Be sure to substitute the correct implementation name.

CALL MYAPEFR ''

```

Edit Model Object List

Model . . : MYMDL
List . . : JAR      List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select  2=Edit      3=Copy      4=Delete entry
5=Display 8=Details   9=Deselect 10=Action diagram

Opt   Object                Implementation ---Generation--- Fun/Msg
Name   Date   Time   Type
---    Edit Horse                MYAEEFR    08/31/95 11:15:04 EDTFIL
--- 0  Edit Horse - Version 1     MYAPEFR    09/01/95 10:33:02 EDTFIL
---    Edit Jockey                MYAIEFR    08/31/95 10:33:57 EDTFIL
---    Edit Race                    MYAKEFR    08/31/95 10:35:06 EDTFIL
---    Entry number                 ACCD
---    Entry Status                 ACST
---    Female
                                                    More...

Parameters or command
===> CALL MYAPEFR ''
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Press Enter.

The interactive panel for Edit Horse - Version 1 should display showing the data you entered earlier for the Edit Horse function.

Following are the steps needed to test your change.

1. Type **/** in the Subfile selector for any horse.
2. Press F10 to access the action bar.
3. Type **S** to access the Selector Choice menu.
4. Type **1** next to the Display Racing Results action.
5. Press Enter.

Note: Because you will not enter data for the RACE and RACE ENTRY files until the *Advanced Functions* chapter, Display Racing Results will have no data to display; however, you should see the new information message on return to Edit Horse - Version 1.

6. Press F3 to return to Edit Horse - Version 1. The new message should display at the bottom of the panel.

Press F3 to return to the Edit Model Object List panel.

Comparing Two Versions of a Function

You can compare two versions of a function using the Compare Model Objects (YCMPMDLOBJ) command. This command is useful for solving problems that arise while testing a new version and for identifying changes made to one version of a function for retrofitting to another version.

Note: You can also use this command to compare two functions or two messages. In other words, the model objects being compared need not be versions.

To compare two versions of a function, type YCMPMDLOBJ on the Command line.

```

                                Edit Model Object List

Model . . : MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select      2=Edit      3=Copy      4=Delete entry
5=Display     8=Details     9=Deselect 10=Action diagram

Opt  Object                               Implementation ---Generation--- Fun/Msg
---  ---
---  Edit Horse                           MYAEEFR      08/31/95 11:15:04 EDTFIL
---  Edit Horse - Version 1                MYAEEFR      09/01/95 10:33:02 EDTFIL
---  Edit Jockey                           MYAEEFR      08/31/95 10:33:57 EDTFIL
---  Edit Race                             MYAKEFR      08/31/95 10:35:06 EDTFIL
---  Entry number                          ACCD
---  Entry Status                          ACST
---  Female

Parameters or command
====> YCMPMDLOBJ
-----
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
More...

```

Entering Parameters for YCMPMDLOBJ

Press F4 to prompt the command. Enter parameters to identify the functions to be compared; namely, enter the Object owner, name, and type of both functions. In this case, type **HORSE**, **Edit Horse**, ***FUN**, **HORSE**, **Edit Horse - Version 1**, and ***FUN** as shown. Accept the defaults for the other parameters.

```

                                Compare Model Objects (YCMPMDLOBJ)

Type choices, press Enter.

Model object name:
Object owner . . . . . > HORSE
Object name--*generic . . . . . > Edit Horse
Object type . . . . . > *FUN
Model object surrogate . . . . . > *OBJNAM1
From model library . . . . . *MDLLIB
Model object name:
Object owner . . . . . > HORSE
Object name--*generic . . . . . > Edit Horse - Version 1
Object type . . . . . > *FUN
Model object surrogate . . . . . *OBJNAM2
To model library . . . . . *MDLLIB1
Ignore case differences . . . . . *NO
Print headers . . . . . > *NO

Bottom
F3=Exit  F4=Prompt  F5=Refresh  F10=Additional parameters  F12=Cancel
F13=How to use this display  F24=More keys

```

Press Enter.

When the command completes, it returns automatically to the Edit Model Object List panel. If differences were found a message displays at the bottom of the panel.

Viewing Differences between Versions

Use the i OS Work with Spool Files (WRKSPLF) command to view the differences. Type WRKSPLF on the Command line.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR      List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select   2=Edit   3=Copy   4=Delete entry
5=Display  8=Details  9=Deselect 10=Action diagram

Opt   Object                               Implementation  ---Generation--- Fun/Msg
---   ---                               Name           Date      Time  Type
---   Edit Horse                          MYAEEFR       08/31/95 11:15:04 EDTFIL
---   Edit Horse - Version 1                MYAPEFR       09/01/95 10:33:02 EDTFIL
---   Edit Jockey                          MYAIEFR       08/31/95 10:33:57 EDTFIL
---   Edit Rece                             MYAKEFR       08/31/95 10:35:06 EDTFIL
---   Entry number                          ACCD
---   Entry Status                          ACST
---   Female

Parameters or command                               More...
==> WRKSPLF

F3=Exit  F4=Prompt  F5=Refresh  F6=Build   F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
HORSE/EDIT HORSE/*FUN in MYMDL differs from HORSE/Edit Horse - Version 1/*FU
    
```

Press Enter. Use Subfile selector option 5 to display the job named YCMPMDLOB\$. The differences are shown as follows.

```

Display Spooled File

File . . . . . : YCMPMDLOB$      Page/Line 1/3
Control . . . . :                Columns 1 - 78
Find . . . . . :

*...+...1...+...2...+...3...+...4...+...5...+...6...+...7...+...
2EDV1: Development                YCMPSRC - Source Compare.
OPTIONS:- FILE1 : YSRCF.QTEMP.FUN1100247 (HORSE/Edit Horse/*FUN -
FILE2 : YSRCF.QTEMP.FUN1101305 (HORSE/Edit Horse - Versi
MATCHSIZE: 00000003 PRTBEFORE: 00001 PRTAFTER : 00001
LIST : *NOLINES IGNSPACE : *NO IGNCASE : *NO

*----- Files differ -----*
Lines 00082/00083 in file : YSRCF.QTEMP.FUN1100247 ← Edit Horse
>> | PGM.*Reload subfile = CND.*YES
>> | -ENDCASE
Lines 00082/00085 in file : YSRCF.QTEMP.FUN1101305 ← Edit Horse
>> | PGM.*Reload subfile = CND.*YES - Version 1
*** >> | Send information message - 'Racing results displayed'
*** >> | I Horse name = RCD.Horse name
>> | -ENDCASE
Files YSRCF.QTEMP.FUN1100247 (HORSE/Edit Horse/*FUN - MYMDL
and YSRCF.QTEMP.FUN1101305 (HORSE/Edit Horse - Version 1/*FUN - MYM
More...

F3=Exit F12=Cancel F19=Left F20=Right F24=More keys
    
```

Press F3 twice to return to the Edit Model Object List panel.

Making the Edit Horse - Version 1 Current

Once you have tested Edit Horse - Version 1 and are satisfied that both the new and old functionality work correctly, you can replace the original Edit Horse function in the model with the new version by making the version current.

First display the Work with Version panel by typing **19** in the Subfile selector for either version of the Edit Horse function.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
18=Device structure      19=Work with versions      20=Access path
21=Narrative/object      22=Narrative/owner          23=STRSEU

Opt   Object                Implementation  ---- Generation---- Fun/Msg
----- ----- ----- ----- ----- -----
19 0   Edit Horse                MYAEEFR           08/31/95  11:15:04  EDTFIL
      Edit Horse - Version 1    MYAPEFR           09/01/95  10:33:02  EDTFIL
      Edit Jockey                MYAIEFR           08/31/95  10:33:57  EDTFIL
      Edit Race                  MYAKEFR           08/31/95  10:35:06  EDTFIL
      Entry number              ACCD
      Entry Status              ACST
      Female

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Press Enter.

On the Work with Version panel, press F23 to view additional options. The appropriate option is 26, Make current. Type **26** in the Subfile selector for Edit Horse - Version 1.

```

Work with Versions

Type options, press Enter.
14/15=Generate batch/interactive  17=Device design  18=Structure
20=Access path  21/22=Narrative  23=STRSEU  26=Make current

Opt   Object                Version  Implementation  Status
----- ----- ----- ----- -----
26   *   Edit Horse - Version 1    Development  MYAPEFR           Current
      *   Edit Horse                Development  MYAEEFR

F3=Exit  F5=Refresh  F11=Alt view  F12=Cancel  F23=More options

```

Press Enter.

Naming the New Current Version

The prompt screen for the Redirect Model Object (YRDRMDLOBJ) command displays.

When you make a version current, by default, the object names of the original and new current versions are exchanged; this is indicated by *YES in the Transfer model object name parameter. The implementation names of the two versions are always exchanged. To avoid misunderstanding, be sure to inform other developers when you make a new version current.

```
Redirect Model Object (YRDRMDLOBJ)
Type choices, press Enter.
From model object name:
Object owner . . . . . > *CURRENT      Character value...
Object name . . . . .          Character value
Object type . . . . .          *FUN, *MSG
To model object name:
Object owner . . . . . > 'Horse'      Character value, *TOOBJSGT, .
Object name . . . . . > 'Edit Horse - Version 1'
Object type . . . . . > '*FUN'      *FRMOBJNAM, *FUN, *MSG
Transfer model object name . . . *YES      *NO, *YES
Change type . . . . . *PUBLIC      *NONE, *PUBLIC, *PRIVATE...

F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F13=How to use this display
F24=More keys
```

Press Enter to accept the defaults.

Note: If other objects in the model reference Edit Horse, they are automatically changed to reference the new current version instead. For example, if another function called Edit Horse,CA 2E would change the function so that it calls the new current version of Edit Horse instead. This process is known as *redirection*. Messages display at the bottom of the panel during redirection.

The new current version now contains the call to the information message. Its object name is now Edit Horse and its implementation name is MYAEEFR.

Regenerating the New Current Version

You need to generate and compile the new current version so the source and program object contain the new functionality. Type **14** in the Subfile selector as shown to submit a request for batch generation.

```

Work with Versions

Type options, press Enter.
14/15=Generate batch/interactive  17=Device design  18=Structure
20=Access path  21/22=Narrative  23=STRSEU           26=Make current

Opt  Object                Version      Implementation
 14 * Edit Horse           Development  MYAEEFR      Status
   Edit Horse - Version 1  Development  MYAPEFR      Current

F3=Exit  F5=Refresh  F11=Alt view  F12=Cancel  F23=More options
Usages of Model object 'Horse/Edit Horse/*FUN' in Library MYMDL redirected t
Bottom

```

Press Enter to submit the request. Press F3 to return to the Edit Model Object List panel. The 0 to the right of the Subfile selector of the Edit Horse list entry indicates that it is a non-current version.

Exercise

Submit the batch job using the procedure you used previously in this topic. Press F19 to display the Job List Commands menu and select the YSBMMDLCRT option. When you finish, return to the Edit Model Object List panel.

Viewing Model Object Information for the Versions

Note that an 8 appears to the left of both the Edit Horse and Edit Horse - Version 1 list entries. This indicates that the list entry information does not match that of the corresponding model object. In this case, the object names and implementation names are mismatched since they were exchanged during the process of making Edit Horse - Version 1 current.

Note: This difference is allowed to occur so you can use your model object list as a historical record.

To view current details for a model object, use Subfile selector option 8. (Note that you can press F23 to see other options.) For example, type **8** against the Edit Horse list entry.

```

Edit Model Object List

Model . . . MYMDL
List . . . JAR      List JAR in MYMDL created by user JAR.

Type options, press Enter.
18=Device structure      19=Work with versions      20=Access path
21=Narrative/object      22=Narrative/owner         23=STRSEU

Opt  Object                Implementation  ---Generation---  Fun/Msg
 8  8  Edit Horse           MYAEEFR       08/31/95 11:15:04 EDTFIL
   8  Edit Horse - Version 1 MYAPEFR       09/01/95 10:33:02 EDTFIL
   Edit Jockey           MYAIEFR       08/31/95 10:33:57 EDTFIL
   Edit Race             MYAKEFR       08/31/95 10:35:06 EDTFIL
   Entry number          ACCD
   Entry Status          ACST
   Female
                                           More...

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
    
```

Press Enter.

Note that the Object Name, Edit Horse - Version 1, and the implementation name shown in the Source column, MYAPEFR, do not match the corresponding information shown on the Edit Model Object List panel for the Edit Horse list entry.

```

Display Model Object                                Model : MYMDL

Object . . . Edit Horse - Version 1      Owner . . . Horse
Type . . . FUN  Attribute . . . RPG  Surrogate . 1100110
Copy name . . Edit Horse
Create date . 08/29/95  Version type . . DEV
Create time . 16:57:40  Current object . N
Change date . 09/01/95  Change type . . PUT  Impact processed N
Change time . 11:38:25  Change user . . JAR
Comp chg date. 09/01/95  Action required . GEN
Comp chg time. 11:38:25
Checkout date          Checkout status          List . . . .
Checkout time          Checkout user . . . Promotion .
Import date .          Import model . .
Import time .          Import status . .
Generate date 08/31/95  Function type . . EDTFIL
Generate time 11:15:04
Source  Type Text
MYAPEFR  RPG  Edit Horse - Version 1  Edit file
MYAPEFRD  DSP  Edit Horse - Version 1  Edit file
MYAPEFRH  HLP  Edit Horse - Version 1  Edit file
                                           Bottom

F5=Refresh  F8=Change copy name  F12=Cancel
    
```

Press F12 to return to the Edit Model Object List panel.

Refreshing List Entries for the Versions

To update the two list entries to match the actual model objects, type **33** in the Subfile selector for both entries.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
18=Device structure      19=Work with versions      20=Access path
21=Narrative/object     22=Narrative/owner        23=STRSEU

Opt   Object                               Implementation  ---Generation---  Fun/Msg
      Object                               Name           Date      Time   Type
33 0 8 Edit Horse                          MYAEEFR        08/31/95  11:15:04 EDTFIL
33 8  Edit Horse - Version 1              MYAEEFR        09/01/95  10:33:02 EDTFIL
---   Edit Jockey                          MYAIEFR        08/31/95  10:33:57 EDTFIL
---   Edit Race                             MYAKEFR        08/31/95  10:35:06 EDTFIL
---   Entry number                          ACCD
---   Entry Status                          ACST
---   Female
                                           More...

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
Model object details displayed.

```

Press Enter.

Note: If many discrepancies exist between entries on a model object list and the actual model objects, you can refresh the entire list by pressing the F15 command key. This executes the Check a Model List (YCHKMDLLST) command.

The information for the list entries for the two versions now match that of the corresponding model objects.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR_____ List JAR in MYMDL created by user JAR.

Type options, press Enter.
18=Device structure      19=Work with versions      20=Access path
21=Narrative/object     22=Narrative/owner        23=STRSEU

Opt   Object                               Implementation  ---Generation---  Fun/Msg
      Object                               Name           Date      Time   Type
__ 0  Edit Horse - Version 1              MYAEEFR        08/31/95  11:15:04 EDTFIL
__   Edit Horse                          MYAEEFR        09/01/95  10:33:02 EDTFIL
__   Edit Jockey                          MYAIEFR        08/31/95  10:33:57 EDTFIL
__   Edit Race                             MYAKEFR        08/31/95  10:35:06 EDTFIL
__   Entry number                          ACCD
__   Entry Status                          ACST
__   Female
                                           More...

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Exercise

Use the Position the List panel to display all entries for your session list.

Note: Press F7, blank out all the fields, and press Enter. CA 2E automatically repositions your session list at the top in order by Object Name and Object Type.

Model Object Cross References

This topic introduces the CA 2E model object cross reference panels.

New terms introduced

- Model object cross reference
- Expansion
- Usages
- Using objects
- References

New panels introduced

- Display Model Usages
- Display Model References

Objectives

To use CA 2E's model object cross reference facilities, including the Display Model Usages panel and the Display Model References panel.

Overview of Model Object Cross References

CA 2E's *model object cross reference* facilities consist of a set of commands and interactive panels that you can use to determine, for any model object, which other objects it references and which other objects it is used by.

The process of determining either usages or references for a model object is known as *expansion*. Using model object cross reference facilities, you can expand usages or references for a model object to any level.

You can display or print model object usages and references; you can also convert them to a model object list.

Model Object Usages

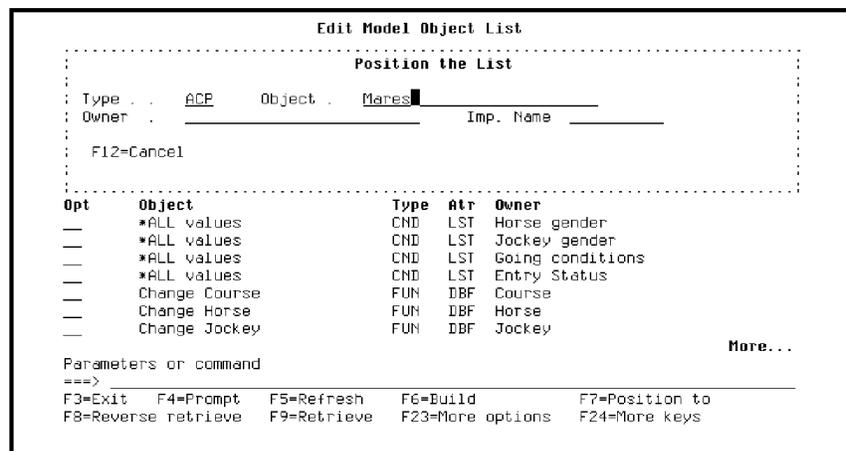
Usages for a model object are all the model objects that use it. Usages are external to the model object and require the model object in order to be complete. A model object's usages are sometimes referred to as *using objects*.

Suppose you want to change the Mares access path. Before you do so, you need to determine which model objects use it. In this step you will use the Display Model Usages panel to display usages for the Mares access path.

Accessing Your Session List

Start by accessing the Edit Model Object List panel for your session list. Use one of the methods you used earlier in this chapter.

First position the session list to the Mares access path. Press F7 to display the Position the List window. Type **ACP** for the Type field and **Mares** for the Object field.



Press Enter. Your session list is now displayed in order by Object Type and Object Name beginning with the Mares access path.

Press F23 until option 91 is displayed. Option 91 displays usages for the selected object. Type **91** in the Subfile selector for the Mares access path.

```

                                Edit Model Object List

Model . . . : MYMDL
List . . . : JAR                List JAR in MYMDL created by user JAR.

Type options, press Enter.
34=Compare objects      81=References/object      82=References/owner
91=Usages/object        92=Usages/owner          /=Merge command

Opt   Object                Type Atr Owner
91    Mares                    ACP   RTU  Horse
█      Physical file             ACP   PHY  Race Entry
—      Physical file             ACP   PHY  Race
—      Physical file             ACP   PHY  Course
—      Physical file             ACP   PHY  Horse
—      Physical file             ACP   PHY  Jockey
—      Races for a Horse         ACP   RSQ  Race Entry

Parameters or command
====>
F3=Exit   F4=Prompt   F5=Refresh   F6=Build   F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Press Enter. Notice the messages at the bottom of the panel as CA 2E expands model usages.

Display Model Usages Panel

When all usages have been expanded, the Display Model Usages panel displays showing the first level of objects in the model that use the Mares access path. Notice the 001 in the Lvl column for each using object; this indicates that the object uses the Mares access path directly.

The Display Model Usages panel provides a variety of controls and filters including, recursion, scope, and positioning to help you analyze your model to determine the impact of proposed changes.

Note: Most of the options provided on the Display Model Usages panel are beyond the scope of this tutorial. However, you can use the online help if you would like to experiment further. Or, you can refer to the CA 2E guide, *Generating and Implementing Applications*.

```

Gen objs :      5          Display Model Usages          Model . . : MYMDL
Total . . :      5          Level . . : 001
Object . . : Mares          Owner . . : Horse
Type . . : ACP Attribute . . : RTU          Exclude system objs . *YES
Scope . . : *NEXT          Filter . . : *ANY          Current objects only . *YES
Object . . : _____ Type . . : _____ Reason . . : *FIRST

2=Edit      3=Copy      4=Delete object      5=Display      8=Details      10=Action diagram
13=Parms    14=GEN batch      15=GEN interactive      16=Y2CALL

Opt Object          Typ Attr Owner          Lvl Reason
┌ Edit Horse          FUN RPG Horse          001 *REFACP
├ Select Horse        FUN RPG Horse          001 *REFACP
├ Select Mares        FUN RPG Horse          001 *FUNPAR
└ Mares               ACP RTU Horse          000 *OBJECT

Bottom
F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F23=More options
    
```

Usage Reason

The Reason column shows how each of the listed model objects use the Mares access path. For example,

- *REFACP - The Edit Horse and Select Horse functions use Mares as a referenced access path.
- *FUNPAR - The Select Mares function uses Mares as the definition of a function parameter.
- *OBJECT - This identifies the model object for which you requested usages. This object is included on the list of usages so you can use the Subfile selection options on the original model object.

The model objects that use the Mares access path are all external functions that will at least need to be regenerated and compiled if you change the Mares access path. However, if your proposed change requires relations to be added to or removed from the Mares access path, you might also need to edit these functions.

In this model no other model objects use the using objects for Mares. You can test whether other objects use the objects displayed by typing **91** in the Subfile selector for any of the using objects.

Exercise

Type **91** against Edit Horse and press Enter to display its usages. The Display Model Usages panel redisplay showing only the model object itself. This indicates that no other model objects use Edit Horse; in other words, it has no usages.

```
Gen objs : 1          Display Model Usages          Model : MYMDL
Total   : 1          Level : 002
Object  : Edit Horse          Owner : Horse
Type    : FUN Attribute : RPG          Exclude system objs : *YES
Scope  : *NEXT          Filter : *ANY          Current objects only : *YES
Object  : _____ Type : _____ Reason : *FIRST

2=Edit      3=Copy      4=Delete object      5=Display      8=Details      10=Action diagram
13=Parms   14=GEN batch      15=GEN interactive      16=Y2CALL

Opt Object          Typ Attr Owner          Lvl Reason
 1 Edit Horse          FUN RPG Horse          000 *OBJECT

Bottom
F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F23=More options
```

Using Usage Levels

Notice that the Level number in the upper right corner has changed to 002. This indicates the number of times you have expanded usages beginning with the original model object.

For a more complex example, a model object may have many levels of using objects. The value of *NEXT in the Scope field lets you step through the expansion of usages one level and one model object at a time. In other words, you can type **91** for any using objects to determine its usage. The Level shown at the upper right of the screen shows the current level. The F3 key lets you back up one level at a time; the F15 key returns to the top level.

Note that you can change the Scope field to *NOMAX to expand all usages for a selected model object. However, for working models this can require significant processing time.

Exiting Model Usages

Press F3 twice to return to the Edit Model Object List panel.

Press F7 to display the Position the List window. Blank out all fields and press Enter to reposition the session list and display all entries.

Model Object References

References for a model object are the model objects it refers to internally. In other words, references are the model objects the referring model object requires in order to be complete or to exist. For example, Display Racing results and Change Horse are references of the Edit Horse function.

This step shows how to access the Display Model References panel and how you can use it to solve problems in program applications.

Accessing the *ALLOBJ List

Start by accessing the Edit Model Object List panel for the All Objects list (*ALLOBJ). Since your session list is currently displayed, type ***ALLOBJ** for the List field at the top of the panel and press Enter.

Positioning *ALLOBJ to an Implementation Name

Suppose you only know the implementation name of the program in which an error occurred; for example, MYAEFR (Edit Horse).

From the Edit Model Object List press F7. Type the implementation name of the program in the Imp. Name field as shown. Be sure to substitute the name corresponding to your Edit Horse function.

Opt	Object	Type	Atr	Owner
—	Mares	ACP	RTU	Horse
—	Physical file	ACP	PHY	Race Entry
—	Physical file	ACP	PHY	Race
—	Physical file	ACP	PHY	Course
—	Physical file	ACP	PHY	Horse
—	Physical file	ACP	PHY	Jockey
—	Races for a Horse	ACP	RSQ	Race Entry

Parameters or command
==>
F3=Exit F4=Prompt F5=Refresh F6=Build F7=Position to
F8=Reverse retrieve F9=Retrieve F23=More options F24=More keys

Press Enter.

The *ALLOBJ list is now positioned at the Edit Horse function. Note the message at the bottom of the panel and that the alternate view showing the Implementation name displays automatically. You can change views by pressing F11.

Displaying References for Edit Horse

Option 81 lets you display references for a selected model object. Type **81** in the Subfile selector for Edit Horse.

```

Edit Model Object List

Model . . : MYMDL
List . . . *ALLOBJ *All objects list for model MYMDL.

Type options, press Enter.
34=Compare objects      81=References/object      82=References/owner
91=Usages/object       92=Usages/owner          /=Merge command

Opt   Object           Implementation  ---Generation---  Fun/Msg
81    Edit Horse       MYAEEFR          09/01/95 10:33:02  EDTFIL
---    Retrieval index  MYAEREL0        08/31/95 11:13:48
---    Update index     MYAEREL1        08/31/95 11:13:44
---    Mares           MYAEREL2        08/31/95 11:13:55
---    Stallions       MYAEREL3        08/31/95 11:13:59
---    Physical file   MYAEREP         08/31/95 11:13:41
---    Retrieval index  MYAFREL0        08/31/95 10:30:09

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
Data displayed in Implementation Name order.
    
```

Press Enter. Notice the messages at the bottom of the panel as CA 2E expands the model references.

Display Model References Panel

When all references have been expanded, the Display Model References panel displays showing all objects in the model referenced by Edit Horse. This panel provides a variety of controls and filters including, recursion, scope, and positioning to help you analyze your model.

Note: Most of the options provided on the Display Model References panel are beyond the scope of this tutorial. However, you can use the online help if you would like to experiment further. Or, refer to the CA 2E module, *Generating and Implementing Applications*.

```

Gen objs :      3      Display Model References      Model . : MYMDL
Total . :      63      Level . : 001
Object . : Edit Horse      Owner . : Horse
Type . . : FUN Attribute . . : RPG      Exclude system objs . *YES
Scope . . : *NEXT      Filter . . : *ANY      Current objects only . *YES
Object . . : _____      Type . . : _____      Reason . . : *FIRST

2=Edit      3=Copy      4=Delete object      5=Display      8=Details      10=Action diagram
13=Parms      14=GEN batch      15=GEN interactive      16=Y2CALL

Opt Object
| Horse
| Change Horse
| Create Horse
| Delete Horse
| Display Racing results
| Edit Horse
| Retrieval index
| Dam name
| Dam Date of birth

Typ Attr Owner
| FIL REF
| FUN DBF Horse
| FUN DBF Horse
| FUN DBF Horse
| FUN RPG Race Entry
| FUN RPG Horse
| ACP RTU Horse
| FLD REF
| FLD REF

Lvl Reason
| 001 *REFFIL
| 001 *DFTDBF
| 001 *DFTDBF
| 001 *DSLDBF
| 001 *ACTION
| 000 *OBJECT
| 001 *BASED
| 001 *DEVENT
| 001 *PARAM
| More...

F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F23=More options
    
```

Displaying Only External Functions

Since you are using references to solve a problem in an application program, you only need to see external functions that are referenced in the Edit Horse action diagram.

Type ***EXTFUN** for the Scope field and type ***ACTION** for the Reason field.

```

Gen objs :      3      Display Model References      Model . : MYMDL
Total . :      63      Level . : 001
Object . : Edit Horse      Owner . : Horse
Type . . : FUN Attribute . . : RPG      Exclude system objs . *YES
Scope . . : *EXTFUN      Filter . . : *ANY      Current objects only . *YES
Object . . : _____      Type . . : _____      Reason . . : *ACTION

2=Edit      3=Copy      4=Delete object      5=Display      8=Details      10=Action diagram
13=Parms      14=GEN batch      15=GEN interactive      16=Y2CALL

Opt Object
| Horse
| Change Horse
| Create Horse
| Delete Horse
| Display Racing results
| Edit Horse
| Retrieval index
| Dam name
| Dam Date of birth

Typ Attr Owner
| FIL REF
| FUN DBF Horse
| FUN DBF Horse
| FUN DBF Horse
| FUN RPG Race Entry
| FUN RPG Horse
| ACP RTU Horse
| FLD REF
| FLD REF

Lvl Reason
| 001 *REFFIL
| 001 *DFTDBF
| 001 *DFTDBF
| 001 *DSLDBF
| 001 *ACTION
| 000 *OBJECT
| 001 *BASED
| 001 *DEVENT
| 001 *PARAM
| More...

F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F23=More options
    
```

Press Enter. Only the functions that make up the program in which the error occurred are now displayed. In a working model this list would generally be much longer. This is a useful starting place for the developers whose task it is to fix the problem.

```

Gen objs :      2      Display Model References      Model . . : MYMDL
Total . . :      9      Level . . : 001
Object . . : Edit Horse      Owner . . : Horse
Type . . : FUN      Attribute . . : RPG      Exclude system objs . . *YES
Scope . . : *EXTFUM      Filter . . : *ANY      Current objects only . . *YES
                                                Reason . . : *ACTION

2=Edit      3=Copy      4=Delete object      5=Display      8=Details      10=Action diagram
13=Parms      14=GEN batch      15=GEN interactive      16=Y2CALL

Opt Object      Typ Attr Owner      Lvl Reason
┌ Racing results displayed      MSG INF *Messages      001 *ACTION
├ Display Racing results      FUN RPG Race Entry      001 *ACTION
├ Dam younger than horse      MSG ERR *Messages      001 *ACTION
└ Sire younger than horse      MSG ERR *Messages      001 *ACTION

Bottom
F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F23=More options
    
```

Creating a Model List of the References

In this step you will use the F16 command key to create a model object list and convert the references displayed to model list entries. You can specify the name of an existing list or you can type a new name and CA 2E will automatically create the model list.

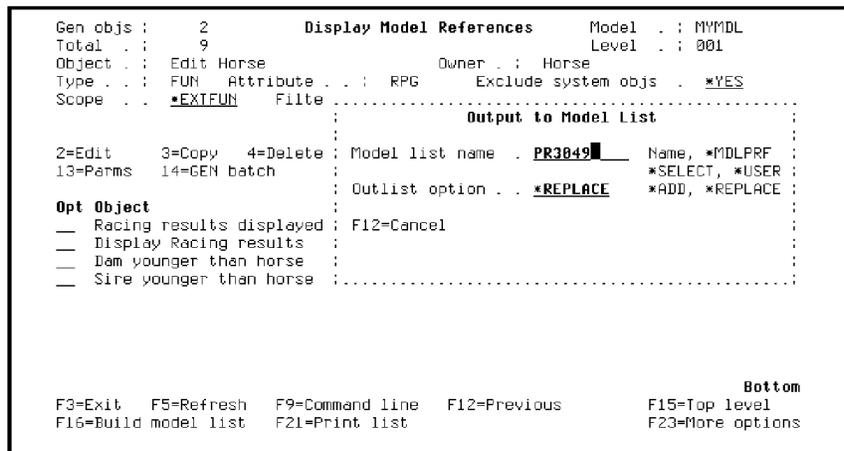
If you specify the name of an existing list be sure the Outlist option is correct. A value of *REPLACE clears the list before converting the references; a value of *ADD appends the new entries to any existing entries.

Naming the List of References

You should assign a name to the list that will be meaningful to the development staff. By default the model list name is the Model list for commands specified in your model profile.

Press F16 to display the window where you will enter the name of the model list that is to contain the references. Suppose you are responding to Problem Report 3049; as a result, you might name the model list PR3049.

Type **PR3049** in the Output to Model List window.



Press Enter. Notice the messages at the bottom of the window as the references are converted to entries on the model object list. On return to the Display Model References panel a message at the bottom of the panel verifies that the conversion is complete.

Using the List of References

You can now print the PR3049 model list using the F21 command key. You can either give the printed copy of the list to your development staff or they can use the model list online as an aid to solving the problem.

Exiting Display Model References

Press F3 to return to the Edit Model Object List panel. Reposition the list to the top in Object Name/Object Type order as follows: press F7 to display the Position the List window, blank out all fields, and press Enter.

Redisplay Your Session List

Type the name of your session list in the List field at the top of the panel. Recall that by default your session list has the same name as your user profile.

```

Edit Model Object List

Model . . : MYMDL
List . . . JAR *All objects list for model MYMDL.

Type options, press Enter.
1=Select  2=Edit    3=Copy    4=Delete entry
5=Display 8=Details  9=Deselect 10=Action diagram

Opt      Object                Type Atr Owner
█        *ALL values            CND   LST   Horse gender
—         *ALL values            CND   LST   Jockey gender
—         *ALL values            CND   LST   Going conditions
—         *ALL values            CND   LST   Entry Status
—         Change Course          FUN   DBF   Course
—         Change Horse           FUN   DBF   Horse
—         Change Jockey          FUN   DBF   Jockey

Parameters or command                                     More...
==>
F3=Exit   F4=Prompt  F5=Refresh F6=Build   F7=Position to
F8=Reverse retrieve F9=Retrieve F23=More options F24=More keys
Data displayed in Object Name/Object Type order.

```

Press Enter.

Impact Analysis

This topic introduces the CA 2E impact analysis tools, including simulating a proposed change and component change processing.

New terms introduced

- Change type
- Private change
- Public change
- Simulating a change
- Component change processing

Objectives

To show how to determine the impact of a proposed change to a model object on other objects in the model.

Overview of Impact Analysis

Impact analysis lets you determine the impact of a proposed change or an actual change to any object in your model. For example, you can determine which objects are affected if you change the length of a key field or which functions need to be regenerated if you change logic in the action diagram of an internal function.

Change Type

Whenever you change a model object, CA 2E assigns a *change type*. The change type describes the way in which a change impacts other objects that use the changed object. The four possible change types are Object only (*OBJONLY), Generation required (*GEN), Private (*PRIVATE), and Public (*PUBLIC). The first two indicate changes that affect only the changed object itself. As a result, this tutorial covers just the last two change types.

- *PRIVATE - this change type indicates a change to an object that requires that you regenerate and compile all access paths and external functions that use it.

For example, if you change the action diagram of an internal function, you need to regenerate the external functions that call it.

- *PUBLIC - this change type indicates that the interface of the model object with other objects has changed. As a result, some model objects that use the changed object may require editing. When the editing is complete, you need to regenerate the access paths and external functions that use the changed object.

For example, if you change the parameters of an internal function you need to edit all functions that call it and then regenerate all external functions that use it.

The change type depends on which attributes of a model object are changed and is derived internally by CA 2E.

Simulating a Change to a Model Object

Simulating a change to a model object lets you see the impact of a proposed change on other objects in the model before you actually make the change. Simulation identifies which other model objects need to be edited or generated as a result of the proposed change.

When you change a model object, the only objects that can be affected by the change are those that *use* the changed object. As a result a major part of simulating a change consists of expanding usages for the object to be changed.

Suppose you want to change the length of the *Course code* field. This is a *PUBLIC change; in other words, some using objects will need to be edited to incorporate the change.

Positioning the List to Course Code

From the Edit Model Object List panel, press F7 to display the Position the List window. Type **FLD** for the Type field and type **Course code** for the Object field.

```

Edit Model Object List
-----
Position the List
Type . . . FLD   Object . . Course code
Owner . . . _____ Imp. Name _____
F12=Cancel
-----
Opt   Object                Type  Atr  Owner
---   ---
*ALL values          CND  LST  Horse gender
*ALL values          CND  LST  Jockey gender
*ALL values          CND  LST  Going conditions
*ALL values          CND  LST  Entry Status
Change Course       FUN  DBF  Course
Change Horse        FUN  DBF  Horse
Change Jockey       FUN  DBF  Jockey
More...

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys

```

Press Enter. Type **91** in the Subfile selector for *Course code* as shown to display the Display Model Usages panel.

```

Edit Model Object List
-----
Model . . . MYMDL
List . . . JAR      List JAR in MYMDL created by user JAR.
Type options, press Enter.
1=Select  2=Edit      3=Copy      4=Delete entry
5=Display 8=Details   9=Deselect 10=Action diagram

Opt   Object                Type  Atr  Owner
---   ---
91   Course code           FLD  CDE
    Course name            FLD  TXT
    Dam Date of birth      FLD  REF
    Dam Horse code        FLD  REF
    Dam name               FLD  REF
    Date of birth          FLD  DT#
    Distance               FLD  QTY
More...

Parameters or command
===>
F3=Exit  F4=Prompt  F5=Refresh  F6=Build  F7=Position to
F8=Reverse retrieve  F9=Retrieve  F23=More options  F24=More keys
Data displayed in Object Type/Object Name order.

```

Press Enter.

Positioning the Usages to Course Code

To simulate a change to Course code, you first need to locate it. Since Course code has many usages, an easy way to locate it is to use the positioning options. Type **Course code** in the Object field and type **FLD** in the Type field.

```

Gen objs :      5      Display Model Usages      Model . : MYMDL
Total . :      18      Level . : 001
Object . : Course code
Type . . : FLD Attribute . . : CDE      Exclude system objs . *YES
Scope . . : *NEXT Filter . . : *ANY Current objects only . *YES
Object . . : Course code Type . . : FLD Reason . . : *FIRST

2=Edit      3=Copy      4=Delete object      5=Display      8=Details      10=Action diagram
13=Parms    14=GEN batch      15=GEN interactive      16=Y2CALL

Opt Object          Typ Atr Owner          Lvl Reason
-- Course            FIL REF                    001 *FILENT
-- Race              FIL REF                    001 *FILENT
-- Race Entry        FIL CPT                    001 *FILENT
-- Change Course     FUN DBF Course            001 *FUNPDT
-- Change Race       FUN DBF Race              001 *FUNPDT
-- Change Race Entry FUN DBF Race Entry        001 *FUNPDT
-- Create Course     FUN DBF Course            001 *FUNPDT
-- Create Race       FUN DBF Race              001 *FUNPDT
-- Create Race Entry FUN DBF Race Entry        001 *FUNPDT
More...
F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F23=More options
    
```

Press Enter.

Simulating a *PUBLIC Change

Press F23 to display additional Subfile selector options. Option 95 lets you simulate a *PUBLIC change for the selected model object.

Type **95** in the Subfile selector for Course code.

```

Gen objs :      5      Display Model Usages      Model . : MYMDL
Total . :      18      Level . : 001
Object . : Course code
Type . . : FLD Attribute . . : CDE      Exclude system objs . *YES
Scope . . : *NEXT Filter . . : *ANY Current objects only . *YES
Object . . : Course code Type . . : FLD Reason . . : *FIRST

81/82=References      91/92=Usages
94=Simulate *PRIVATE change      95=Simulate *PUBLIC change

Opt Object          Typ Atr Owner          Lvl Reason
95 Course code     FLD CDE                    000 *OBJECT

Bottom
F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F23=More options
    
```

Press Enter to display all objects that will be affected by a *PUBLIC change to Course code.

```

Gen objs :    15          Display Model Usages      Model   : MYMDL
Total   . :    27                                     Level   : 002
Object  . : Course code
Type    . : FLD  Attribute . . : CDE      Exclude system objs . *YES
Scope  . : *GENFUN  Filter . . : *ANY      Current objects only . *YES

2=Edit    3=Copy  4=Delete object  5=Display  8=Details  10=Action diagram
13=Parms  14=GEN batch  15=GEN interactive  16=Y2CALL

Opt Object
┌ Physical file          ACP PHY Course      002 PUB EDT
├ Update index          ACP UPD Course      003 PUB EDT
├ Update index          ACP UPD Course      003 PUB EDT
├ Retrieval index       ACP RTU Course      003 PUB EDT
├ Update index          ACP UPD Course      002 PUB EDT
├ Retrieval index       ACP RTU Course      003 PUB EDT
├ Create Course         FUN DBF Course      003 PUB EDT
├ Create Course         FUN DBF Course      003 PUB EDT
├ Change Course        FUN DBF Course      003 PUB EDT
└
More...
F3=Exit  F5=Refresh  F9=Command line  F12=Previous  F15=Top level
F16=Build model list  F21=Print list  F23=More options
Warning: Simulation of a *PUB change to object 'Course code'.

```

Interpreting the Results

When you simulate a change, CA 2E expands usages for the object to be changed up to the first external function for each sequence of model objects that use it. This is indicated by *GENFUN in the Scope field. In addition, only those objects that need to be edited or generated to implement the proposed change are displayed, not all usages.

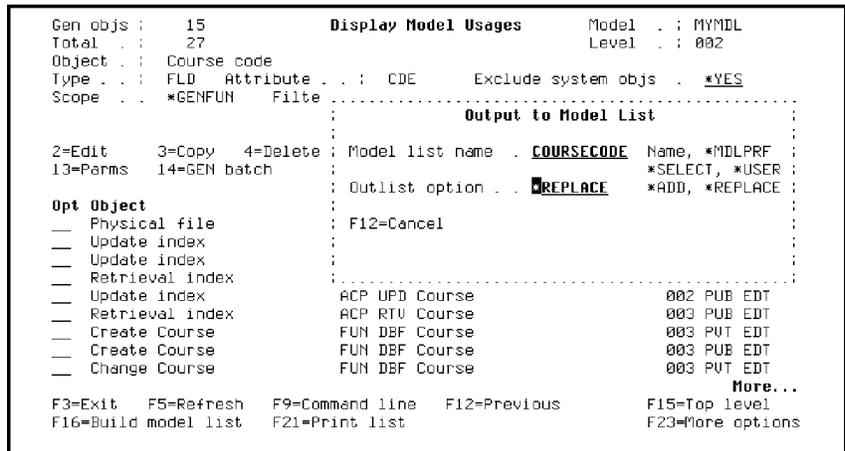
Note the numbers in the Lvl column; they indicate the usage level for each using object. The Action column indicates whether the using object needs to be edited (EDT) or regenerated (GEN).

As you scroll through the list, do not be concerned about what appear to be duplicate entries; they do not indicate errors.

Converting the Simulation Usages to a List

In order to further study the impact of your proposed change, convert the usages displayed to a model object list. Be sure to give it a descriptive name; for example, COURSECODE.

Press F16 and type **COURSECODE** in the Model list name field in the window that displays as shown. Since this is a new list you can accept the default for the Outlist option.



Press Enter. Notice the messages at the bottom of the window as CA 2E creates the list and converts the displayed usages to model list entries.

Press F3 twice to return to the Edit Model Object List panel. Use the F7 key to reposition the session list to the top and display all entries.

Optional Exercise

Type **COURSECODE** in the List field and press Enter to display the model object list you just created. Use the F11 key to view information for each list entry.

When you finish viewing this list, type the name of your session list in the List field and press Enter.

Component Change Processing

Component change processing refers to an automated impact analysis tool. When you simulate a change you are in effect simulating component change processing. The difference is that component change processing updates the All Objects list for the changed object and all objects affected by the change, including an indication of whether the object needs to be edited or regenerated.

Component change processing is optional; you control it using the model profile and the Component Change Processing (YCMPCHG) model value. You can choose to run it interactively, by request, or in batch.

Further discussion of this tool is beyond the scope of this tutorial; however, the simulation topic should have given you some familiarity with the process. Component change processing is discussed in detail in the CA 2E module, *Generating and Implementing Applications*.

Accessing Edit Database Relations

At this point you can exit the model by pressing F3. If you want to continue with the tutorial, you can use either the Edit Model (YEDTMDL) command or the Start CA 2E (YSTRY2) command to reenter the model at the Edit Database Relations panel.

For example, type YEDTMDL on the command line.

```

                                Edit Model Object List
Model . . : MYMDL
List . . . JAR          List JAR in MYMDL created by user JAR.

Type options, press Enter.
1=Select      2=Edit      3=Copy      4=Delete entry
5=Display     8=Details    9=Deselect 10=Action diagram

Opt   Object                Type Atr Owner
---    ---
---    *ALL values             CND   LST   Horse gender
---    *ALL values             CND   LST   Jockey gender
---    *ALL values             CND   LST   Going conditions
---    *ALL values             CND   LST   Entry Status
---    Change Course           FUN   DBF   Course
---    Change Horse            FUN   DBF   Horse
---    Change Jockey           FUN   DBF   Jockey
                                           More...

Parameters or command
===> YEDTMDL
-----
F3=Exit   F4=Prompt   F5=Refresh   F6=Build   F7=Position to
F8=Reverse retrieve   F9=Retrieve   F23=More options   F24=More keys

```

Press Enter.

Chapter 7: Advanced Functions

This chapter demonstrates the use of the Edit Transaction (EDTTRN) function with a Span (SPN) access path and the use of function fields. This chapter introduces the following topics.

- The Edit Transaction Function Type
- Span Access Path
- Defining an Edit Transaction Function
- Using Function Fields
- Defining Function Field Parameters

This section contains the following topics:

[Span Access Path and Edit Transaction Function](#) (see page 331)

[Introduction to Function Fields](#) (see page 349)

Span Access Path and Edit Transaction Function

This topic demonstrates the use of the Edit Transaction (EDTTRN) function with a Span (SPN) access path.

New terms introduced

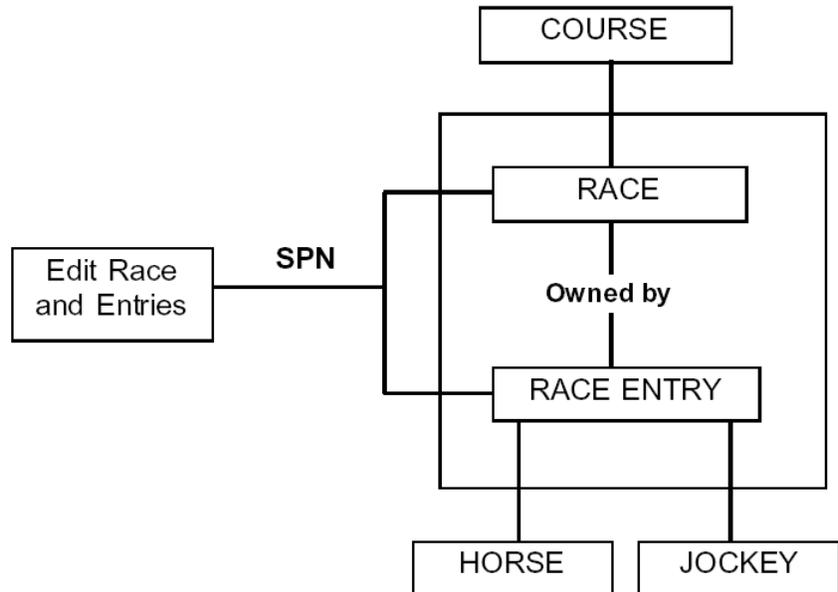
- Access path format
- New panels introduced
- Display Access Path Formats

Objectives

You will specify a SPN access path based on the RACE and RACE ENTRY files.

Overview

The Edit Transaction function allows two database files to be updated simultaneously. The Edit Transaction function type requires a SPN access path, which is a logical file with two formats.



In order for a SPN access path to be built over two files, the two files must be connected by a file-to-file relation; for example, an Owned by relation. The Edit Transaction function provides a display consisting of a subfile control format for the owning file and a subfile record format for the owned file.

You will set up an Edit Transaction function for the RACE and RACE ENTRY files. This provides the facility to enter both the race details and the race entry details for a given race on the same interactive panel.

Overview of Processing Steps

To implement the Edit Transaction function you will:

1. Define and generate a SPN access path for the RACE and RACE ENTRY files.
2. Create the Edit Transaction function and modify the device design for the Edit Race and Entries function.
3. Generate source for the function.
4. Compile the access path, display file, and program source.

Entering Your Design Model

Return to the Edit Database Relations panel for your design model. Select the RACE and RACE ENTRY files by typing **Race*** on the selection line.

EDIT DATABASE RELATIONS		My model			
=>	Race*	Rel lvl:			
? Typ	Object	Relation	Seq	Typ	Referenced object
—	FIL Course	Known by		FLD	Course code
—	FIL Course	Has		FLD	Course name
—	FIL Horse	Known by	18	FLD	Horse code
—	FIL Horse	Has	20	FLD	Horse name
—	FIL Horse	Has	30	FLD	Horse gender
—	FIL Horse	Has	40	FLD	Horse value
—	FIL Horse	Has	50	FLD	Date of birth
—	FIL Horse	Refers to	60	FIL	Horse
	For: Dam			Sharing:	*ALL
—	FIL Horse	Refers to	70	FIL	Horse
	For: Sire			Sharing:	*ALL
—	FIL Jockey	Known by		FLD	Jockey code
—	FIL Jockey	Has		FLD	Jockey name
—	FIL Jockey	Has		FLD	Jockey gender
—	FIL Race	Owned by		FIL	Course

More...

Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
 F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys

Press Enter.

Creating a Span Access Path

Create a SPN access path on the RACE file. A SPN access path must be attached to the file that is to form the header format of the access path. In this case, you will create the SPN access path over the RACE file.

Type **Z** against any relation on the RACE file to display all existing access paths.

EDIT DATABASE RELATIONS		My model			
=>	Race*	Rel lvl:			
? Typ	Object	Relation	Seq	Typ	Referenced object
Z	FIL Race	Owned by		FIL	Course
—	FIL Race	Known by		FLD	Race date
—	FIL Race	Known by		FLD	Race time
—	FIL Race	Has		FLD	Race name
—	FIL Race	Has		FLD	Going conditions
—	FIL Race	Has		FLD	Distance
—	FIL Race	Has		FLD	Prize money
—	FIL Race Entry	Owned by		FIL	Race
—	FIL Race Entry	Known by		FLD	Entry number
—	FIL Race Entry	Refers to		FIL	Horse
—	FIL Race Entry	Refers to		FIL	Jockey
—	FIL Race Entry	Has		FLD	Finishing position
—	FIL Race Entry	Has		FLD	Handicap
—	FIL Race Entry	Has		FLD	Entry Status

Bottom

Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
 F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys

Press Enter. The Edit File Details panel displays.

Defining the Span Access Path

To specify the SPN access path you need to:

1. Define two access path file formats, one for the subfile control (header) and one for the subfile record (detail)
2. Specify the keys for those formats

Define the new access path by calling it Race and Entries of type SPN. Type the access path type, name, and Z.

```
EDIT FILE DETAILS                               My model
File name . . . . . : Race
Attribute . . . . . : REF                       Field reference file. : *NONE
Documentation sequence. . . . . : REF           Source library. . . . : MYGEN
GEN format prefix . . . . . : AC              Distributed . . . . . : H (Y,N)
Assimilated physical. . . . . :
Record not found message. : Race              NF Msgid. : USR0003
Record exists message . . . : Race            EX Msgid. : USR0004

? Typ Access path      Source mbr Key   Index options   Auto add
- PHY Physical file    MYACREP  NONE
- UPD Update index     MYACREL0 UNIQUE IMMED  ATR ONLY
- RTV Retrieval index  MYACREL1 UNIQUE IMMED  ATR ONLY
Z SPN Race and Entries

-
-
-
-
-
-
SEL: Z-Details, G/J-Generate, E-STRSEU, D-Delete, L-Locks, O-Overrides
      H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
      F3=Exit F5=Reload F7=Functions F8=Change name F17=Services F20=Narrative
```

Press Enter. The Edit Access Path Details panel displays.

Entering the Access Path Formats

An access path format defines a view upon a physical file. By default, it makes all of the non-virtual entries in that file available. An access path format can be defined as a list of access path relations that will be resolved into a list of field entries. Relations can be removed from a view on the Edit Access Path Relations panel.

When you previously used the Edit Access Path Details panel, the access path format was automatically provided. For the SPN access path you must explicitly add the formats. Note that it is important that you add the formats in the correct sequence: header format first, detail format second.

Press F9 to display the Display Access Path Formats panel where you will add the format for the subfile control (header).

```

EDIT ACCESS PATH DETAILS          My model
File name . . . . . : Race          Attribute . . : REF
Access path name . . . . : Races and Entries      Type . . . . : SPN
Unique or duplicate order : E (U-Unique,F-FIFO,L-LIFO,C-FCFO,''-Undefined)
Index maintenance option  : I (I-IMMED, D-DLY, R-REBLD)
Alternate collating table : _____
Allow select/omit . . . . : _ (S-Static, D-Dynamic, ''-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . : MYACREL2
Source member text . . . : Race          Races and Entries

SEL: Z-Entries, R-Relts, S-SEL/omit, A-Assoc.acp, T-Trim, V-Virtualize, D-Delet
F3=Exit F5=Reload F8=Rename F9=Add format F20=Narrative

```

Selecting the First Access Path Format

The Display Access Path Formats panel shows you the files that you can select for the SPN access path. In this case, the two files shown are connected to the RACE file by an Owned by and a Defined as relation.

Select the RACE format with X.

```

DISPLAY ACCESS PATH FORMATS           My model
File name . . . . . : Race           Attribute . : SPN
Access path name. . . . . : Race and Entries

? File           Relation For
X Race           Defined as
■ Race Entry     Owned by

SEL: X-Select format of specified file.
F3=Exit
    
```

Press Enter.

Confirming Selection of the First Format

The selection of the first format for the SPN access path, Race and Entries, has now been confirmed. Press F9 to add a second format for the subfile record (detail).

```

EDIT ACCESS PATH DETAILS           My model
File name . . . . . : Race           Attribute . : REF
Access path name. . . . . : Race and Entries   Type . . . : SPN
Unique or duplicate order : F (U-Unique,F-FIFO,L-LIFO,C-FCFO,''-Undefined)
Index maintenance option : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table : _____
Allow select/omit . . . . . : _____ (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . : MYACREL2
Source member text . . . : Race           Race and Entries

? Seq name      GEN  Format text           Associated
? Seq name      pfx  (Based on file)     Retrieval access path
■ 1 FACREA0     AC   Race                 Retrieval index

SEL: Z-Entries, R-Rel, S-Sel/omit, A-Assoc.acp, T-Trim, V-Virtualize, D-Delet
F3=Exit F5=Reload F8=Rename F9=Add format F20=Narrative
    
```

Specifying the Second Format

The Display Access Path Formats panel displays showing the file-to-file relations for the RACE file. Type **X** to select the Race Entry format for the subfile record.

```
DISPLAY ACCESS PATH FORMATS          My model
File name . . . . . : RACE          Attribute . . : SPH
Access path name. . . . . : RACE and Entries

? File           Relation      For
■ RACE          Defined as
X RACE Entry    Owned by

SEL: X-Select format of specified file.
F3=Exit
```

Press Enter to return to the Edit Access Path Details panel.

Adding Virtual Fields to the Access Path Formats

When the end user enters races and race entries, it would be helpful to have the following virtual fields display on the interactive panel: Course name, Horse name, and Jockey name. As mentioned previously, each access path initially contains all of the relations for the file on which it is based, but none of the virtual entries. As a result, if you want virtual fields included on the two formats for the Race and Entries access path, you need to add them explicitly.

In this step, you will add these virtual fields to the Race and Race Entry access path formats. Type **V** in the Subfile selector for both the Race format and the Race Entry format.

```

EDIT ACCESS PATH DETAILS                               My model
File name . . . . . : Race                               Attribute . : REF
Access path name . . . . : Races and Entries           Type . . . . : SPH
Unique or duplicate order : F (U-Unique,F-FIFO,L-LIFO,C-FCFO,' '-Undefined)
Index maintenance option  : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . . : (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . : MYACREL2
Source member text . . . : Race                       Races and Entries

      Format      GEN  Format text                Associated
? Seq name      pfx  (Based on file)          Retrieval access path
V 1 FACREAZ     AC   Race                       Retrieval index
V 2 FACCPA3     AD   Race Entry                 Retrieval index

SEL: Z-Entries, R-Rel, S-Sel/omit, A-Assoc.acp, T-Trim, V-Virtualize, D-Delete
F3=Exit F5=Reload F8=Rename F9=Add format F20=Narrative
    
```

Press Enter.

The Virtualize Access Path panel displays showing the virtual field, Course name that can be added to the Race access path format.

```

VIRTUALIZE ACCESS PATH                               My model
File name . . . . . : Race                               Attribute . : REF
Access path . . . . . : Retrieval index                 Type . . . . : RTV

      Field              Type      Ocr  Et  Ksq  GEN name  Length  Renamed
      Course name       TXT              V   ABTX      25

F3=Exit, no update  ENTER=Validate
    
```

Press Enter to add the Course name virtual field to the Race access path format.

A Confirm prompt displays in the lower right-hand corner of the panel.

```

VIRTUALIZE ACCESS PATH                               My model
File name . . . . . : Race                               Attribute. : REF
Access path . . . . . : Retrieval index                 Type . . . . : RTV

  Field                Type      Ocr  Et Ksq GEN name   Length  Renamed
Course name          TXT      V   ABTX           25

F3=Exit, no update  ENTER=Validate

CONFIRM:  (Y,N)
    
```

Press Enter to confirm the addition of the Course name virtual field.

CA 2E again displays the Virtualize Access Path panel showing the virtual fields that can be added to the Race Entry access path format. In this case, the virtual fields are Horse name and Jockey name.

```

VIRTUALIZE ACCESS PATH                               My model
File name . . . . . : Race Entry                           Attribute. : CPT
Access path . . . . . : Retrieval index                 Type . . . . : RTV

  Field                Type      Ocr  Et Ksq GEN name   Length  Renamed
Horse name          TXT      V   ADTX           25
Jockey name        TXT      V   AETX           25

F3=Exit, no update  ENTER=Validate
    
```

Press Enter to add these virtual fields to the Race Entry access path format. A Confirm prompt displays in the lower right-hand corner of the panel.

```

VIRTUALIZE ACCESS PATH                               My model
File name . . . . . : Race Entry                      Attribute . : CPT
Access path . . . . . : Retrieval index                Type . . . . : RTV

  Field                Type      Ocr  Et  Ksq  GEN name  Length  Renamed
Horse name           TXT          V    ADTX    25
Jockey name         TXT          V    AETX    25

F3=Exit, no update  ENTER=Validate

                                           CONFIRM: Y (Y,N)
    
```

Press Enter to confirm the addition of the Horse name and Jockey name virtual fields and return to the Edit Access Path Details panel.

Details for the First Access Path Format

The Edit Access Path Details panel displays both formats. Next, display the details for the access path format by zooming against the Race access path format. This displays the Edit Access Path Format Entries panel.

Type Z against the Race access path format.

```

EDIT ACCESS PATH DETAILS                               My model
File name . . . . . : Race                              Attribute . : REF
Access path name . . : Race and Entries                 Type . . . . : SPH
Unique or duplicate order : F (U-Unique,F-FIFO,L-LIFO,C-FCFO,''-Undefined)
Index maintenance option : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . :   (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . : MYACREL2
Source member text . . : Race                          Race and Entries

  Format      GEN  Format text                Associated
? Seq name  pfx  (Based on file)           Retrieval access path
Z 1 FACREAO AC Race                Retrieval index
2 FADCPA1 AD Race Entry            Retrieval index

SEL: Z=Entries, R=Rel, S=Sel/omit, A=Assoc.acp, T=Trim, V=Virtualize, D=Delet
F3=Exit F5=Reload F8=Rename F9=Add format F20=Narrative
    
```

Press Enter.

Specifying the Key for the First Access Path Format

The next step is to check the keys of the Race access path format. You may specify any of the fields from the RACE file as keys, in either ascending or descending order. However, there must be a common key between the two formats. For example, the header record key fields must be part of the detail record's key.

The keys will be defaulted to the keys as specified by the file relations. In the case of two files linked by an Owned by relation, the default keys are recommended. If the two file formats are linked by a Refers to relation, you need to change the key order.

EDIT ACCESS PATH FORMAT ENTRIES				My model		Attribute . . : REF	
File name	:	Race				Type.	: SPH
Access path name.	:	Races and Entries					
Format text	:	Race					
Based on.	:	Race				Format No . . .	: 1
? Field			GEN	Key	Altcol	Ref	
			Name	no.	Dsc	seq	cnt
■ Course code	CDE	ABCD	K	<u>1</u>	-		1
- Course name	TXT	ABTX	V				1
- Race date	DT#	ABD2	K	<u>2</u>	-		1
- Race time	TM#	ABT2	K	<u>3</u>	-		1
- Race name	TXT	ACTX	A				1
- Going conditions	STS	ABST	A				1
- Distance	QTY	AAQT	A				1
- Prize money	VAL	AAVA	A				1
SEL: Z-Field details, L-Locks.							
F3=Exit F7=Relations							

Because in this example, RACE ENTRY is Owned by RACE, press Enter to accept the defaults.

Press F3 to exit and return to the Edit Access Path Details panel.

Details for the Second Access Path Format

In this step you will zoom into the Race Entry access path format to check its key.

Type **Z** against the Race Entry access path format.

```

EDIT ACCESS PATH DETAILS          My model
File name . . . . . : Race          Attribute . . : REF
Access path name . . . . . : Race and Entries  Type . . . . : SPH
Unique or duplicate order : F (U-Unique,F-FIFO,L-LIFO,C-FCFO,' '-Undefined)
Index maintenance option  : I (I-IMMED, D-DLY, R-REBLD)
Alternate collating table :
Allow select/omit . . . . . : (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . . . : MYACREL2
Source member text . . . . . : Race          Race and Entries

? Seq name      Format      GEN      Format text      Associated
                pfx      (Based on file)  Retrieval access path
  1 FACREAB      AC      Race            Retrieval index
  2 FADCPA1      AD      Race Entry      Retrieval index

SEL: Z-Entries, R-Rel, S-Sel/omit, A-Assoc.acp, T-Trim, V-Virtualize, D-Delet
F3=Exit F5=Reload F8=Rename F9=Add format F20=Narrative
    
```

Press Enter.

The keys Course code, Race date, Race time, and Entry number have been selected by default to be the keys of the format since these are the keys as defined by the file relations for the RACE ENTRY file.

```

EDIT ACCESS PATH FORMAT ENTRIES    My model
File name . . . . . : Race          Attribute . . : REF
Access path name . . . . . : Races and Entries  Type . . . . : SPH
Format text . . . . . : Race Entry
Based on . . . . . : Race Entry          Format No . . : 2

? Field      GEN      Key      Altcol Ref
             Name     Type     no. Dsc seq cnt
  Course code CDE      ABCD     K      1      -      1
  Race date   DT#      ABDZ     K      2      -      1
  Race time   TM#      ABT2     K      3      -      1
  Entry number CDE      ACCD     K      4      -      1
  Horse code  CDE      ADCD     A      -      -      1
  Horse name  TXT      ADTX     V      -      -      1
  Jockey code CDE      AECD     A      -      -      1
  Jockey name TXT      AETX     V      -      -      1
  Finishing position NBR      ABNB     A      -      -      1
  Handicap    QTY      ABQT     A      -      -      1
  Entry Status STS      ACST     A      -      -      1

SEL: 2-Field details, L-Locks.
F3=Exit F7=Relations
    
```

Press Enter to confirm the keys.

Press F13 to exit and return to the Edit File Details panel.

Defining the Edit Transaction Function

From the Edit File Details panel, you can transfer directly to the Edit Functions panel for the RACE file by pressing F7.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Race
Attribute . . . . . : REF
Documentation sequence . . . . . :
GEN format prefix . . . . . : AC
Assimilated physical . . . . . :
Record not found message . . . . . : Race
Record exists message . . . . . : Race

Field reference file . . . : *NONE
Source library . . . . . : MYGEN
Distributed . . . . . : N (Y,N)
Enhance SQL Naming . . . . . : N (Y,N)
HF Msgid . . . . . : USR0003
EX Msgid . . . . . : USR0004

? Typ Access path      Source mbr Key   Index options      Auto add
- PHY Physical file    MYACREP  NONE
- UPD Update index     MYACREL0 UNIQUE IMMED      ATR ONLY
- RTV Retrieval index  MYACREL1 UNIQUE IMMED      ATR ONLY
- SPH Race and Entries MYACREL2 FIFO  IMMED              ATR ONLY
-
-
-
-
SEL: Z-Details, G/J-Generate, E-STRSEU, D-Delete, L-Locks, O-Overrides
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F7=Functions F8=Change name F17=Services F20=Narrative
Source generation request for MYACREP accepted. +
    
```

Press F7 to access the Edit Functions panel.

Type the function details; namely, type **Edit Race and Entries** for the Function name, **EDTTRN** for the Function type, **Race and Entries** for the Access path, and **S** to edit the device design.

```

EDIT FUNCTIONS                               My model
File name . . . : Race
** 1ST LEVEL **

? Function      Function type      Access path
- Change Race   Change object      Update index
- Create Race   Create object      Update index
- Delete Race   Delete object      Update index
- Edit Race     Edit file          Retrieval index
- Select Race   Select record      Retrieval index
- S Edit Race and Entries EDTTRN             Race and Entries
-
-
-
-
-
-
-
-
More...
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Narr, O-Open,
T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock.
F3=Exit F5=Reload F7=File details F9=Add functions F17=Services
    
```

Press Enter to create the Edit Race and Entries function and display the device design.

The Modified Device Design

Update this default device design to look like the one shown on the next panel. Use the function keys you used to edit the device design for the Edit Horse and Select Horse functions earlier in this tutorial.

```

File  fFunction  Selector  Help
-----
*PROGRAM  *PGMMOD                               DD/MM/YY HH:MM:SS
                                Edit Race and Entries
Course code . . .  _____  000000000000000000000000
Race date . . . .  _____  Name . _____
Going conditions  _  Distance . _____  Prize money . _____

Select items, then select an action.

Opt  Entry  Horse  Horse  Finishing  Entry  H'cap
   number code name          position  Status   cap
-   _____  _____  000000000000000000000000  _____  -  _____
   Jockey: _____  000000000000000000000000  _____  -  _____
-   Jockey: _____  000000000000000000000000  _____  -  _____
   Jockey: _____  000000000000000000000000  _____  -  _____
-   Jockey: _____  000000000000000000000000  _____  -  _____
   Jockey: _____  000000000000000000000000  _____  -  _____

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Note: To move a field to another position on the panel, place the cursor on the field to be moved and press F8. Position the cursor on the field that appears before the desired position for the field you are moving. Press F8. For example, place the cursor on the Finishing position field, and press F8. Then position the cursor on the Horse name field, and press F8 again. This moves the Finishing position field after Horse name.

Defining Optional Entry Fields

You have now updated the device design to meet the initial requirements. However, by default, CA 2E defines all input-capable fields as required entry fields. To allow the end user to enter race entries without specifying all the details about those entries, you can make some of the fields optional. Note that only non-key fields can be optional.

To make some of the fields in the RACE ENTRY file optional, position the cursor on a field in the first subfile record.

```

File  fUnction  Selector  Help
-----
*PROGRAM  *PGMMOD                               DD/MM/YY HH:MM:SS
                                Edit Race and Entries
Course code . . .      _____ 000000000000000000000000
Race date . . .      _____ Name _____
Going conditions _____ Distance _____ Prize money _____

Select items, then select an action.

Opt  Entry  Horse  Horse  Finishing  Entry  H'cap
number code name position Status
-    -    -    -    -    -    -
  Jockey: _____ 000000000000000000000000 _____ - _____
  Jockey: _____ 000000000000000000000000 _____ - _____

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press F7.

This displays the relations for the subfile record format. You specify optional relations by typing **O** against the relations.

Type **O** against the relations.

```

EDIT SCREEN FORMAT RELATIONS          My model
File name . . . . . : Race              Attribute . . : REF
Access path name . . . . . : Races and Entries  Type . . . . . : SPN
Format text . . . . . : Race Entry
Based on . . . . . : Race Entry           Format No . . : 2

? Verb      File/for      Access path/Function  Check
  Owned by  Race          Retrieval index      REQUIRED
  Known by  Entry number      Retrieval index      REQUIRED
  O Refers to Horse          Retrieval index      REQUIRED
  O Refers to Jockey        Retrieval index      REQUIRED
  O Has     Finishing position      Retrieval index      REQUIRED
  O Has     Handicap              Retrieval index      REQUIRED
                                                    +

R-Required, O-Optional, H-No error, U-User, S-Select F4, T-Default F4
F3=Exit
    
```

Press Roll Up to view the remaining relations listed. Type **O** against the relation.

```

EDIT SCREEN FORMAT RELATIONS          My model
File name . . . . . : Race              Attribute . : REF
Access path name. . . . . : Races and Entries  Type. . . . . : SPN
Format text . . . . . : Race Entry           Format No . . : 2
Based on. . . . . : Race Entry

? Verb      File/for      Access path/Function      Check
O Has      Entry Status          Access path/Function      REQUIRED

R-Required, O-Optional, N-No error, U-User, S-Select F4, T-Default F4
F3=Exit
    
```

Press Enter to confirm the changes to the format relations. Note that the values in the Check column changed from REQUIRED to OPTIONAL.

Press Roll Down to view the beginning of the list of relations.

```

EDIT SCREEN FORMAT RELATIONS          My model
File name . . . . . : Race              Attribute . : REF
Access path name. . . . . : Races and Entries  Type. . . . . : SPN
Format text . . . . . : Race Entry           Format No . . : 2
Based on. . . . . : Race Entry

? Verb      File/for      Access path/Function      Check
■ Owned by  Race          Retrieval index          REQUIRED
   Known by  Entry number          Retrieval index          REQUIRED
  _ Refers to Horse          Retrieval index          OPTIONAL
  _ Refers to Jockey          Retrieval index          OPTIONAL
  _ Has      Finishing position          OPTIONAL
  _ Has      Handicap          OPTIONAL
                                                    +

R-Required, O-Optional, N-No error, U-User, S-Select F4, T-Default F4
F3=Exit
    
```

Press F3 return to the device design.

Introduction to Function Fields

You will now add function fields to your device design.

New terms introduced

- Function field
- New panels introduced
- Edit Device Function Field

Objectives

Add a new field to the subfile control format of the Edit Transaction panel that shows the number of horses that finished the race. To do so you will define a function field containing the total number of race entries having an Entry Status of Finished.

Overview of Function Fields

Function fields are non-database fields that may be used in device designs and action diagrams. The same function field can be used in many different functions.

There are six types, or usages, of function fields. Four provide standard field-level functions: SUM, MIN, MAX, and CNT; two are user-defined and let you define your own function fields: USR and DRV.

Function field parameters specify which field values are to be passed into the function field at execution time and which field is to be returned from the function field as the result. All function fields with the exception of USR fields have one output parameter, the function field itself. The system-defined function fields have a single input parameter. Derived function fields, of usage DRV, are specified in the action diagram and can have up to nine input parameters.

Adding Function Fields

In this step, you will define a function field of usage DRV to evaluate whether or not a given race entry finished a race. The DRV field will contain a value of 1 if the horse finished and 0 if it did not. You will also define a function field with a usage of SUM to calculate the number of finishers. The sum of the values in the DRV function field gives the count of the number of finishers.

Position the cursor on the field that is to be displayed on the panel before the function field, in this case Handicap.

```

File  fFunction  Selector  Help
-----
*PROGRAM  *PGMMOD                               DD/MM/YY HH:MM:SS
                                Edit Race and Entries
Course code . . .  _____ 00000000000000000000000000000000
Race date . . . . _____ Name . _____
Going conditions  _ Distance . _____ Prize money . _____

Select items, then select an action.

Opt Entry Horse Horse Finishing Entry H'cap
number code name position Status
- _____ 00000000000000000000000000000000 _____ -
  Jockey: _____ 00000000000000000000000000000000

F3=Exit  F5=Reset  F9=Open  F10=Actions
    
```

Press F19 to display the Edit Device Function Field panel.

Naming the Function Field

If the function field already exists and you know its name, you can fill in the name on the Edit Device Function Field panel. Otherwise, type a ? to display existing fields.

Type ? for the Field name.

```
EDIT DEVICE FUNCTION FIELD           My model
Format. . . . . : Subfile record.
Field name . . . : ? _____ ('?' to select)

F3=Exit F5=Parameters
```

Press Enter.

Displaying Existing Fields

The ? displays a list of all existing fields. You can select an existing function field or you can create a new one. In this tutorial, you will create two new function fields.

Overriding the Field Defaults

Since you specified **Y** for Edit field, you will be shown the field details for the Finished race field. You can now change the internal field length to 3 from the Edit Field Details panel. Type **3** for internal length and press Field Exit.

```

EDIT FIELD DETAILS                               My model
Field name . . . . . : Finished race             Document'n seq. . . :
Type . . . . .      : HBR                       Field usage: DRV
Internal length. . . : 3 █ Data type : P         GEN name: ACNB
                   K'bd shift: -
Headings. . . . . :-
Text . . . . .      : Finished race
Left hand side text. : Finished race
Right hand side text : Number
Column headings. . . : Finished
                   race
Control . . . . . :-
Default condition : *NONE
Check condition . . : *NONE
Modulus 10/11. . . . :
Edit codes. . . . . :- Mask input edit code (Y, ' ')
Screen input . . . . : 4 ' '
Screen output. . . . : 3 ' 0'
Report . . . . .     : 3 ' 0'
F3=Exit no update  F8=Change name/type  F9=Conditions  F10=Appearance  F20=Har
  
```

Press Enter. Press F3 to return to the Display Fields panel.

Displaying the Function Fields

The Display Fields panel now has your new function fields displayed. Note that you need to press Roll Up to view the No. of finishers function field.

Type **P** against Finished race as shown to edit its parameters.

```

DISPLAY FIELDS                               My model
? Field name                               Type REF (*ZERO) (*BLANK)
                                           Length Field name Field usage
- Course code                             CDE      6 ABCD CDE
- Course name                             TXT     25 ABTX ATR
- Dam Date of birth                       DT# REF  10 ADDZ ATR
- Dam Horse code                          CDE REF  6 AFCD CDE
- Dam name                                 TXT REF  25 AFTX ATR
- Date of birth                           DT#     10 ACDZ ATR
- Distance                                 QTY     5.0 AAOZ ATR
- Entry number                            CDE     6 ACCD CDE
- Entry Status                             STS     1 ACST ATR
P Finished race                            HBR     3.0 ACNB DRV
█ Finishing position                       HBR     5.0 ABNB ATR
- Going conditions                        STS     1 ABST ATR
- Handicap                                 QTY     5.0 ABOT ATR
+
SEL: P-Parameters, N-Narrative
     X-Select.
F3=Exit F5=Reload F10=Define field
  
```

Press Enter to display the Edit Function Parameters panel.

Press F3 to return to the Edit Function Parameters panel.

The derived (DRV) function field itself, Finished race, is automatically defined as an output parameter. Check this by displaying the parameter details. Type **Z** against the Finished race field to display the Edit Function Parameter Details panel. Note that the Usage for this parameter is O (output).

Press F3 twice to exit and return to the Display Fields panel.

Selecting the Function Field

You have just finished declaring the function fields in CA 2E. After returning to the Display Fields panel, you need to select the Finished race function field for inclusion on the device design. First, type **Finished** in the positioner line and press Enter to position to the new function fields.

Type **X** next to Finished race.

DISPLAY FIELDS		My model				
?	Field name	Type	REF	(*ZERO) Length	(*BLANK) Field name	Field usage
	Finished					
X	Finished race	NBR		3.0	ACNB	DRV
█	Finishing position	NBR		5.0	ABNB	ATR
-	Going conditions	STS		1	ABST	ATR
-	Handicap	QTY		5.0	ABQT	ATR
-	Horse code	CDE		6	ADCD	CDE
-	Horse gender	STS		1	ADST	ATR
-	Horse name	TXT		25	ADTX	ATR
-	Horse value	VAL		11.2	ABVA	ATR
-	Jockey code	CDE		6	AECD	CDE
-	Jockey gender	STS		1	AEST	ATR
-	Jockey name	TXT		25	AETX	ATR
-	No. of finishers	NBR	REF	3.0	ADNB	SUM
-	Prize money	VAL		11.2	AAVA	ATR

SEL: P-Parameters, N-Narrative
X-Select.
F3=Exit F5=Reload F10=Define field

Press Enter.

Accepting the Parameters

The Edit Action - Function Details window is displayed showing the parameters for the Finished race function field. Note that the input parameter is Entry Status, the output parameter is Finished race, and both parameters have the RCD (subfile record) context.

```

DISPLAY FIELDS                               My model
                                           (*ZERO) (*BLANK)
? F :
E : EDIT ACTION - FUNCTION DETAILS
X F : Function file : *FIELD
F : Function. . . : Finished race
- G :
- H : IOB Parameter                               Use Typ Ctx Object Name
- H : 0 Finished race                             FLD RCD Finished race
- H : I Entry Status                               FLD RCD Entry Status
- H :
- H :
- J :
- J :
- J :
- N : F3=Exit F9=Edit parameters F10=Default parms F12=Previous
- P : Some parameters have been defaulted. Press ENTER to accept
SEL:
X-Select.
F3=Exit F5=Reload F10=Define field
    
```

Press Enter to accept the default parameters and return to the device design.

The Modified Device Design

After returning to the device design, note that the Finished race function field has been added to the subfile record.

```

File fUction Selector Help
-----
*PROGRAM *PGMMOD                               DD/MM/YY HH:MM:SS
                               Edit Race and Entries
Course code . . . _____ 000000000000000000000000
Race date . . . . _____ Name _____
Going conditions _____ Distance . _____ Prize money . _____

Select items, then select an action.

Opt  Entry  Horse  Horse  Finishing  Entry  H'cap  Fini
number code code name  position  Status  _____ race
-----
- Jockey: _____ 000000000000000000000000 _____ - _____ 666

F3=Exit F5=Reset F9=Open F10=Actions
Design exceeds device size limits for function Edit Race and Entries
    
```

Note that since the device design exceeds the limits of the panel, you will need to adjust this device design later in the tutorial.

Press F3 to exit and display the Edit Function Devices panel.

Defining a Function Field Action Diagram

You will now define the action for the user-defined (DRV) function field, Finished race. This will require entering logic into the action diagram for the Edit Race and Entries function.

Press F5 to view the action diagram for the Edit Race and Entries function.

```

EDIT FUNCTION DEVICES                               My model
Function name. . : Edit Race and Entries           Type : Edit transaction
Received by file : Race                           Acpth: Races and Entries

? Title
Screen title..... ■ Edit Race and Entries

SEL: Z-Scr/rpt design, N-Narrative, A-Animate
F3=Exit F5=Action diagram F15=Open Functions

```

Press F5 to view the Action Diagram User Points.

```

EDIT ACTION DIAGRAM                               Edit   MYMDL   Race
FIND=>                                           Edit Race and Entries
■ > Edit Race and Entries
--- .---
--- . ...Initialize                                <--
--- . > Conduct program process
--- . .REPEAT WHILE
--- . |-*ALWAYS
--- . | ...Initialize screen                        <--
--- . | > Conduct screen conversation
--- . | .REPEAT WHILE
--- . | |-*Transaction continues
--- . | | Display screen
--- . | | ..Process response                        <--
--- . | |-ENDWHILE
--- . |-ENDWHILE
--- . | ...Closedown                                <--
--- .---
F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```


Adding a CASE Construct

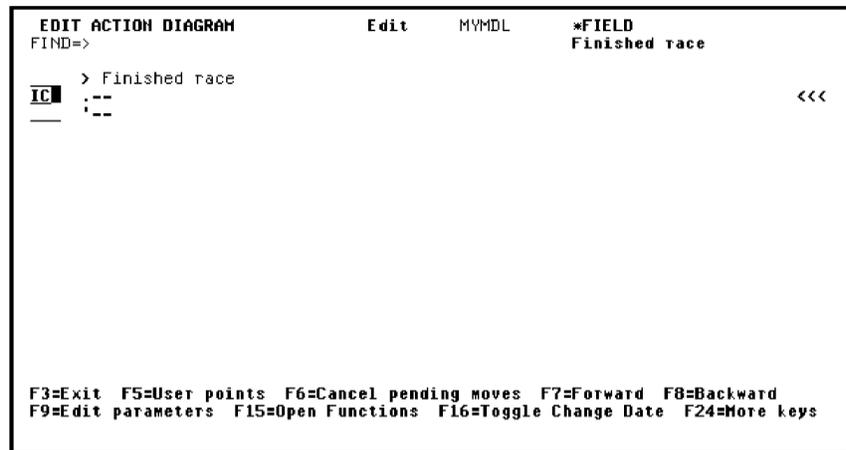
The action diagram for the function field Finished race will be displayed. Note that you are now editing the Finished race function as shown in the upper right corner of the panel. You will use the Action Diagram Editor to insert the following conditions and actions for the Finished race function field.

```

CASE
Condition 1   Does Entry Status = Finished?
Action 1     Yes, set Finished race to 1
Condition 2   *OTHERWISE
Action 2     Set Finished race to 0
ENDCASE

```

Type **IC**.



Press Enter.

Adding an Action

Insert an action into the action diagram. Type **IA**.

```
EDIT ACTION DIAGRAM      Edit      MYMDL      *FIELD
FIND=>                   Finished race

___ > Finished race
___ .--
___ .-.-CASE
IA .-!!! New condition
___ .-ENDCASE
___ .--

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

Press Enter.

Adding a Second Condition

Add another condition to the CASE construct by typing **IX** against the first !!! New condition as shown. Recall that IX inserts a new condition within a CASE construct.

```
EDIT ACTION DIAGRAM      Edit      MYMDL      *FIELD
FIND=>                   Finished race

___ > Finished race
___ .--
___ .-.-CASE
IX .-!!! New condition
___ .-!!! Undetermined action
___ .-ENDCASE
___ .--

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

Press Enter.

Adding a Second Action

Add another action to the CASE construct by typing **IA** against the second !!! New condition.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    *FIELD
FIND=>                        Finished race

___ > Finished race
___ .---
___ . .-CASE
___ . .-!!! New condition
___ . .!!! Undetermined action
IA . .-!!! New condition
___ . .-ENDCASE
___ .---

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter.

Defining the Conditions and Actions

To define the conditions and actions, type **F** against them all, and press Enter. Recall that **F** lets you edit the action or condition details for a line in the action diagram.

Type **F** against the conditions and actions.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    *FIELD
FIND=>                        Finished race

___ > Finished race
___ .---
___ . .-CASE
F . .-!!! New condition
F . .!!! Undetermined action
F . .-!!! New condition
F . .!!! Undetermined action
___ . .-ENDCASE
___ .---

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter.

Specifying the First Condition

The first condition specifies that the action is only to be executed if the Entry Status is Finished.

Type the details as shown. Type **PAR** (parameter) for the context, **Entry Status** for the field, and **?** in the condition field to view a list of the available conditions.

```

EDIT ACTION DIAGRAM          Edit   MYMDL   *FIELD
FIND=>                        Finished race

___ > Finished race          EDIT ACTION - CONDITION
___ .---
___ .-CASE                   Title. : !!! New condition
F .-!!! New condi           Context.Field . . . : PAR Entry status
F .-!!! Undetermi          Condition . . . . . : ?
F .-!!! New condi
F .-!!! Undetermi
___ .-ENDCASE
___ .---

F3=Exit F7=Edit Compound Condition

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
    
```

Press Enter.

Defining Field Conditions for the Status Field

If you completed the earlier exercise of defining conditions for the Entry Status field, the Edit Field - Condition window panel will include the list of conditions shown here. If you have not already done so, you can add them at this point.

Type **X** against the condition Finished.

```

EDIT FIELD CONDITIONS          My model
Field name . . . . . : Entry Status      Attr. : STS
Enter condition . . . : _____      and type to add new condition.
type . . . . . : _____ (Type: LST, VAL)

? Condition                Type Op File/From value      Display/To value      MN
- *ALL values              LST **
- Disqualified             VAL D D
X Finished                 VAL F F
- Not yet run              VAL W W
- Scratched                VAL S S

SEL: Z-Details, D-Delete, X-Select, U-Where used, N-Narrative.
F3=Exit
    
```

Press Enter twice.

Specifying the First Action

You have just finished defining the first condition in the CASE construct you are defining. Because you also typed **F** against the first action in the CASE construct, CA 2E displays the Edit Action - Function Name window to specify the action. In this case, the action will be the built-in function ***MOVE**.

The action you are specifying is executed when the first condition is true; namely, when Entry Status is Finished. The action is to return a constant value of one in the Finished race function field.

Leave the Function file field blank to indicate a built-in function and type ***MOVE**.

```

EDIT ACTION DIAGRAM          Edit   MYMDL   *FIELD
FIND=>                        Finished race
-----
___ > Finished race          : EDIT A : EDIT ACTION - FUNCTION NAME
-----
___ : -CASE                   : Title. : Function file :
F   : -!!! New condi         : Context:          : *MOVE
F   : -!!! Undetermi        : Condi  : F3=Exit
F   : -!!! Undetermi        : OR
F   : -ENDCASE              : Compari:
___ :                          : Context:
___ :                          : F3=Exit F7=Edit Compound Condition
-----

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter to enter parameter details for the ***MOVE** function.

Type the details for the ***MOVE** parameters.

```

EDIT ACTION DIAGRAM          Edit   MYMDL   *FIELD
FIND=>                        Finished race
-----
___ > Finished race          : EDIT A : EDIT ACTION - FUNCTION NAME
-----
___ : EDIT ACTION - FUNCTION DETAILS
F   : Function file :
F   : Function. . . : *MOVE
F   : IOB Parameter Use Typ Ctx Object Name
___ : 0 *Result      PAR Finished race
___ : I *Factor 2    CON 1
-----

F3=Exit F9=Edit parameters F10=Default parms F12=Previous

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

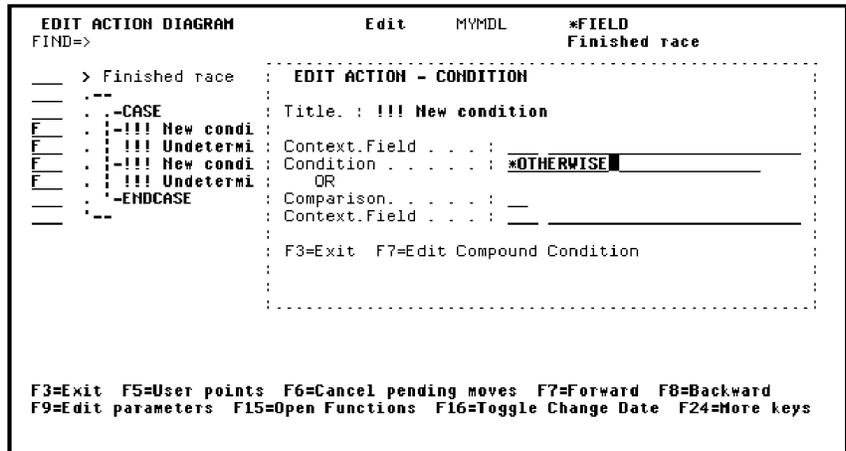
```

Press Enter.

Specifying the Second Condition

Because you typed **F** against the second new condition in the action diagram CASE construct, CA 2E displays the Edit Action - Condition window. The second condition specifies the action to be executed in all cases other than that specified in the first condition. A special value of ***OTHERWISE** is used for this case.

Remove all the ? and specify ***OTHERWISE** for the condition.



Press Enter.

Defining the Second Action

Because you typed **F** against the second action, CA 2E displays the Edit Action - Function Name window. For the second action, you will specify the action to take when the first condition is not true. The action is to return a value of zero in the Finished race function field. You will again use the ***MOVE** built-in function.

Leave the Function file field blank and specify the ***MOVE** function.

```

EDIT ACTION DIAGRAM          Edit   MYMDL   *FIELD
FIND=>                        Finished race

___ > Finished race          EDIT A   EDIT ACTION - FUNCTION NAME
___ :                        :         :
___ : -CASE                  : Title.  : Function file :
F   : -!!! New condi        : Context: F3=Exit
F   : -!!! Undetermi        : OR
F   : -!!! New condi        : Compari:
F   : -!!! Undetermi        : Context:
___ : -ENDCASE              :
___ :                        :
                                   F3=Exit F7=Edit Compound Condition

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter to enter parameter details for the ***MOVE** function.

Type the details for the ***MOVE** parameters.

```

EDIT ACTION DIAGRAM          Edit   MYMDL   *FIELD
FIND=>                        Finished race

___ > Finished race          EDIT A   EDIT ACTION - FUNCTION NAME
___ :                        :         :
___ : EDIT ACTION - FUNCTION DETAILS
F   : Function file :
F   : Function. . . : *MOVE
F   :
F   : IOB Parameter      Obj
___ : 0 *Result          Use Typ Ctx Object Name
___ : I *Factor 2       PAR Finished race
                                   COH 0
                                   :

                                   F3=Exit F9=Edit parameters F10=Default parms F12=Previous

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter to accept the parameters and return to the Action Diagram Editor.

Complete Action Diagram

The completed action diagram should look like this.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    *FIELD
FIND=>                        Finished race

___ > Finished race
___ .---
___ . .-CASE
___ . .-PAR.Entry Status is Finished
___ . .  PAR.Finished race = CON.1
___ . .  *OTHERWISE
___ . .  PAR.Finished race = CON.*ZERO
___ . .-ENDCASE
___ .---

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
    
```

Press F13 to exit the action diagram for the Finished race function field.

Accept the default of Y to save the Finished race function field.

```

EXIT FUNCTION DEFINITION          My model

Type choices, press Enter.

Change/create function. . . . Y          Y=Yes, N=No
Function name . . . . . Finished race    Name
Access path name. . . . . *N/A          Name
File name . . . . . *FIELD              Name
Function type . . . . . Derived function field

Print function. . . . . N                Y=Yes, N=No
Return to editing . . . . . N            Y=Yes, N=No

F5=Refresh  F12=Cancel  F15=Open Functions
    
```

Press Enter to return to the action diagram for the Edit Race and Entries function.

```

EDIT ACTION DIAGRAM          Edit    MYMDL    Race
FIND=>                        Edit Race and Entries
█ > CALC: Subfile record function fields
--- :--
--- : Finished race          *FIELD
--- :--
                                     <<<
                                     <<<

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
Function 'Finished race' has been saved.

```

Press F13 to exit the action diagram for the Edit Race and Entries function.

Accept the default of **Y** to save the function definition.

```

EXIT FUNCTION DEFINITION          My model
Type choices, press Enter.
Change/create function. . . . . Y                Y=Yes, N=No
Function name . . . . . Edit Race and Entries    Name
Access path name. . . . . Races and Entries      Name
File name . . . . . Race                        Name
Function type . . . . . Edit transaction

Print function. . . . . N                Y=Yes, N=No
Return to editing . . . . . N            Y=Yes, N=No
Submit generation . . . . . N           Y=Yes, N=No

F5=Refresh  F12=Cancel  F15=Open Functions

```

Press Enter.

Specifying the Second Function Field

The required field already exists; as a result, you can type the name No. of finishers directly. Alternatively you could type ? to obtain a selection list.

Type the function field name No. of Finishers.

```
EDIT DEVICE FUNCTION FIELD           My model
Format. . . . . : Subfile control.
Field name . . . : No. of finishers ('?' to select)

F3=Exit F5=Parameters
```

Press Enter.

Defining Parameters for the No. of finishers Function Field

The parameters for the No. of finishers function field are defaulted. The input parameter is Finished race from the RCD (subfile record) context; the output parameter is the No. of finishers function field itself in the CTL (subfile control) context. Recall that you defined the No. of finishers function field with the SUM field usage.

This causes the values in the input parameter field (Finished race) for each detail record to automatically be added together and the sum to be placed in the output parameter (No. of finishers).

```

EDIT DEVICE FUNCTION FIELD           My model
Format. . . . . : Subfile control.
-----
Field : EDIT ACTION - FUNCTION DETAILS
       : Function file : *FIELD
       : Function. . . : No. of finishers
       :
       : IOB Parameter           Use Typ Ctx Object Name
       : 0 No. of finishers      FLD CTL No. of finishers
       : 1 Finished race         FLD RCD Finished race
       :
       :
       : F3=Exit  F9=Edit parameters  F10=Default parms  F12=Previous
       : Some parameters have been defaulted.  Press ENTER to accept
-----
F3=Exit  F5=Parameters
    
```

Press Enter to accept the default parameters as shown.

The Added Function Field

The No. of Finishers field will be added to the subfile control format.

```

File  fFunction  Selector  Help
-----
*PROGRAM  *PGMMOD                               DD/MM/YY HH:MM:SS
                               Edit Race and Entries
Course code . . . . . 000000000000000000000000
Race date . . . . . Name . . . . .
Going conditions  _ Distance . . . . . Prize money . . . . . No. of
Select items, then select an action.
Opt  Entry  Horse  Horse  Finishing  Entry  H'cap  Fini
number  code  name  position  Status  race
-----
   Jockey:  _____ 000000000000000000000000  _____  _____ 666
   Jockey:  _____ 000000000000000000000000  _____  _____ 666
-----
F3=Exit  F5=Reset  F9=Open  F10=Actions
Design exceeds device size limits for function Edit Race and Entries
    
```

Readjusting the Device Design

Adjust the device design so that all fields fit on the panel. Move the No. of finishers function field to a new line and hide the Finished race function field so that it is not displayed.

To do the latter, position the cursor on the field and press Enter. The Edit Screen Entry Details panel displays. Change the I/O usage for the field to hidden (H).

```

EDIT SCREEN ENTRY DETAILS           My model
Field name . . . . . : Finished race           Display length . . . : 3
GEN name . . . . . : ACNB
Label location . . . : C (Above,Before,Column,blank) Label spacing. : _
Lines before . . . . : _
Spaces before . . . . : 2                     Screen text. . . . . : E (M, L, F)
Column Headings. . . : Finished
                   race
Left hand side text. : Finished race
Right hand side text : Number
Display RHS text . . : _ RHS spaces . . . . . : _ Fill LHS text. . . . : Y
I/O Usage. . . . . : H Edit codes Output. . : 3 Input: 4
Mask input edit code : N
Check condition . . : *NONE
Allow zero . . . . . : _ Field exit option. . . : Z

F3=Exit, no update F7=Relations F18=Screen attributes

```

Press Enter. The final device design should look like this:

```

File  fUction  Selector  Help
-----
*PROGRAM *PGMMOD                               DD/MM/YY HH:MM:SS
                                Edit Race and Entries
Course code . . . _____ 00000000000000000000000000000000
Race date . . . _____ Name _____
Going conditions _____ Distance _____ Prize money _____
No. of finishers 666

Select items, then select an action.

Opt  Entry  Horse  Horse  Finishing  Entry  H'cap
   number code  name  position  Status
-----
-   Jockey: _____ 00000000000000000000000000000000 _____ - _____

F3=Exit F5=Reset F9=Open F10=Actions

```

Press F3 to go to the Edit Function Devices panel.

Exiting the Device Design

You have finished creating the function Edit Race and Entries and designed an appropriate panel layout.

```
EDIT FUNCTION DEVICES                My model
Function name . . . : Edit Race and Entries      Type : Edit transaction
Received by file : Race                          Acpth: Races and Entries

? Title
Screen title..... Edit Race and Entries

SEL: Z-Scr/rpt design, N-Narrative, A-Animate
F3=Exit  F5=Action diagram  F15=Open Functions
```

Exit from the Edit Function Devices panel by pressing F3. The Exit Function Definition panel displays.

Submitting the Function for Generation

In addition to saving changes to the function, you can use the Exit Function Definition panel to submit the function and display file for generation by setting the Submit generation field to Y.

Accept the default of Y for Change/create function to save your changes and change the Submit generation field to Y.

```
EXIT FUNCTION DEFINITION                My model
Type choices, press Enter.

Change/create function . . . . Y                V=Yes, N=No
  Function name . . . . . Edit Race and Entries   Name
  Access path name . . . . Races and Entries     Name
  File name . . . . . Race                       Name
  Function type . . . . . Edit transaction

Print function . . . . . N                V=Yes, N=No
Return to editing . . . . . N                V=Yes, N=No
Submit generation . . . . . Y                V=Yes, N=No

F5=Refresh  F12=Cancel  F15=Open Functions
```


Exercises

Do the following exercises:

1. Submit the request for generation and compilation for the Races and Entries SPN access path and the Edit Races and Entries function. You do this by selecting the Submit model create request (YSBMMDLCRT) option from the Display Services Menu (F17). For a program to compile successfully, all files and access paths used by the program must have been generated and compiled first.

Note: Be sure to write down the implementation name for the Edit Races and Entries function. You will need this name for testing the program using the CALL command.

2. Call the Edit Races and Entries function and add a few races to the database and some entries for each race. When you call the program, remember to specify the null or blank parameter for the return code. For example,

call myaretr “

Try pressing F4 on fields like *Horse code* and *Jockey code* to view a selection list of available entries.

Note: CA 2E automatically provides this prompting capability for file-to-file relations, such as, RACE ENTRY Refers to HORSE. When the end user types a ? or user prompt (F4) for a key or foreign key field, by default CA 2E calls the related Select record function, such as, Select Horse. A function used in this way is known as a *prompt function*.

3. Call the Edit Horse program and test the link you defined between the Edit Horse program and the Display Racing Results program. You should be able to select a horse and display its racing history.

For example, the steps required to call Display Racing results for Faithful Dobbin are:

- a. Type / in Subfile selector for Faithful Dobbin.
- b. Press F10 to access the action bar.
- c. Type S to access the Selector Choice menu.
- d. Type 1 beside the Display Racing Results action.
- e. Press Enter.

Press F3 to return to the Edit Horse function.

Chapter 8: Report Functions

This chapter introduces the two functions used to produce reports. These are:

- The Print File (PRTFIL) Function
- The Print Object (PRTOBJ) Function

You will use these functions to define the two following reports:

- A simple report of all the horses recorded in the database.
- A more complex report showing all the horses in the database and for each horse, a list of the races in which the horse competed.

This section contains the following topics:

[Introduction to the Print File Function](#) (see page 375)

[Introduction to the Print Object Function](#) (see page 396)

Introduction to the Print File Function

In this topic you will learn how to define a Print File function to produce a simple report of all the horses recorded in the database.

New terms introduced

- PRTFIL (Print File) function
- CNT (count) function field
- CUR (current report format) report context
- NXT (next report format) report context

New displays introduced

- Edit Report Design
- Display Report Formats
- Edit Report Format Details

Objectives

You will be producing a report that lists all the horses recorded in your database. In addition, the report will give the total number of horses recorded and the total value of all the horses. The following steps are involved:

1. Create a Print Horses function based on the HORSE file. The function will require the creation of a RSQ (resequence) access path to retrieve records in *Horse name* order.
2. Specify the *Total horse value* and *Total number of horses* function fields on the report design.
3. Modify the layout of the report, as required.
4. Generate and compile the source for the access path and the report.
5. Test the implemented function.

Defining the Print File Function

Starting from the Edit Functions panel for the HORSE file, specify the Print Horses function. A Print File (PRTFIL) function is defined the same way as other functions. Type **Print Horses** for the Function name, **PRTFIL** for the Function type, and **?** in the access path field to view a list of existing access paths.

EDIT FUNCTIONS		My model	** 1ST LEVEL **
File name. . . : Horse			
? Function	Function type	Access path	
- Change Horse	Change object	Update index	
- Create Horse	Create object	Update index	
- Delete Horse	Delete object	Update index	
- Edit Horse	Edit file	Retrieval index	
- Select Horse	Select record	Retrieval index	
- Select Mares	Select record	Mares	
- Select Stallions	Select record	Stallions	
- Print Horses	PRTFIL	?█	
-			
-			
-			
-			
-			
-			
			More...
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, N-Marr, O-Open, T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock. F3=Exit F5=Reload F7=File details F9=Add functions F17=Services			

Press Enter. The Edit File Details panel displays as a result of entering **?** for the Access path.

Specifying a New Access Path

Use the Edit File Details panel for the HORSE file to create a new access path that will cause the report to print horse details in alphabetical order by Horse name, rather than in Horse code order. To achieve this, specify a new access path of type RSQ called Horse name order.

Type **RSQ** for the access path type, **Horse name order** for the Access path name, and **Z** to zoom into the access path.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Horse                    Field reference file. : >NONE
Attribute . . . . . : REF                      Source library. . . . : MYGEN
Documentation sequence. . . . . :              Distributed . . . . . : N (Y,N)
GEN format prefix . . . . . : AE              Enhance SQL Naming. . : N (Y,N)
Assimilated physical. . . . . :              HF Msgid. . . . . : USR0007
Record not found message. . . . . : Horse     EX Msgid. . . . . : USR0008
Record exists message . . . . . : Horse

? Typ Access path                               Source mbr Key   Index options      Auto add
- PHY Physical file                            MYAEREP  NONE             ATR ONLY
- UPD Update index                            MYAEREL0 UNIQUE IMMED      ATR ONLY
- RTV Hares                                    MYAEREL2 UNIQUE IMMED  DVNSLT            ATR ONLY
- RTV Retrieval index                         MYAEREL1 UNIQUE IMMED      ATR ONLY
- RTV Stallions                               MYAEREL3 UNIQUE IMMED  DVNSLT            ATR ONLY
Z RSQ Horse name order
-
-
SEL: X>Select, Z=Details, G/J=Generate, E=STRSEU, D=Delete, O=Override, L=Lock
H=Hold/Release, T=Trim, V=Virtualize, U=Usage, F=Func refs., N=Narrative
F3=Exit F5=Reload F8=Change name F17=Services F20=Narrative

```

Press Enter.

Adding Virtual Entries to the Access Path

Remember that virtual entries are not automatically added to an access path. As a result, you need to add the Dam name, Dam Date of birth, Sire name, and Sire Date of birth virtual fields explicitly so they will appear on the report you are designing.

Type **V** against the access path format.

```

EDIT ACCESS PATH DETAILS                       My model
File name . . . . . : Horse                    Attribute . . . . . : REF
Access path name. . . . . : Horse name order  Type . . . . . : RSQ
Unique or duplicate order : F (U-Unique,F-FIFO,L-LIFO,C-FCFO,''-Undefined)
Index maintenance option : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table :
Allow select/omit . . . . . : (S-Static, D-Dynamic, ''-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNX)
Source member name . . . : MYAEREL4
Source member text . . . : Horse                Horse name order

Format      GEN  Format text                Associated
? Seq name  pfx  (Based on file)          Retrieval access path
V 1 VAEREA6 AE Horse                Retrieval index

SEL: Z=Entries, R=Relations, S=Select/omit, A=Assoc.acps, T=Trim, V=Virtualize
F3=Exit F8=Rename F20=Narrative

```

Press Enter to display the Virtualize Access Path panel.

```

VIRTUALIZE ACCESS PATH                               My model
File name . . . . . : Horse                               Attribute . : REF
Access path . . . . . : Horse name order                 Type . . . . : RSQ

  Field                Type      Ocr  Et  Ksq  GEN name   Length  Renamed
Dam name              TXT REF    V   AFTX    25     Y
Dam Date of birth    DT# REF    V   ADDZ    18     Y
Sire name            TXT REF    V   AGTX    25     Y
Sire Date of birth  DT# REF    V   AEDZ    18     Y

F3=Exit, no update  ENTER=Validate
    
```

Press Enter twice to validate and confirm the virtual entries displayed. Notice the message at the bottom of the Edit Access Path Details panel.

Edit Access Path Details

You used the Edit Access Path Details panel earlier in this tutorial to specify a RSQ access path. You will use the same process here to specify a new key order on the access path format.

Type Z against the access path format.

```

EDIT ACCESS PATH DETAILS                               My model
File name . . . . . : Horse                               Attribute . : REF
Access path name . . . . : Horse name order                 Type . . . . : RSQ
Unique or duplicate order : U (U-Unique,F-FIFO,L-LIFO,C-FCFO,' '-Undefined)
Index maintenance option  : I (I-IMMED, D-DLV, R-REBLD)
Alternate collating table : I
Allow select/omit . . . . : S (S-Static, D-Dynamic, ' '-None)
Generation mode . . . . . : M (M-MDLVAL, D-DDS, S-SQL, X-UNIX)
Source member name . . . : HYAEREL4
Source member text . . . : Horse                               Horse name order

  ? Seq name      Format      GEN  Format text                Associated
  Z 1 VAEREAG    AE    Horse                    Retrieval index
                                Retrieval access path

SEL: Z=Entries, R=Relations, S=Select/omit, A=Assoc.acps, T=Trim, V=Virtualize
F3=Exit F8=Rename F20=Narrative
Format 'Horse' of 'Horse name order' updated with all virtuals.
    
```

Press Enter

Specifying Access Path Details

On the Edit Access Path Format Entries panel, specify the new key order for the RSQ access path. The initial key order default is the same as for the default Retrieval index access path.

The New Key Order

Specify an alternative key order. For this type of access path, you can choose any field except a virtual field as a key field. Use Horse name as the key.

In the Key no. column, clear the 1 next to Horse code and type **1** against Horse name.

```

EDIT ACCESS PATH FORMAT ENTRIES      My model
File name . . . . . : Horse          Attribute . . : REF
Access path name. . . . . : Horse name order  Type. . . . . : RSQ
Format text . . . . . : Horse          Format No . . : 1
Based on. . . . . : Horse

? Field          GEN      Name      Type      Key   Altcol Ref
? Horse code     CDE      ADCD      K          1     -     1
- Horse name     TXT      ADTX      A          1     -     1
- Horse gender   STS      ADST      A          -     -     1
- Horse value    VAL      ABVA      A          -     -     1
- Date of birth  DT#      ACDZ      A          -     -     1
- Dam Horse code CDE REF  AFCD      A          -     -     1
- Dam name       TXT REF  AFTX      V          -     -     1
- Dam Date of birth DT# REF  ADDZ      V          -     -     1
- Sire Horse code CDE REF  AGCD      A          -     -     1
- Sire name      TXT REF  AGTX      V          -     -     1
- Sire Date of birth DT# REF  AEDZ      V          -     -     1

SEL: Z-Field details, L-Locks.
F3=Exit F7=Relations

```

Press Enter. Press F3 twice to exit.

Generating and Compiling the New Access Path

At the Edit File Details panel, request batch generation and compilation for the newly defined access path using the J option.

Type **J** next to the Horse name order RSQ access path.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Horse
Attribute . . . . . : REF                      Field reference file. : *NONE
Documentation sequence. . . . . :              Source library. . . . : MYGEN
GEN format prefix . . . . . : AE              Distributed . . . . . : N (Y,N)
Assimilated physical. . . . . :              Enhance SQL Naming. . : N (Y,N)
Record not found message. : Horse            HF Msgid. : USR0007
Record exists message . . : Horse            EX Msgid. : USR0008

? Typ Access path      Source mbr Key   Index options      Auto add
- PHY Physical file    MYAREP  NONE
- UPD Update index     MYAREL0 UNIQUE IMMED      ATR ONLY
- RTV Mares            MYAREL2 UNIQUE IMMED      ATR ONLY
- RTV Retrieval index  MYAREL1 UNIQUE IMMED      ATR ONLY
- RTV Stallions        MYAREL3 UNIQUE IMMED      ATR ONLY
J RSQ Horse name order MYAREL4 UNDEFH IMMED      ATR ONLY
|
|
|
SEL: X-Select, Z-Details, G/J-Generate, E-STRSEU, D-Delete, O-Override, L-Lock
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F8=Change name F17=Services F20=Narrative
    
```

Press Enter to request generation.

Selecting the Access Path

Now that you have created the required access path, select it for use with the Print Horses function.

Type **X** to select the Horse name order access path.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Horse
Attribute . . . . . : REF                      Field reference file. : *NONE
Documentation sequence. . . . . :              Source library. . . . : MYGEN
GEN format prefix . . . . . : AE              Distributed . . . . . : N (Y,N)
Assimilated physical. . . . . :              Enhance SQL Naming. . : N (Y,N)
Record not found message. : Horse            HF Msgid. : USR0007
Record exists message . . : Horse            EX Msgid. : USR0008

? Typ Access path      Source mbr Key   Index options      Auto add
- PHY Physical file    MYAREP  NONE
- UPD Update index     MYAREL0 UNIQUE IMMED      ATR ONLY
- RTV Mares            MYAREL2 UNIQUE IMMED      ATR ONLY
- RTV Retrieval index  MYAREL1 UNIQUE IMMED      ATR ONLY
- RTV Stallions        MYAREL3 UNIQUE IMMED      ATR ONLY
X RSQ Horse name order MYAREL4 UNDEFH IMMED      ATR ONLY
|
|
|
SEL: X-Select, Z-Details, G/J-Generate, E-STRSEU, D-Delete, O-Override, L-Lock
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F8=Change name F17=Services F20=Narrative
Source generation request for MYAREL4 accepted.
    
```

Press Enter.

The default layout is made up of the following formats:

The page header format at the top contains a title (Print Horses) plus information such as the date and page number. The header format is repeated on each page of the printed report. An End of report format is placed at the end of the report design.

A heading format and corresponding total format is provided for each Level break. For example, for each key of the based-on access path there is a heading and total format. If the access path has a unique key, the number of level breaks is one less than the number of keys. In this case, the access path does not have a unique key. Since there is one key level, one heading format is provided that, by default, has Horse name as an output field.

The detail format contains the subfile records from the based-on access path. It is shown on the Print Horses report layout between the Horse name heading and Horse name total formats. All the fields from the access path are available in this format. The key field (Horse name) is hidden by default because it already appears on the heading format.

You can modify the report layout the same way you modified the device designs of the earlier functions. The editors for the report layout and the panel design are very similar. However, a report is by default 132 characters across and extends vertically past the bottom of the panel. You can press the Roll Up key to roll the panel by half a panel at a time.

Displaying the Report Formats

The report formats are shown on the Display Report Formats panel. To access this panel, press F17 from the device design (report layout).

DISPLAY REPORT FORMATS		My model					
? Format	Type	Hide	Start	Space	New	Ovflw	Function
		fmt	Line	before	page	print	indent
■ Standard report header	HDR		1				
- Top of Page	TOP			1			
- First Page Format	1PG			1			
- Horse name	1HD			1			
- Detail line.	RCD			1			
- Horse name	2TL			1			
- Final totals	ZTL			1			
- End of report	FTR			1			

SEL: Z-Details, H-Hide, I-Indent, '-'-Drop, '+'-Reinstate format.
F3=Exit

- The Top of page format (TOP) enables you to define fields to be printed at the top of each page in addition to the Standard report header (HDR). This format is empty by default.
- The First page format (1PG) can be used to add title information to the beginning of the report. This format is empty by default.
- The Level-heading format (1HD) contains fields appropriate to the key level; in this case, Horse name. By default, this format prints before the first detail within a level break.
- The Detail line format (RCD) contains the records from the access path on which the Print File function is based. By default, this format is printed for every record read. This format cannot be dropped, only hidden.
- The Level total format (2TL) contains fields appropriate to the key level. By default, this format is printed after the last detail record or subtotal within a level break.
- The Final total format (ZTL) contains totals of all previous total levels. By default, this format contains only the constant Final totals; you can add your own function fields to provide totals.

Dropping Formats from a Report Design

In this step you will remove the Horse name heading and total formats. To remove a format, you can either hide it or drop it completely. If you hide a format it will still be logically present. In this example, you will drop both formats completely.

Type '-' against the two Horse name formats.

DISPLAY REPORT FORMATS		My model					
? Format	Type	Hide	Start	Space	New	Ovflw	Function
		fmt	Line	before	page	print	indent
- Standard report header	HDR		1				
- Top of Page	TOP			1			
- First Page Format	1PG			1			
- Horse name	1HD	-		1			
- Detail line.	RCD			1			
- Horse name	2TL	-		1			
- Final totals	ZTL			1			
- End of report	FTR			1			

SEL: Z-Details, H-Hide, I-Indent, '-'-Drop, '+'-Reinstate format.
F3=Exit

Press Enter. Notice the D in the Hide fmt column for the two formats you dropped.

Adding Function Fields

In this step, you will add two function fields to the Final totals format (ZTL).

Type **Z** against Final totals format.

```

DISPLAY REPORT FORMATS                               My model
? Format                                         Type Hide Start Space New  Ovflw  Function
                                         fmt Line before page print  indent
- Standard report header      HDR           1
- Top of Page                 TOP           1
- First Page Format          1PG           1
- Horse name                       1HD   D           1
- Detail line.               RCD           1
- Horse name                       2TL   D           1
Z Final totals              ZTL           1
- End of report             FTR           1

SEL: Z-Details, H-Hide, I-Indent, '-'-Drop, '+'-Reinstate format.
F3=Exit
    
```

Press Enter to display the Edit Report Format Details screen for the Final totals format.

```

EDIT REPORT FORMAT DETAILS                               My model
Format . . . . . : Final totals                               Type: ZTL
Skip to new page . . . . . :    Print on forms overflow. . . . . :   
Blank lines before fmt . . . . . :  1 or Fixed start line no. . . . . :   
Indentation type . . . . . :    Relative . :    Absolute . :   

SEL: Z-Details, A,B,C,D-Text position, I,O,H,'-'-Field usage.
F3=Exit F7=Fmt rel F10=Sequence F19=Add function field F23=Add constant
    
```

Press F19 to add a function field to this format using the Edit Device Function Fields panel.

Displaying Existing Function Fields

To display existing function fields, type ? for Function field.

```

EDIT DEVICE FUNCTION FIELD           My model
Format. . . . . : Final totals
Field name . . . : ? ( '?' to select)

F3=Exit  F5=Parameters

```

Press Enter.

All fields defined in your model are displayed, including the two function fields you defined for the Edit Race and Entries function (EDTTRN).

```

DISPLAY FIELDS                       My model
? Field name                          Type REF  (*ZERO) (*BLANK)
                                     Length Field name Field usage
- Course code                          CDE    6      ABCD      CDE
- Course name                          TXT    25      ABTX      ATR
- Dam Date of birth                    DT#   REF   10      ADD2      ATR
- Dam Horse code                       CDE   REF   6       AFCD      CDE
- Dam name                             TXT   REF   25      AFTX      ATR
- Date of birth                        DT#    10      ACD2      ATR
- Distance                             QTY    5.0    AQT      ATR
- Entry number                         CDE    6       ACCD      CDE
- Entry Status                         STS    1       ACST      ATR
- Finished race                        HBR    3.0    ACHB      DRV
- Finishing position                   HBR    5.0    ABNB      ATR
- Going conditions                     STS    1       ABST      ATR
- Handicap                             QTY    5.0    ABQT      ATR      +

SEL: P-Parameters, N-Narrative
     X-Select.
F3=Exit  F5=Reload  F10=Define field

```

To define two new function fields, press F10.

Specifying Function Parameters

When you pressed Enter, the two new function fields were created. Press Roll Up twice to view the two new function fields.

The Total horse value function field is now fully defined. However, you must still specify the field used to arrive at the Total number of horses function. Type **P** next to this function field as shown to specify its parameters.

DISPLAY FIELDS		My model				
?	Field name	Type	REF	(*ZERO) Length	(*BLANK) Field name	Field usage
-	Sire Horse code	CDE	REF	6	ACCD	CDE
-	Sire name	TXT	REF	25	AGTX	ATR
-	Total horse value	VAL	REF	11.2	ACVA	SUM
P	Total number of horses	NBR		5.0	AENB	CHT

SEL: P-Parameters, N-Narrative
X-Select.
F3=Exit F5=Reload F10=Define field

Press Enter.

Selecting the Function Fields

You have finished defining the two new function fields. You must now select them to appear on the Final totals format.

Type **X** against Total Horse value.

DISPLAY FIELDS		My model				
?	Field name	Type	REF	(*ZERO) Length	(*BLANK) Field name	Field usage
-	Sire Horse code	CDE	REF	6	AGCD	CDE
-	Sire name	TXT	REF	25	AGTX	ATR
X	Total horse value	VAL	REF	11.2	ACVA	SUM
-	Total number of horses	HBR		5.0	AENB	CHT

SEL: P-Parameters, N-Narrative
X-Select.
F3=Exit F5=Reload F10=Define field

Press Enter.

Press F19 to add the Total number of horses function field.

Type **Total Number of horses** in the Field name field.

```

EDIT DEVICE FUNCTION FIELD           My model
Format. . . . . : Final totals
Field name . . . : Total number of horses ('?' to select)

F3=Exit  F5=Parameters

```

Press Enter.

Confirming the Parameters

CA 2E automatically provides defaults for the parameters and contexts. In this case you need only accept them.

```

EDIT DEVICE FUNCTION FIELD           My model
Format. . . . . : Final totals
Field : EDIT ACTION - FUNCTION DETAILS
       : Function file : *FIELD
       : Function. . . : Total number of horses
       : IOB Parameter           Use Typ Ctx Object Name
       : 0 Total number of horses   FLD HXT Total number of horses
       : 1 Horse code               FLD OUR Horse code
       :
       : F3=Exit  F9=Edit parameters  F10=Default parms  F12=Previous
       : Some parameters have been defaulted. Press ENTER to accept
       :
F3=Exit  F5=Parameters

```

Press Enter to accept the parameters and return to the report device design.

Press F3.

EXIT FUNCTION DEFINITION		My model
Type choices, press Enter.		
Change/create function.	<u>Y</u>	Y=Yes, N=No
Function name	<u>Print Horses</u>	Name
Access path name.	<u>Horse name order</u>	Name
File name	<u>Horse</u>	Name
Function type	<u>Print file</u>	
Print function.	<u>N</u>	Y=Yes, N=No
Return to editing	<u>N</u>	Y=Yes, N=No
Submit generation	<u>N</u>	Y=Yes, N=No
F5=Refresh F12=Cancel F15=Open Functions		

Saving the Report Device Design

Save the changes by accepting the defaults and pressing Enter.

Generating and Compiling the Function

You have now finished specifying the Print Horses function. Type **J** next to this function on the Edit Functions panel and press Enter to request batch generation of the Print File and program that will implement the function.

Finally, compile the generated source for the function and the access path. Press F17 to access the Display Services Menu and select the Submit model create request (YSBMMDLCRT) option. Be sure to note the implementation name (member) of the Print Horses function so you can call it in the next step.

Running Your Program

When the Print Horses function has successfully compiled, try it out by calling the program from a command line. For example,

call myaspr "

Following is an example of the resulting report showing data you entered earlier using the Edit Horse program.

Your company name here		Print Horses	
Horse	M/F	Value	D of B
Bonfire	M	5000.00	2/01/83
		Dam:	
		Sire:	
Faithful Dobbin	F	3500.00	5/31/86
		Dam:	
		Sire:	
Pegasus	M	3000.00	6/23/92
		Dam: Faithful Dobbin	5/31/86
		Sire: Bonfire	2/01/88
Final totals			
Total number of horses	:	3	
Total horse value . . .	:	11500.00	
** END OF REPORT **			

Use the i OS Work with Spooled Files (WRKSPLF) command to view or print your report.

Introduction to the Print Object Function

You will learn how to embed a Print Object function into the existing Print File function to produce a more detailed report.

New terms introduced

- PRTOBJ (Print Object) function
- QRY (Query) access path

New displays introduced

- Edit Device Structure

Objectives

At this point, you have created a function to print a list of all the horses stored in the database. A more useful report might also list the races for which each horse has been entered. To produce such a report, you need to combine records from the RACE ENTRY file with the existing Print Horses function. You can achieve this using a Print Object function. Use the following steps to do this.

1. Specify a Print Object function based on the RACE ENTRY file.
2. Define a Query access path to be used with the RACE ENTRY file.
3. Combine the Print Object function with the Print File function and specify the parameters to be passed between them.
4. Generate and compile the new Print Horses function.
5. Test the program.

Defining the Print Object Function

To define a Print Object function, start from the Edit Database Relations panel and go to the Edit Functions panel on the RACE ENTRY file.

Type **F** against RACE ENTRY.

EDIT DATABASE RELATIONS		My model	
=>	Race*	Rel lvl:	
?	Typ Object	Relation	Seq Typ Referenced object
—	FIL Race	Owned by	FIL Course
—	FIL Race	Known by	FLD Race date
—	FIL Race	Known by	FLD Race time
—	FIL Race	Has	FLD Race name
—	FIL Race	Has	FLD Going conditions
—	FIL Race	Has	FLD Distance
—	FIL Race	Has	FLD Prize money
F	FIL Race Entry	Owned by	FIL Race
—	FIL Race Entry	Known by	FLD Entry number
—	FIL Race Entry	Refers to	FIL Horse
—	FIL Race Entry	Refers to	FIL Jockey
—	FIL Race Entry	Has	FLD Finishing position
—	FIL Race Entry	Has	FLD Handicap
—	FIL Race Entry	Has	FLD Entry Status

Bottom

Z(n)=Details F=Functions E(n)=Entries S(n)=Select F23=More options
 F3=Exit F5=Reload F6=Hide/Show F7=Fields F9=Add/Change F24=More keys

Press Enter.

Specifying a Query Access Path

The Edit File Details panel shows the existing access paths for the RACE ENTRY file. You will create a new access path for the Print Race Entries function.

To produce the desired report, the records in the RACE ENTRY file need to be processed in order by Horse name. To do this, you need to create an access path keyed on the Horse name field; however, Horse name is a virtual field on the RACE ENTRY file. In order to use a virtual field as a key, you need to create a query (QRY) access path. In addition, since virtual entries are not automatically included on an access path, you need to add them explicitly.

Specify a QRY access path named **Entries by Horse name** and type **V** against it.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Race Entry
Attribute . . . . . : CPT                      Field reference file. : *NONE
Documentation sequence. . . . . :              Source library. . . . : MYGEN
GEN format prefix . . . . . : AD              Distributed . . . . . : N (Y,N)
Assimilated physical. . . . . :              Enhance SQL Naming. . : N (Y,N)
Record not found message. : Race Entry        HF Msgid. : USR0005
Record exists message . . : Race Entry        EX Msgid. : USR0006

? Typ Access path      Source mbr Key      Index options      Auto add
- PHV Physical file    MYADCPP  NONE              ATR ONLY
- UPD Update index     MYADCPL0 UNIQUE IMMED      ATR ONLY
- RTV Retrieval index  MYADCPL1 UNIQUE IMMED      ATR ONLY
- RSQ Races for a Horse MYADCPL2 FIFO IMMED      ATR ONLY
V QRY Entries by Horse name
-
-
-
SEL: X-Select, Z-Details, G/J-Generate, E-STRSEU, D-Delete, O-Override, L-Lock
      H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit F5=Reload F8=Change name F17=Services F20=Narrative

```

Press Enter to view the virtual entries that are available for inclusion on the access path; namely, Horse name and Jockey name.

```

VIRTUALIZE ACCESS PATH                          My model
File name . . . . . : Race Entry              Attribute. : CPT
Access path . . . . . : Entries by Horse name Type . . . : QRY

Field          Type      Ocr  Et  Ksq  GEN name  Length  Renamed
Horse name     TXT          V    ADTX    25
Jockey name    TXT          V    AETX    25

F3=Exit, no update  ENTER=Validate

```

Press Enter twice to validate and confirm the inclusion of the two virtual entries and return to the Edit File Details panel. Note the message at the bottom of the panel indicating that the access path has been updated with all virtuals.

Type **Z** against the Entries by Horse name access path to begin the process of specifying Horse name as the key.

```

EDIT FILE DETAILS                               My model
File name . . . . . : Race Entry
Attribute . . . . . : CPT                      Field reference file. : *NONE
Documentation sequence. . . . . :              Source library. . . . . : MYGEN
GEN format prefix . . . . . : AD              Distributed . . . . . : N (Y,N)
Assimilated physical. . . . . :              Enhance SQL Naming. . . . . : N (Y,N)
Record not found message. : Race Entry        HF Msgid. : USR0005
Record exists message . . . : Race Entry      EX Msgid. : USR0006

? Typ Access path          Source mbr Key      Index options      Auto add
- PHY Physical file       HYADCPP  NONE
- UPD Update index        HYADCPL0 UNIQUE IMMED  ATR ONLY
- RTV Retrieval index     HYADCPL1 UNIQUE IMMED  ATR ONLY
- RSU Races for a Horse   HYADCPL2 FIFO IMMED   ATR ONLY
Z GRY Entries by Horse name HYADCPL3 FIFO          ATR ONLY
-
-
-

SEL: X-Select, Z-Details, G/J-Generate, E-STRSEU, D-Delete, O-Override, L-Lock
      H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
      F3=Exit F5=Reload F8=Change name F17=Services F20=Narrative
      Access path 'Entries by Horse name' updated with all virtuals.
    
```

Displaying the Access Path Format Entries

Press Enter to display the Edit Access Path Details panel. Next, type **Z** against the displayed format and press Enter to access the Edit Access Path Format Entries panel.

```

EDIT ACCESS PATH FORMAT ENTRIES                My model
File name . . . . . : Race Entry                Attribute . . : CPT
Access path name. . . . . : Entries by Horse name Type. . . . . : GRY
Format text . . . . . : Race Entry
Based on. . . . . : Race Entry                  Format No . . : 1

? Field                                     GEN
█ Course code          CDE      ABCD      K      1      -      1
- Race date            DT#      ABDZ      K      2      -      1
- Race time            TM#      ABTZ      K      3      -      1
- Entry number         CDE      ACCD      K      4      -      1
- Horse code           CDE      ADCD      A      -      -      1
- Horse name           TXT      ADTX      V      -      -      1
- Jockey code          CDE      AECD      A      -      -      1
- Jockey name          TXT      AETX      V      -      -      1
- Finishing position   NBR      ABNB      A      -      -      1
- Handicap             QTY      ABQT      A      -      -      1
- Entry Status         STS      ACST      A      -      -      1

SEL: Z-Field details, L-Locks.
      F3=Exit F7=Relations
    
```

On the Edit Access Path Format Entries panel, the key order defaults to that of the RTV access path. Note that all fields, including virtual fields, are available as key fields.

Specifying an Alternative Key

Specify Horse name and Race date as the alternate keys of the access path. You can assume that each horse runs in no more than one race per day; as a result, Race time is not required as a key.

Define the keys by changing entries in the Key no. column as shown; namely, blank the key no. field for Course code, Race time, and Entry number, and type **1** for Horse name.

```

EDIT ACCESS PATH FORMAT ENTRIES      My model
File name . . . . . : Race Entry      Attribute . . : CPT
Access path name. . . . . : Entries by Horse name  Type. . . . . : QRY
Format text . . . . . : Race Entry
Based on. . . . . : Race Entry          Format No . . : 1

? Field                               GEN      Key   Altcol Ref
?                               Name     no.  Dsc  seq  cnt
- Course code           CDE     ABCD   K    -    -    1
- Race date             DT#     ABDZ   K    2    -    1
- Race time             TM#     ABT2   K    -    -    1
- Entry number          CDE     ACCD   K    -    -    1
- Horse code            CDE     ADCD   A    -    -    1
- Horse name           TXT     ADTX   V    1    -    1
- Jockey code          CDE     AECD   A    -    -    1
- Jockey name          TXT     AETX   V    -    -    1
- Finishing position   NBR     ABHB   A    -    -    1
- Handicap             QTY     ABOT   A    -    -    1
- Entry Status         STS     ACST   A    -    -    1

SEL: Z-Field details, L-Locks.
F3=Exit  F7=Relations

```

Press Enter. Press F3 twice to exit to the Edit File Details panel.

Compiling the QRY Access Path

The access path you have just defined must be generated and compiled before running the application. You have the option to add it to the job list now. To do so, type **J** next to the QRY access path.

```

EDIT FILE DETAILS                      My model
File name . . . . . : Race Entry      Field reference file. : *NONE
Attribute . . . . . : CPT              Source library. . . . : MYGEN
Documentation sequence. . . . . : AD    Distributed . . . . . : N (Y,N)
GEN format prefix . . . . . : AD       Enhance SQL Naming. . : N (Y,N)
Assimilated physical. . . . . :
Record not found message. : Race Entry  HF Msgid. : USR0005
Record exists message . . : Race Entry  EX Msgid. : USR0006

? Typ Access path           Source mbr Key   Index options      Auto add
- PHY Physical file         MYADCPP   NONE
- UPD Update index          MYADCPLO  UNIQUE IMMED        ATR ONLY
- RTV Retrieval index       MYADCPLO  UNIQUE IMMED        ATR ONLY
- RSO Races for a Horse     MYADCPLO  FIFO  IMMED        ATR ONLY
- J QRY Entries by Horse name MYADCPLO  FIFO
-
-
-
SEL: X-Select, Z-Details, G/J-Generate, E-STRSEU, D-Delete, O-Override, L-Lock
H-Hold/Release, T-Trim, V-Virtualize, U-Usage, F-Func refs., N-Narrative
F3=Exit  F5=Reload  F8=Change name  F17=Services  F20=Narrative

```

Press Enter.

The Default Report Device Design

Initially, the report device design should look like the one shown.

Race Entries for 00000000000000000000000000000000						
Course	Date	Time	Entry number	Jockey	Finishing H' cap position	
000000	00000000	00000000	000000	00000000000000000000000000000000	66666	66666
000000	00000000	00000000	000000	00000000000000000000000000000000	66666	66666
000000	00000000	00000000	000000	00000000000000000000000000000000	66666	66666

The default layout is obtained in a similar way to the previous Print File function. The access path has a non-unique key. A heading and total format are provided for each key of the access path. All the fields from the access path format are output on the detail line records, except for the key fields, which are hidden.

A PRTOBJ function is an internal function. It does not represent a complete report and must be embedded within an existing Print File function. The embedding Print File defines the standard header format, page size, and additional details for the combined report.

Press Enter to return to the Edit Functions panel.

Combining the Report Functions

You have just finished defining the two report functions. Press F3 to exit the Edit Functions panel for the RACE ENTRY file and return to the Edit Database Relations panel.

Go to the Edit Functions panel for the HORSE file. To do this, type **Horse*** on the selection line and press Enter. Then type **F** next to any HORSE relation and press Enter.

The next step is to combine the two functions so that the records from the Print Object function (each race entry) will be printed after each detail record in the Print File function (after the horse to which it applies). To do this, you will use the Edit Device Structure panel.

Type **T** against the Print Horses function.

```

EDIT DEVICE STRUCTURE                My model
Function name : Print Horses
█ Page Headings
  — First Page
  — KEY.Horse name Header
  — Details
  — KEY.Horse name Totals
  — Final Totals
  — End of report

SEL: IA/IB/D/2 M/C/B/A
F3=Exit F6=Cancel pending moves F14=Map

```

Press Enter.

```

EDIT DEVICE STRUCTURE                My model
Function name : Print Horses
  — Page Headings
  — First Page
  — KEY.Horse name Header
  IA Details
  — KEY.Horse name Totals
  — Final Totals
  — End of report

SEL: IA/IB/D/2 M/C/B/A
F3=Exit F6=Cancel pending moves F14=Map

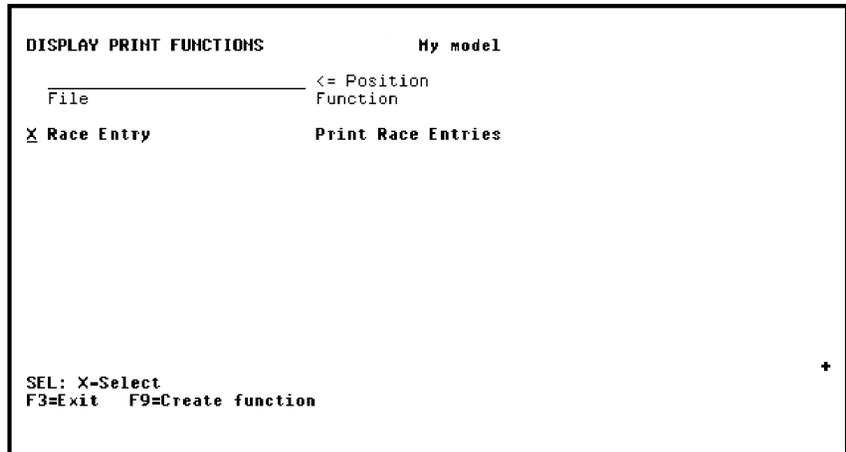
```

Embedding the Print Race Entries Function

The Edit Device Structure panel represents the layout of the report in terms of the formats from which it is constructed. This display is only available for functions of type PRTFIL or PRTOBJ. It has facilities for embedding PRTOBJ functions within the report and moving and copying them.

Many Print Object functions can be embedded within the same Print File function. A Print Object function can contain other embedded Print Object functions. This makes it possible to construct complex reports. In this tutorial, you will be embedding one Print Object function in the previously defined Print File function.

Insert a Print Object function after the Details format by typing **IA** (Insert After) in the Subfile selector.



Press Enter.

Selecting the PRTOBJ Function

The Display Print Functions panel is now shown. This panel displays a list of all the Print Object functions that are available for inclusion in the Print File function. In this case there is just one, Print Race Entries. Type **X** to select the Print Race Entries function.

```

EDIT DEVICE STRUCTURE                               My model
Function name : Print Horses
█ Page Headings
  First Page
  --- KEY.Horse name Header
  --- Details
  --- \FUH.Print Race Entries
  --- KEY.Horse name Totals
  --- Final Totals
  --- End of report

SEL: IA/IB/D/2 M/C/B/A
F3=Exit F6=Cancel pending moves F14=Map

```

Press Enter.

The Modified Device Structure

The modified device structure is shown below. The backslash character indicates that the Print Race Entries function is attached to the preceding Details format and will be printed after each detail record.

```

EDIT DEVICE STRUCTURE                               My model
Function name : Print Horses
--- Page Headings
--- First
--- KEY. : ----- Exit Device Structure
--- De  :
--- \F  : Select one of the following:
--- KEY. : 1. Exit without update
--- Final : 2. Exit and save device structure
--- End of r : 3. Return to editing
           :
           : Option:  2
           : F12=Cancel
           : -----
SEL: IA/IB/D/2 M/C/B/A
F3=Exit F6=Cancel pending moves F14=Map

```

Press F3 to exit.

The New Report Device Design

The modified report device design displays with the fields resulting from the embedded Print Object function.

View the Rest of the Report Device Design

You can display the rest of the report device design by pressing Page Down (or Roll Up depending upon your keyboard).

EXIT FUNCTION DEFINITION	My model
Type choices, press Enter.	
Change/create function.	Y Y=Yes, N=No
Function name	<u>Print Horses</u> Name
Access path name.	<u>Horse name order</u> Name
File name	<u>Horse</u> Name
Function type	Print file
Print function.	N Y=Yes, N=No
Return to editing	N Y=Yes, N=No
Submit generation	N Y=Yes, N=No
F5=Refresh F12=Cancel F15=Open Functions	

Note: If your report device design does not look like that shown above, adjust it until it looks similar. Do not be concerned with exceeding the panel limits. For reports, CA 2E allows 132 characters per line.

Modifying the Combined Report Device Design

You are restricted in the placement of the fields from the Print Object function. Place the cursor on any PRTOBJ field and press F10. All the PRTOBJ fields are moved in a single block. In other words, you cannot manipulate the PRTOBJ fields individually from this panel. You are only allowed to alter the indentation of the whole PRTOBJ function relative to the left-hand margin of the PRTFIL function in which it is embedded. It is possible to specify individual formats of the PRTOBJ. You can specify an absolute indentation that is fixed relative to the left-hand margin of the report, regardless of any adjustments made to the indentation of the PRTOBJ as a whole.

In the current report design, the PRTOBJ fields are displayed after all the detail line records. This implies that all the horses will be printed followed by all the race entries. The advantage of the report as shown in the above panel is that it enables you to easily distinguish between the different formats. However, to meet the original requirements, you need to change the report functions to print one horse at a time followed by the corresponding race entries. You will do this in the next step.

Press F3 twice to exit the Device Design Editor. Save your design by accepting the default options.

EDIT FUNCTIONS		
File name. . . . :	Horse	My model
		** 1ST LEVEL **
? Function	Function type	Access path
- Change Horse	Change object	Update index
- Create Horse	Create object	Update index
- Delete Horse	Delete object	Update index
- Edit Horse	Edit file	Retrieval index
F Print Horses	Print file	Horse name order
█ Select Horse	Select record	Retrieval index
- Select Mares	Select record	Mares
- Select Stallions	Select record	Stallions
-		
-		
-		
-		
-		
Note...		
SEL: Z-Details, P-Parms, F-Action diagram, S-Device design, M-Harr, O-Open, T-Structure, A-Access path, U-Usage, G/J-Generate, D-Delete, C-Copy, L-Lock. F3=Exit F5=Reload F7=File details F9=Add functions F17=Services Function 'Print Horses' has been saved.		

Press Enter.

Specifying Parameters

You have now combined the two report functions and have a suitable report design. However, the function is not yet fully defined. If you generate and compile the program now, it would print all the race entries in the RACE ENTRY file after every horse. You need to pass a restrictor parameter from the Print Horses function to the Print Race Entries function so that only the race entries that apply to each horse are printed after each horse's details.

There are two places where you can specify the parameters of the Print Race Entries function.

- From the Edit Functions panel of the RACE ENTRY file by typing **P** against Print Race Entries.
- From the action diagram of the Print Horses function.

In this example, you will use the second method. Go to the Action Diagram Editor for the Print Horses function. To do so, type **F** next to the Print Horses function on the Edit Functions panel.

```

EDIT ACTION DIAGRAM          Edit   MYMDL   Horse
FIND=>                        Print Horses
-----
___ > Prin : ACTION DIAGRAM EXIT POINTS   F3=Exit  SEL:X,2-Select.
___ .-- : USER: Initialize program
___ ...I : USER: Record selection processing <--
___ .Posi : USER: Process top of page
___ ...R : Print first page <<< <--
___ ...P : USER: Null report processing <--
___ ...P : USER: Print required level headings <<< <--
___ .-CA : Z Print details <<<
___ .-DB : USER: Print required level totals <<<
___ . : Print final totals + <<< <--
___ .-*0 :
___ . : Process report body <--
___ . : Print final totals <--
___ .-ENDCASE
___ . : Print end of report <--
___ .--

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys

```

Press Enter.

Editing the Action Diagram

Display the user points of the action diagram by pressing F5. To specify the parameters of the Print Race Entries function, locate the point in the action diagram at which the function is called. Since the function was attached to the Detail format, you will zoom into the Print details user point.

Type **Z** against the Print details user point.

```
EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Print Horses

___ > Print details
___ .---
___ . Process before print of detail format
___ . ...USER: Process before print of detail format <--
___ . ...PRTOBJ calls before print of detail format
___ . On print of detail format
___ . > USER: On print of detail format
___ . .---
___ . .--- <<<
___ . Print detail line format
___ . Process after print of detail format
___ . ...PRTOBJ calls after print of detail format <--
Z . ...USER: Process after print of detail format <--
___ .---

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

Press Enter.

The Print Details Construct

You embedded the PRTOBJ function after the detail line format. To reach the equivalent point in the action diagram, type **Z** against the hidden construct, ...PRTOBJ calls after print of detail format.

```
EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Print Horses

___ > PRTOBJ calls after print of detail format
___ .---
Z . ...Embedded PRTOBJ : Print Race Entries <--
___ .---

F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

Press Enter.

Editing the Print Race Entries Function

You have now reached the point in the action diagram where the PRTOBJ is embedded. Type **Z** against the hidden construct, ...Embedded PRTOBJ : Print Race Entries.

```

EDIT ACTION DIAGRAM          Edit      MYMDL      Horse
FIND=>                        Print Horses

___ > Embedded PRTOBJ : Print Race Entries
   .--
  ?█ : Print Race Entries - Race Entry *
   .--
   ___

F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys

```

Press Enter.

The Action Diagram Editor Subfile Selector Values

You can type **?** in the Subfile selector of the Action Diagram Editor to display a list of allowed values. Type **?**.

```

DISPLAY ALLOWED VALUES          My model
Field name. . . . . : *AD SFLSEL
List name . . . . . : Line Commands

? Value          Description
- *              Activate/Inactivate construct (Comment out)
- **             Place block Activate/Inactivate boundary
- A              Place copied or moved construct after this line
- B              Place copied or moved construct before this line
- C              Copy construct to a point indicated by 'A' or 'B'
- CC             Place block Copy boundary
- D              Delete this construct
- DD             Place block Delete boundary
- F              Edit action or condition details for line
X FF            Edit action parameters
█ H              Hide construct
- I+             Insert *ADD built-in function
- I+F           Insert and Prompt *ADD built-in function
- I*            Insert Comment
- I*F           Insert and Prompt Comment
SEL: X-Select value.
F3=Exit, no selection

```

Press Enter.

Editing the Function

Since you are in the process of specifying a restrictor parameter, you should select FF, Edit action parameters.

Type **X** as shown to select the FF value.

```
EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Print Horses

___ > Embedded PRTOBJ : Print Race Entries
?___ X EDIT ACTION - FUNCTION DETAILS
    : Function file : Race Entry
    : Function. . . : Print Race Entries

    :
    :
    :
    :
    :
    :
    : F3=Exit  F9=Edit parameters  F10=Default parms  F12=Previous

    :
    :
    :
    :
F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
```

Press Enter.

Displaying the Function Parameters

The Edit Action - Function Details window is now displayed.

```
EDIT ACTION DIAGRAM          Edit    MYMDL    Horse
FIND=>                        Print Horses

___ > Embedded PRTOBJ : Print Race Entries
?___ X EDIT ACTION - FUNCTION DETAILS
    : Function file : Race Entry
    : Function. . . : Print Race Entries

    :
    :
    :
    :
    :
    :
    : F3=Exit  F9=Edit parameters  F10=Default parms  F12=Previous

    :
    :
    :
    :
F3=Exit  F5=User points  F6=Cancel pending moves  F7=Forward  F8=Backward
F9=Edit parameters  F15=Open Functions  F16=Toggle Change Date  F24=More keys
```

To edit the function parameters, press F9. The Edit Function Parameters panel lets you edit parameters for the Print Race Entries function.

Editing the Function Parameters

To define the Horse name field as a restrictor parameter, type **Z** in the Subfile selector to specify additional details, and type ***Field, Horse name**, and **FLD**.

```

EDIT FUNCTION PARAMETERS
Function name. . : Print Race Entries      Type : Print object
Received by file : Race Entry             Acpth: Entries by Horse name
                                           Passed
? File/*FIELD                             Access path/Field  as  Seq
Z *Field                                   Horse name        FLD  █
- - - - -                                - - - - -         - - - - -
- - - - -                                - - - - -         - - - - -
- - - - -                                - - - - -         - - - - -
- - - - -                                - - - - -         - - - - -
- - - - -                                - - - - -         - - - - -
- - - - -                                - - - - -         - - - - -
- - - - -                                - - - - -         - - - - -
- - - - -                                - - - - -         - - - - -
                                           |
                                           Values
                                           FLD: One parameter per field
                                           RCD: One parameter for all fields
                                           KEY: One parameter for key fields only

SEL: Z-Details (field selection).
F3=Exit F5=Reload

```

Press Enter.

Specifying a Restrictor Parameter

On the Edit Functions Parameter Details panel you will specify the usage and role of the Horse name parameter. In this case, the parameter defaults to Input (I). You will specify that the parameter has a restrictor role by typing **R** in the Subfile selector. This will cause the Print Race Entries program to process only those records on the RACE ENTRY file for the horse identified by the Horse name parameter.

Type **R** against the Horse name parameter.

```

EDIT FUNCTION PARAMETER DETAILS
Function name. . : Print Race Entries      Type : Print object
Received by file : Race Entry             Acpth: Horse name
Parameter (file) : *FIELD                 Passed as: FLD
? Field                               Usage  Role
R Horse name                           I

```

SEL: Usage: I-Input, O-Output, B-Both, N-Neither, D-Drop.
Role: R-Restrict, H-Map, V-Vary length, P-Position.
F3=Exit

Press Enter.

CA 2E confirms that the parameter is a restrictor parameter by showing RST in the Role column.

```
EDIT FUNCTION PARAMETER DETAILS
Function name. . : Print Race Entries      Type : Print object
Received by file : Race Entry             Acpth: Horse name
Parameter (file) : *FIELD                 Passed as: FLD
? Field                               Usage  Role
█ Horse name                          I      RST

SEL: Usage: I-Input, O-Output, B-Both, N-Neither, D-Drop.
      Role: R-Restrict, M-Map, V-Vary length, P-Position.
F3=Exit
```

Press F3 twice to exit and return to the Edit Action - Function Details window.

Confirming Parameter Details

The final step is to confirm the values for the parameters you specified. Note that the default context for the Horse name parameter is CUR (current). Since the Detail line is being processed at this point in the action diagram, the CUR context corresponds to the Detail line format.

Note: If you had used the Edit Functions panel rather than the Action Diagram Editor to define parameters, you would still need to access the Action Diagram Editor to confirm the parameter values.

```
EDIT ACTION DIAGRAM          Edit      MYMDL      Horse
FIND=>                       Print Horses

___ > Embedded PRTOBJ : Print Race Entries
?  : EDIT ACTION - FUNCTION DETAILS
___ : Function file : Race Entry
    : Function. . . : Print Race Entries
    :                               Obj
    : IOB Parameter          Use Typ Ctx Object Name
    : I Horse name          RST FLD CUR Horse name

:
:
: F3=Exit F9=Edit parameters F10=Default parms F12=Previous
: Some parameters have been defaulted. Press ENTER to accept
:
:
F3=Exit F5=User points F6=Cancel pending moves F7=Forward F8=Backward
F9=Edit parameters F15=Open Functions F16=Toggle Change Date F24=More keys
```

Press Enter to accept the parameter details.

Exit Action Diagram

Exit the action diagram and save the design you have just completed. To exit the action diagram quickly, press F13.

Generating and Compiling the Functions

You have now finished defining the Print Horses function. Accept the default values on the Exit Function Definition panel and change the N on the Submit generation option to Y. This will save the function and add it to the joblist for generation. Then select the Submit model create request (YSBMMDLCRT) option from the Display Services menu (F17) to submit the generation and compilation for the function and the Query access path.

Testing the Program

Once the program has compiled, call it from any command line. Various messages relating to the execution of the Query access path (via the i OS Open Query File (OPNQRV)) command are displayed while the report is produced. A sample report listing data entered with the Edit Horse and Edit Race and Entries programs follows.

Your company name here		Print Horses					
Horse	MF	Value	D of B				
Bonfire	M	5000.00	2/01/88				
		Dam:					
		Sire:					
Race Entries for Bonfire							
Course	Date	Time	Entry number	Jockey	Finishing position	H'cap	
CAMDEN	5/01/95	1:11:00	2	M Brown	3	0	
GOLDEN	6/12/95	1:30:00	3	M Brown	3	0	
Faithful Dobbin	F	3500.00	5/31/86				
		Dam:					
		Sire:					
Race Entries for Faithful Dobbin							
Course	Date	Time	Entry number	Jockey	Finishing position	H'cap	
CAMDEN	5/01/95	1:05:00	1	A Miles	2	0	
GOLDEN	6/12/95	1:00:00	2	M Brown	1	0	
Pegasus	M	3000.00	6/23/92				
		Dam:	Faithful Dobbin		5/31/86		
		Sire:	Bonfire		2/01/88		
Race Entries for Pegasus							
Course	Date	Time	Entry number	Jockey	Finishing position	H'cap	
CAMDEN	5/01/95	1:00:00	3	M Brown	1	0	
GOLDEN	6/12/95	1:02:00	1	M Brown	2	0	
Final totals							
Total number of horses			:	3			
Total horse value			:	11500.00			
** END OF REPORT **							

Glossary

access path

A view of the data in a physical file, in a given key sequence, implemented as an i OS physical or logical file.

access path format entry

A process that establishes which fields are present in the access path, which of those fields are key fields for the access path, and the order of those key fields.

access path relation

The set or subset of a file's relations that apply to a particular access path.

access path types

Types which differentiate the functionality of the various access paths. The types of access paths include Physical, Update, Retrieval, Resequencing, Span, and Query.

action bar

A construct that appears at the top of an end user panel. It provides a set of choices which define the actions available to the end user.

action bar choice

An option that allows application users access to the actions available for the panel.

action diagram

A notation for defining and showing procedural processing logic. It is made up of a number of basic logic constructs: Iterative, Sequential, and Conditional. Most functions have an action diagram associated with them.

action diagram editor

A facility that lets you modify the default processing logic automatically supplied for a function by adding action diagram constructs at specified user points.

All Objects Model Object List

A unique list within a model that contains an up-to-date detailed model object description for each model object in the model. A model object's description is updated automatically whenever it changes. It is also referred to as *ALLOBJ.

animation

A process that converts a device design to a Toolkit panel design that you can use to interactively simulate (prototype) a system design. This is useful for demonstrating a design to end users to ensure that the design meets operational requirements before you begin programming.

application

A set of implementation objects, primarily programs and files that together satisfy business needs. For example, a payroll application or an order entry application.

attribute

A property of an entity. It is any detail that qualifies, identifies, classifies, quantifies, or expresses the state of an entity. Attributes are usually implemented as fields.

based-on file

The file to which a given object is attached.

built-in function

Type of function which provides commonly required low level operations such as addition and multiplication.

capture file

One of the two types of database files. Capture files generally contain transaction data.

change type

The change type indicates the impact a change to a model object has on other model objects. The change type indicates whether impacted model objects require editing and/or regeneration to ensure the integrity of the model and the application.

component change processing

An automated impact analysis tool that determines how a change to a model object affects other objects in the model and records whether the affected objects need to be edited or regenerated.

condition

A value that specifies the circumstances under which an action or set of actions are to be executed. It also defines the particular value for a field.

conditional construct

A construct that allows steps to be conditionally executed within the action diagram logic and generally conforms to nested IF THEN ELSE logic statements or SELECT sets.

construct

The system of notation in an action diagram to define a boundary for procedural logic.

context

The source of a field within a function. A particular field name can be present several times in a function. The context of the field differentiates between these instances of the field. For example, a field may appear on a panel and also be part of a database file.

cross reference facility

The operations provides for identifying dependencies between objects. This is also referred to as the model object cross reference facility.

current version

This refers only to versions of functions or messages. A version is current when it is the version that is active in the model. In other words, the current version is the one used by and referred to by other model objects and is the one shown on panels that are not specific to processing versions. Only one version in a group of versions can be current at a time.

data model

A representation of the information used by a business. A data model contains groups of data called entities, attributes of the entities, and the relationships between those entities or between an entity and an attribute.

database function

An internal function which reads or updates the database. The database functions are: Change Object (CHGOBJ), Retrieve Object (RTVOBJ), Create Object (CRTOBJ), and Delete Object (DLTOBJ).

design model

The library that holds the i OS database files that compose the model. The model library has an associated library, the generation library, which contains the source code generates for the model.

design object

See model object.

designer

The user type that can change any aspect of the design model including data relationships and functional specifications. In general when a designer is using a model, no other user can access that model. A designer also has the authority to lock and unlock objects. Also known as *DSNR.

developer

A term used to designate either a designer (*DSNR) or a programmer (*PGMR) when a distinction between the two user types is not necessary. Designers and programmers are often referred to collectively as "developers."

device design

The layout of a panel or report associated with a function.

device function

A function which has a device design associated with it, such as Edit Record (EDTRCD), Display File (DSPFIL), Edit Transaction (EDTTRN), and Print File (PRTFIL).

domain

A set of possible values an attribute can take, along with its definition of length and data type, such as numeric or alpha.

dynamic selection

An option that specifies that all records are included in the access path regardless of any select/omit criteria. The records are then filtered by the system as they are read by a program.

end user

The person who uses the generated application once it is in production.

entity

An object which is significant or relevant to the business it represents; for example, a company, a person, a product. An entity is a potential file to be created in the data model of your application system.

entity-relationship diagram (ERD)

A graphic chart used to record the entities and entity relationships using boxes, lines, and notation.

expansion

The process of resolving all relations for a file or for all files in a model. For example, synchronizing a model causes the expansion of all relations to rebuild the file entries for all files in the model.

external function

A function which is implemented as a separate HLL program rather than as a subroutine. All functions are either external or internal.

field ()

A description of an item of data. It must have a name and a field type. Field names may be up to 25 characters long. The names of fields must be unique within the design model.

field type

An assigned type which defines the type of data that the field represents; for example, a number or a date.

file ()

A list of relations that describe an entity. can automatically resolve the relations into a list of file entries or fields. File names may be up to 25 characters long. The names of files must be unique within the model.

file entry

A field that arises as a result of resolving relations. An entry indicates the presence of a field on a file. The three types, depending on the type of relation from which the field is resolved, are: key field entry, attribute entry, and virtual field entry.

file type

The description of how the file will be used. Each file must be one of the allowed file types: structure (STR), reference (REF), or capture (CPT).

first normal form (1NF)

The normalization rule that eliminates repeating groups of data from an entity.

foreign key

A file entry that is the result of a relationship between two entities. The relationship is defined by a non-key attribute of one entity that exists as the primary key of the other entity.

function

A template process that operates on a file or field. A function serves as a building block with which to design applications.

function field

A field whose value is not physically stored in the database but is derived from other fields or files. Function fields can be placed on device designs and used in action diagrams.

function options

The optional features of the standard functions.

function parameter

A field whose value is passed into or out of a function when it is executed. Each parameter can have a parameter role and a parameter usage.

function parameter role

The parameter role that specifies how a parameter is to be used in a function into which it is passed. Standard parameter roles include Restrictor, Positioner, Map, and Vary.

function parameter usage

The parameter attribute that specifies whether a function parameter is to be passed to and/or returned from a function. Function parameter usage includes Input, Output, Both, and Neither.

function redirection

A process whereby the using objects of a given function (FUN) or message (MSG) are redirected to use an alternative FUN or MSG. This occurs when you make a version of a function or message current.

function type

One of a group of process templates provides such as EDTFIL.

generalization

The process during data modeling of combining two entities of the same class into one entity and renaming it.

generatable objects;defined generation

The creation of application source code from a function definition and device design.

generation library

The library that holds generated source code, compiled objects, and help text for a model.

group

This term relates to versions of functions or messages. Versions of the same model object form a group of versions.

i OS

The IBM i operating system.

impact analysis

The process of determining the impact of a proposed or actual change to model objects in order to ensure the integrity of a set of changes by identifying and including dependent objects. impact analysis tools include, cross reference commands, interactive panels to determine usages and references, simulation, and automated component change processing.

implementation

The process of setting up your application and moving it into production once you have generated and compiled source objects.

implementation objects;defined implementation object

Objects such as generated source and compiled objects as opposed to model objects. They are also known as traditional or 3GL (third generation language) objects.

internal function

A function which is generated as in-line code within the calling function.

involution

A process that occurs when an entity refers to itself. This is known as an involuted relation. Also called a self referencing relation.

iterative construct

A programming construct that represents repetitive statements or loops that will be implemented as REPEAT WHILE logic within the main action diagram logic.

key

The field(s) used to uniquely identify a record in a file.

list entry

This is another term for model object list entry.

logical file (i OS)

A logical view of the data in the physical file based on key sequence. Access paths can be implemented as logical files.

message function

Function types which allow you to send error, status, or information messages to the invoking program or to send information to other destinations such as submitting a job to batch.

model object

design objects such as, access paths, functions, and fields, as opposed to implementation objects such as, generated source or a compiled object.

model object description

A reference to a model object in the All Objects list (*ALLOBJ). It contains detailed information about the actual model object. A model object's description is automatically updated whenever the model object changes, and as a result, always reflects the current state of the object.

model object list

A list of references to model objects.

model object list entry

A reference to a model object in a named model object list. It reflects the state of the model object at the time the list entry was created or refreshed, and as a result, provides an historical record of the model object.

model profile

A user profile associated with a model where you can define defaults for various processes and file specifications for an interactive session.

model value

A specific value for a model that controls particular features of the interactive use of , code generation, or implementation.

normalization

The process of eliminating data redundancy using specific standards and rules in data modeling.

notepad

A temporary action diagram which can be used to copy constructs between action diagrams.

object ()

A design element of a model; for instance, a field or function. See also model object.

object type

Each object must belong to one of the object types: file, field, condition, message, function, access path, or application area.

open functions

All functions a single user currently has open for editing.

owning model object

Certain object types exist associated with an owning type. For example, functions (FUN) and access paths (ACP) are owned by a file (FIL) object type.

panel

A panel is displayed by a device function. Panels are composed of a header, a footer, and a body.

panel entry

The appearance of a field on a panel device design. Panel entries arise either from the resolution of access path relations, from function parameters, or from explicit specification by the application user.

parameter

See function parameter.

primary key

A chosen attribute or group of attributes assigned to a particular entity to uniquely define it within an entity relationship model.

program

The result of generating and compiling a function.

programmer

A user type who can create, change, and delete any help text, access paths, functions, and arrays, including working with action diagrams and field conditions for database and function fields. A programmer cannot alter the database files or fields. In general, programmers cannot use a model while a designer is using it. Also known as *PGMR.

prototyping

The presentation of a realistic mock up of a system used to verify that the design meets the operational requirements.

redirection

See function redirection.

reference file

One of the two types of database files: Reference files contain static data, in contrast to capture files which contain volatile transactional data.

references

The references for a model object are all objects the model object refers to, or contains. For example, an internal function is a reference of the external function that contains it. In other words, references are the model objects the referring model object requires in order to be complete or to exist.

referential integrity checking

The process that ensures that proper relations between files are maintained. This usually means making certain foreign keys contain valid values in the referenced files. Functions generate source code by default to provide referential integrity checking.

relation

A connection between one entity and another or between an entity and an attribute. When specified in , a relation defines the connection between files or between a file and a field in the file.

relation type

A relation must be one of a fixed number of types; the type is indicated by the verb used to represent the relation such as Has or Known by.

restrictor parameter

One of the allowed function parameter roles. If a function has a restrictor parameter, it can only process database records whose keys match the restrictor. Any device design is modified automatically to meet restrictions. Restrictor parameters must be key field entries on the access path to which the function is attached.

second normal form (2NF)

The normalization rule that eliminates attributes that are not dependent on the primary key. In 2NF, non-key attributes are fully functionally dependent on the primary key.

select/omit set

A choice that defines criteria for the inclusion or exclusion of records from the physical file.

sequence construct

The simplest action diagram construct which specifies a list of actions or other constructs that are to be executed sequentially.

session list

A model object list to which all objects you change during a session are logged.

simulation of a change

A process that lets you see the impact of a proposed change to a model object on other objects in your model before you actually make the change.

source file (i OS)

A file specially formatted to contain program source code. It is usually multi-member with each member containing a different set of source.

standard function

A function which specifies entire programs (external functions) or subroutines (internal functions). There are three main classes of standard functions: device functions, database functions, and user functions.

static selection

An option that specifies that only those records that satisfy select/omit criteria are included in the access path.

subfile

The part of a panel that contains a repeating detail format such as that needed for a list longer than one page.

subfile selector

A field on the left hand side of a subfile used for specifying an action to be taken against a particular subfile record or records. For device designs there will normally be a subfile selection value explanation text field to explain the allowed values for the subfile selector.

synchronize a model

The expansion of relations to rebuild the file entries for all files in the model.

third normal form (3NF)

The normalization rule that eliminates non-key dependencies between attributes of an entity. In 3NF, non-key attributes are mutually independent.

unique key

A file key that ensures each record in the file is unique.

usages

The usages for a model object are all objects that use the model object. They are also called using objects.

user

A user type that is limited to viewing the model and cannot change it. Also known as *USER.

user function

A function that is entirely user specified.

user point

A point in an action diagram at which you can insert logic. A user point is indicated by an arrow on the far right in the action diagram editor.

version

A model object that originated as a copy of either a function (FUN) or a message (MSG). Versions of the same originating model object are linked together to form a group of objects.

virtual field

A field that is logically, but not physically, present on an access path. Virtual fields are the result of specifying that fields in a related file are to be included on an access path.

virtual field entry

An entry which describes the presence of a field on a file or access path as a result of a join with another file. Virtual fields can only be specified for the Owned by, Refers to, and Extended by relations.

window

A panel on which information appears that is not necessarily a full panel. Windows can be varying sizes and can be positioned in varying locations.

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