CICS® Transaction Server for VSE/ESA™

Customization Guide

Release 1

SC33-1652-00

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Note!

Before using this information and the product it supports, be sure to read the general information under “Notices” on page 695.

First Edition (June 1999)

This edition applies to Release 1 of CICS Transaction Server for VSE/ESA, program number 5648-054, and to all subsequent versions, releases, and modifications until otherwise indicated in new editions. Make sure you are using the correct edition for the level of the product.

The CICS for VSE/ESA Version 2.3 edition remains applicable and current for users of CICS for VSE/ESA Version 2.3.

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At the back of this publication is a page entitled “Sending your comments to IBM”. If you want to make any comments, please use one of the methods described there.

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Preface

What this book is about

This book provides the information needed to extend and modify an IBM® CICS® Transaction Server for VSE/ESA™ system to match your requirements. It describes how you can tailor your system by coding exit programs, by replacing specific CICS-supplied default programs with versions that you write yourself, and by adapting sample programs.

Who this book is for

This book is for those responsible for extending and enhancing a CICS system to meet the special processing needs of an installation.

What you need to know to understand this book

To use the information in this book, you need to be familiar with some of the architecture of CICS and the programming interface to CICS. General-use programming interface information is given in the *CICS Application Programming Reference* manual and the *CICS System Programming Reference* manual.

Resource definition information is in the *CICS Resource Definition Guide*.

To use the following chapters you need to be familiar with telecommunications access methods (for example, VTAM®):

- “Chapter 8, Writing a terminal error program”
- “Chapter 9, Writing a node error program”
- “Chapter 10, Writing a program to control autoinstall of terminals”

If your task involves error processing, you may need to consult the *VSE/ESA Messages and Codes Volume 3* manual, the *CICS User’s Handbook*, or the *CICS Problem Determination Guide*.

How to use this book

The parts and chapters of the book are self-contained. Use an individual part or chapter as a guide when performing the task described in it.

Syntax notation and conventions used in this book

The symbols { }, [ ], and **|** are used in the syntax descriptions of the EXEC CICS commands and macros referred to in this book. They are not part of the command and you should not include them in your code. Their meanings are as follows:

- Braces { } enclose two or more alternatives, one of which you **must** code.
- Square brackets [ ] tell you that the enclosed is optional.
- The “or” symbol **|** separates alternatives.

In addition to these symbols, the following conventions apply:

- Punctuation symbols and uppercase characters should be coded exactly as shown.
- Lowercase characters indicate that user text should be coded as required.
- Default values are shown like this: <u>DEFAULT</u>.
- Options that are enclosed neither in braces { } nor in square brackets [ ] are mandatory.
- The ellipsis ... means that the immediately preceding option can be coded one or more times.
- All EXEC CICS commands require a delimiter appropriate to the language of the application. For a COBOL program this is ‘END-EXEC’, for example. Delimiters are not included in the syntax descriptions of the commands.

Road map

Table 1. Getting started road map

If you want to...	**Refer to...**
Learn how to write exit programs	Part 1, “Customizing with user exit programs” on page 1
Write programs to run at CICS startup and shutdown	Part 2, “Customizing with initialization and shutdown programs” on page 337
Replace some standard CICS programs with your own versions	Part 3, “Customizing with user-replaceable programs” on page 345
Write your own program to control XRF	Part 4, “Customizing the XRF overseer program” on page 491
Learn how to control and interpret the records written by CICS journaling, monitoring, and statistics	Part 5, “CICS journaling, monitoring, and statistics” on page 511
Customize CICS security	Part 6, “Customizing CICS security processing” on page 585
Write programs to modify resource definitions	Part 7, “Examining and modifying resource attributes” on page 603
Refer to reference material that supplements other sections of the book	“Appendixes” on page 625

Notes on terminology

The terms listed in Table 2 are commonly used in the CICS Transaction Server for VSE/ESA Release 1 library. See the *CICS Glossary* for a comprehensive definition of terminology.

Table 2 (Page 1 of 2). Commonly used words and abbreviations in CICS Transaction Server for VSE/ESA Release 1

Term	**Definition (and abbreviation if appropriate)**
$(the dollar symbol)	In the programming examples in this book, the dollar symbol ($) is used as a national currency symbol. In countries where the dollar is not the national currency, the local currency should be used.
BSM	BSM is used to indicate the basic security management supplied as part of the VSE/ESA product. It is RACROUTE-compliant, and provides the following functions: • Signon security • Transaction attach security
C	The C programming language
CICSplex	A CICSplex consists of two or more regions that are linked using CICS intercommunication facilities. Typically, a CICSplex has at least one terminal-owning region (TOR), more than one application-owning region (AOR), and may have one or more regions that own the resources accessed by the AORs
CICS Data Management Facility	The new CICS Transaction Server for VSE/ESA Release 1 facility to which all statistics and monitoring data is written, generally referred to as “DMF”
CICS/VSE	The CICS product running under the VSE/ESA operating system, frequently referred to as simply “CICS”
COBOL	The COBOL programming language
DB2 for VSE/ESA	Database 2 for VSE/ESA which was previously known as “SQL/DS”.

Table 2 (Page 2 of 2). Commonly used words and abbreviations in CICS Transaction Server for VSE/ESA Release 1

Term	**Definition (and abbreviation if appropriate)**
ESM	ESM is used to indicate a RACROUTE-compliant external security manager that supports some or all of the following functions: • Signon security • Transaction attach security • Resource security • Command security • Non-terminal security • Surrogate user security • MRO/ISC security (MRO, LU6.1 or LU6.2) • FEPI security.
FOR (file-owning region)—also known as a DOR (data-owning region)	A CICS region whose primary purpose is to manage VSAM and DAM files, and VSAM data tables, through function provided by the CICS file control program.
IBM C for VSE/ESA	The Language Environment version of the C programming language compiler. Generally referred to as “C/VSE”.
IBM COBOL for VSE/ESA	The Language Environment version of the COBOL programming language compiler. Generally referred to as “COBOL/VSE”.
IBM PL/I for VSE/ESA	The Language Environment version of the PL/I programming language compiler. Generally referred to as “PL/I VSE”.
IBM Language Environment for VSE/ESA	The common runtime interface for all LE-conforming languages. Generally referred to as “LE/VSE”.
PL/I	The PL/I programming language
VSE/POWER	Priority Output Writers Execution processors and input Readers. The VSE/ESA spooling subsystem which is exploited by the report controller.
VSE/ESA System Authorization Facility	The new VSE facility which enables the new security mechanisms in CICS TS for VSE/ESA R1, generally referred to as “SAF”
VSE/ESA Central Functions component	The new name for the VSE Advanced Function (AF) component
VSE/VTAM	“VTAM”

Part 1. Customizing with user exit programs

Table 3. User exit programs road map

If you want to...	**Refer to...**
Write a program to take control at a predefined point in CICS processing	Chapter 1, “Global user exit programs” on page 3
Write an interface program to access a non-CICS resource	Chapter 2, “Task-related user exit programs” on page 203
Call some CICS-provided functions from a user exit program	Chapter 3, “The user exit programming interface (XPI)” on page 235

Chapter 1. Global user exit programs

This chapter describes the **global user exit points** of CICS Transaction Server for VSE/ESA Release 1, and how you can use them, in conjunction with programs of a special type that you write yourself (**global user exit programs**), to customize your CICS system. The chapter is divided into the following sections:

1. **"Overview — what is a global user exit?"** is an introduction to global user exits, describing their main features and what they can be used for.
2. **"Global user exit programs"** on page 4 covers topics that you need to consider when writing a global user exit program. It deals with the following:
   - "Register conventions" on page 4
   - "31-bit addressing implications" on page 5
   - "Using CICS services" on page 5
   - "Using EDF with global user exits" on page 6
   - "The global work area" on page 6
   - "Making trace entries" on page 7
   - "Parameters passed to the global user exit program" on page 7
   - "Returning values to CICS" on page 10
   - "Restrictions on the use of fields as programming interfaces" on page 11
   - "Exit programs and the CICS storage protection facility" on page 11
   - "Errors in user exit programs" on page 12
   - "Defining, enabling, and disabling an exit program" on page 13
   - "Invoking more than one exit program at a single exit" on page 13
   - "Invoking a single exit program at more than one exit" on page 14
   - "Sample global user exit programs" on page 14
3. **"The global user exit points"** on page 17 contains detailed information about each global user exit point, including the place in the CICS code at which it occurs, and the specific (as distinct from the standard) parameters that are passed to an exit program.

Overview — what is a global user exit?

A global user exit *point* (sometimes referred to simply as a "global user exit") is a place in a CICS module or domain[1] at which CICS can transfer control to a program that you have written (a global user exit *program*), and at which CICS can resume control when your exit program has finished its work. You do not have to use any of the global user exits, but you can use them to extend and customize the function of your CICS system according to your own requirements. For a complete list of the global user exit points, see pages 18 through 22.

Each global user exit point has a unique identifier, and is located at a point in the module or domain at which it could be useful to do some extra processing. For example, at exit point XSTOUT in the statistics domain, an exit program can be given control before each statistics record is written to DMF, and can access the relevant statistics record. You might want to use an exit program at this exit point to examine the statistics record and suppress the writing of unwanted records.

1 A domain is an isolated functional unit of CICS Transaction Server for VSE/ESA Release 1 that communicates with the rest of CICS and with other programs using a set of strictly defined and controlled interfaces.

Global user exit support is provided automatically by CICS. However, there are several conventions that govern how you write your exit program, which are described in “Global user exit programs” on page 4. Also in that section is a list of the standard parameters that the calling modules and domains pass to an exit program, and some information about returning values to the caller.

Because global user exit programs work as if they were part of the CICS module or domain, there are limits on the use you can make of CICS services. Most global user exit programs cannot use EXEC CICS commands. By contrast, most global user exit programs can invoke some CICS services using the exit programming interface (XPI). For more information, see “Using CICS services” on page 5.

Note: Neither source nor object compatibility of CICS management modules is guaranteed from release to release. Any changes that affect exit programs are documented in the appropriate manual.

Global user exit programs

A global user exit program must be written in assembler language and must be quasireentrant. However, if your user exit program calls the XPI, it must be fully reentrant.[2] (For details about coding programs using XPI calls, refer to Chapter 3, “The user exit programming interface (XPI)” on page 235.)

Register conventions

The following register values are provided on entry to an exit program:

- Register 1 contains the address of the user exit parameter list DFHUEPAR.

  Write-to-operator (WTO) commands use register 1. If your exit program uses WTO commands, you should save the address of DFHUEPAR first.

- Register 13 contains the address of the standard register save area where your exit program should store its own registers immediately after being invoked. This address is also in the field UEPEPSA in the parameter list pointed to by register 1.

  If you want to issue operating system requests that use register 13 to point to a save area, you must switch register 13 to point to another save area. You must restore register 13 to its original contents before returning from your user exit program to the caller.

- Register 14 contains the return address to which the exit program should branch on completion of its work. You do this using the BR 14 instruction after restoring the calling module’s registers, or using the RETURN macro.
- Register 15 contains the entry address of the exit program.

No other register values are guaranteed, and they should not be relied on. The exit program should save and restore any registers that it modifies, using the save area addressed by register 13.

[2] A “reentrant” program is coded to allow one copy of itself to be used concurrently by several tasks; it does not modify itself while running. A “quasireentrant” program is serially reusable by different tasks. When it receives control it must be in the same state as when it relinquished control. Such a program can modify itself while running, and is therefore not fully reentrant.

31-bit addressing implications

- The global user exit is invoked in 31-bit AMODE.
- The global user exit may be either RMODE 24 or RMODE ANY.
- If you find it necessary to switch to 24-bit AMODE in the exit program, be sure to return correctly in 31-bit AMODE.
- Ensure the exit program is in 31-bit AMODE for XPI calls.
- Some of the parameters passed in DFHUEPAR are addresses of storage above the 16MB line.

Access register implications:

- The global user exit is invoked in primary-space translation mode. For information about translation modes, see the *IBM ESA/390 Principles of Operation* manual.
- The contents of the access registers are unpredictable.
- If the global user exit modifies any access registers, it must restore them before returning control. CICS does **not** provide a save area for this purpose.
- The global user exit must return control in primary addressing mode.

For further information about access registers, see the *IBM VSE/ESA Extended Addressability* manual.

Using CICS services

The rules governing the use of CICS services in exit programs vary, depending on the exit point from which the exit program is being invoked. The following general rules apply:

- No CICS services can be invoked from any exit point in the dispatcher domain or the journal control program.
- CICS services can be invoked using the exit programming interface (XPI) from most exits. If you use the XPI, note the rules and restrictions that are listed for each exit and each of the XPI macros. The XPI is described in Chapter 3, “The user exit programming interface (XPI)” on page 235.
- Some CICS services can be requested using EXEC CICS commands from some exits. The valid commands are listed in the detailed descriptions of the exits.

  An exit program invoked at an exit that does not support the use of EXEC CICS commands should not call a task-related user exit program (TRUE). (Calling a TRUE is equivalent to issuing an EXEC CICS command.) TRUEs are described in Chapter 2, “Task-related user exit programs” on page 203.
- All exit programs that issue EXEC CICS commands must first address the EIB. This is **not** done automatically via the DFHEIENT macro, as is the case with normal EXEC assembler-language programs. Therefore, the first EXEC command to be issued from an exit program must be EXEC CICS ADDRESS EIB (eib-register), where “eib-register” is the default register (R11) or the register given as a parameter to the DFHEIENT macro.

  All exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. See “Returning values to CICS” on page 10.

Important

- If your global user exit program does *not* contain EXEC CICS commands, **do not** use the CICS command-level translator when assembling the program.
- Take care when making non-CICS (for example, VSE/ESA) system service calls from global user exit programs. Do not use any non-CICS system service calls that could result in an operating system wait or a request for storage. If an operating system request causes a wait, your whole CICS system will stop until the operating system request has been serviced.

Using EXEC CICS and XPI calls in the same exit program

There are a number of exits where you can use both EXEC CICS commands and XPI calls, but you should ensure that there is no conflict on the usage of register 13. To avoid such conflict, use the DATAREG option on the DFHEIENT macro (see “XPI register usage” on page 245 for information).

For an example of how to use EXEC CICS commands and XPI calls in the same global user exit program, see Appendix E, “The example program for the XTSEREQ global user exit, DFH$XTSE” on page 673.

Using EDF with global user exits

If you use the Execution Diagnostic Facility (EDF) to monitor your applications, you must take care when compiling exit programs that issue EXEC CICS commands.

Normally, if an exit program issues EXEC CICS commands, these are displayed by EDF, if the latter is active. They appear between the “Start of Command” and “End of Command” screens for the command that caused the exit to be driven. If you want to suppress the display of EXEC CICS commands issued by your exit program, you must specify the NOEDF option when you translate the program.

Exits in the recovery modules

If an exit program invoked from one of the recovery modules listed in “Using CICS services” on page 5 issues EXEC CICS commands, you must translate it with the NOEDF option. Failure to do so may cause EDF to abend.

The global work area

When you enable an exit program, you can ask CICS to provide a global work area for the exit program. An exit program can have its own global work area, or it can share a work area that is owned by another exit program. Note that the work area is associated with the exit **program** rather than with the exit **point**. For ease of problem determination, the global work area should be shared only by exit programs that are invoked from the same management module or domain. The address and length of the global work area are addressed by parameters UEPGAA and UEPGAL of the DFHUEPAR parameter list, which is described in “DFHUEPAR standard parameters” on page 8. If a user exit program does not own a global work area, UEPGAA is set to zero.

Application programs can communicate with user exit programs that use or share the same global work area. The application program uses the EXEC CICS EXTRACT EXIT command to obtain the address and length of the global work area.

A work area is freed only when all of the exit programs that use it are disabled. For examples of how to use a global work area, see the sample global user exit programs. They are listed in “Sample global user exit programs” on page 14.

Making trace entries

If tracing is active, an entry in the CICS trace table can be made immediately before and immediately after the execution of an exit program. To specify that these entries are to be made, use the UE option of either:

- The CETR transaction
- The EXEC CICS SET TRACETYPE command

For global user exits in domains, extra trace calls giving more information are also available if you have set the AP option of EXEC CICS SET TRACETYPE to level 1 or 2. For information about trace entries, refer to the *CICS Problem Determination Guide*.

In some cases, when tracing is active, you can also make trace entries from within a user exit program, using the XPI DFHTRPTX TRACE_PUT macro described in Chapter 3, “The user exit programming interface (XPI)” on page 235. The individual descriptions of the global user exit points show whether the XPI DFHTRPTX macro can be used at each point.

Parameters passed to the global user exit program

The address of a parameter list is passed to the user exit program in register 1. The list contains some standard parameters that are passed to all global user exit programs, and may also contain some exit-specific parameters that are unique to the exit point from which the exit program is being invoked. Not all of the exit points have these extra parameters.

The exit-specific parameters are described with the individual exits in the section “The global user exit points” on page 17. The standard parameter list is described in the following section.

You can map the parameter list using the DSECT DFHUEPAR, which is generated by the macro instruction

```
DFHUEXIT TYPE=EP,ID=exit_point_identifier
```

The ID parameter provides the extra data definitions that you need to map any exit-specific parameters. For example, the macro instruction

```
DFHUEXIT TYPE=EP,ID=XJCWR
```

generates the DSECT to map the standard parameters followed by the parameters that are specific to exit point XJCWR in the journal control program. If your exit program is to be invoked at more than one exit point, you can code up to 256 characters of relevant exit identifiers on a single DFHUEXIT macro instruction. For example:

```
DFHUEXIT TYPE=EP,ID=(XJCWR,XMNOUT,XSTOUT)
```

If your exit program is to be invoked at every global user exit point, you can code:

```
DFHUEXIT TYPE=EP,ID=ALL
```

If your user exit program is to be used both as a global user exit program and as a task-related user exit program, you must code both:

```
DFHUEXIT TYPE=EP,ID=exit_point_identifier
```

and:

```
DFHUEXIT TYPE=RM
```

(in this order) to generate the DSECTs appropriate to both types of user exit.

If a global user exit program needs to use the DFHRMCAL macro to invoke an external RMI, the DFHRMCAL macro instruction must follow the DFHUEXIT macro.

DFHUEPAR standard parameters

```
DFHUEPAR DSECT
*  STANDARD PARAMETERS
UEPEXN   DS    A      ADDRESS OF EXIT NUMBER
UEPGAA   DS    A      ADDRESS OF GLOBAL WORK AREA
*                      (ZERO = NO WORK AREA)
UEPGAL   DS    A      ADDRESS OF GLOBAL WORK AREA LENGTH
UEPCRCA  DS    A      ADDRESS OF CURRENT RETURN-CODE
UEPTCA   DS    A      RESERVED
UEPCSA   DS    A      RESERVED
UEPEPSA  DS    A      ADDRESS OF REGISTER SAVE AREA
*                      FOR USE BY EXIT PROGRAM
UEPHMSA  DS    A      ADDRESS OF SAVE AREA USED FOR
*                      HOST MODULE'S REGISTERS
UEPGIND  DS    A      ADDRESS OF CALLER'S TASK INDICATORS
UEPSTACK DS    A      ADDRESS OF KERNEL STACK ENTRY
UEPXSTOR DS    A      ADDRESS OF STORAGE FOR XPI PARAMETERS
UEPTRACE DS    A      ADDRESS OF TRACE FLAG
```

UEPEXN
points to a 1-byte binary field whose contents identify the global user exit point from which the exit program is being invoked. You need this information if your exit program can be invoked from more than one exit point.

DFHUEXIT TYPE=EP generates a list of equated values that relate the exit names (exitids) to the exit numbers used internally by CICS to identify the exits. You should always use the exitids, because the exit numbers may change in any future releases of CICS.

UEPGAA
points to the global work area that was provided for the exit program when it was enabled. This is set to zero if no global work area is provided.

UEPGAL
points to a halfword that contains the length of the global work area.

UEPCRCA
points to a halfword that is to contain the return code value from the exit program. When more than one program is called at a user exit, this field

contains (on entry to the second and subsequent programs) the return code that was set by the previously invoked program.

UEPTCA
points to fetch-protect storage. Use of this field results in an abend ASRD at execution time.

UEPCSA
points to fetch-protect storage. Use of this field results in an abend ASRD at execution time.

UEPEPSA
points to a save area in which the exit program should store its own registers on entry. When the exit program is entered, register 13 is also pointing to this area. The convention is to save registers 14, 15, 0–12 at offset 12 (decimal) onward.

UEPHMSA
points to the save area containing the registers of the calling module. Values for registers 14, 15, 0–13 are stored in this order from offset 12 (decimal) in this area.

Apart from register 15, which contains the return code value from the exit program, the values in this save area are used by CICS to reload the registers when returning to the calling CICS module. They should not be corrupted.

This address is **not** passed to global user exit programs invoked from exit points in CICS domains.

UEPGIND
points to a 1-byte field containing indicator bits for use in AP domain user exits. The indicators are represented by two symbolic values, UEPGANY and UEPGCICS, which you can test to determine whether data locations can be above or below the 16MB line and whether the application's storage is in CICS-key or user-key storage. For non-AP domain user exits, the indicator bits are always zero.

UEPGANY The application can accept addresses above the 16MB line. If the symbolic value is not UEPGANY, the application must be returned an address below the 16MB line.

UEPGCICS The application's working storage and the task's life-time storage are in CICS-key storage (TASKDATAKEY(CICS) on the RDO TRANSACTION resource definition). If the symbolic value is not UEPGCICS, the application's working storage and the task's life-time storage are in user-key storage (TASKDATAKEY(USER) on the RDO TRANSACTION resource definition).

UEPSTACK
points to the kernel stack entry. This value must be moved to the exit program's register 13 before invoking the XPI. For more information, refer to Chapter 3, "The user exit programming interface (XPI)" on page 235. The storage addressed by this field **must not be altered**. If it is corrupted, your exit program will have unpredictable effects on your CICS system.

UEPXSTOR
points to a 260-byte area of DFHUEH-owned LIFO storage that the exit program should use when invoking the XPI. For more information, refer to Chapter 3, “The user exit programming interface (XPI)” on page 235.

UEPTRACE
points to the trace flag, which indicates whether tracing is on in the calling management module or domain. This enables you to control your use of the XPI TRACE_PUT macro in line with the tracing in the CICS module or domain. The XPI TRACE_PUT function should be used only when tracing is on. The trace flag is a single byte, whose top bit is set on when tracing is switched on. You test this setting using the symbolic value UEPTRON. The rest of the byte addressed by UEPTRACE is reserved, and its contents should not be corrupted.

Returning values to CICS

At some exit points, you can influence what CICS does on return from an exit program by supplying a return code value. The return code value must be set in register 15 before leaving the exit program. Character strings equating to valid return code values are provided with the parameter list appropriate for each exit point. Always use the equated values rather than using hard-coded values. For example, at exit XMNOUT in the monitor domain, you are presented with the address of a monitoring record. If you decide in your exit program that this record should not be written to DMF, you can set the return code value UERCBYP (meaning “bypass this record”) before returning to CICS, and CICS suppresses the record.

You cannot influence CICS actions in this way at all exit points. If you supply a return code value that is not expected at a particular exit point, the default return code indicating a normal response (usually UERCNORM) is assumed, unless the return code UERCPURG is set (see note below about UERCPURG). You are strongly advised not to let the return code default to the normal response as the result can be unpredictable. The normal response tells CICS to continue processing as if the exit program had not been invoked, and it is a valid option at most global user exit points. The exceptions are shown in the list of return codes provided with each exit description.

The return code currently established for an exit is addressed by parameter UEPCRCA of DFHUEPAR, and it is needed when two or more exit programs are used at one exit. For more information, see “Invoking more than one exit program at a single exit” on page 13.

The return codes that are valid at each of the global user exit points are described in “The global user exit points” on page 17.

Important

- At some exit points, the return code UERCPURG is valid. These exits are identified in the following tables. To prevent unpredictable results, you must **not** set the return code UERCPURG except as described on page 244.
- Exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. The DFHEIRET macro:
  - Restores registers
  - Places a return code in register 15 after the registers are restored
  - Returns control to the address in register 14

  For example:

  ```
  DFHEIRET RCREG=nn
  ```

  where “nn” is the number of any register (other than 13) that contains the return code to be placed in register 15 after the registers are restored.

Restrictions on the use of fields as programming interfaces

The *CICS Data Areas* manual contains definitions of the control block fields that form part of the Product-sensitive and General-use programming interfaces of CICS. Fields that are **not** defined in the *CICS Data Areas* manual as either Product-sensitive programming interface or General-use programming interface fields are **not** intended for your use as part of a CICS programming interface.

Exit programs and the CICS storage protection facility

When you are running CICS with the storage protection facility, there are two points you need to consider for global user exits:

1. The execution key in which your user exit programs run
2. The storage key of data storage obtained for your exit programs

Execution key for global user exit programs

When you are running with storage protection active, CICS always invokes global user exit programs in CICS key. Even if you specify EXECKEY(USER) on the RDO PROGRAM resource definition, CICS forces CICS key when it passes control to the exit program. However, if a global user exit program itself passes control to another program (via a link or transfer-control command), the program thus invoked is executed according to the execution key (EXECKEY) defined in its program resource definition.

Important

You are strongly recommended to specify EXECKEY(CICS) when defining both global user exit programs and programs to which an exit program passes control.

Data storage key for global user exit programs

The storage key of storage used by global user exit programs depends on how the storage is obtained:

- The CICS-supplied storage addressed by the UEPXSTOR parameter of DFHUEPAR, and any global work area specified when an exit program is enabled, are always in CICS key.
- Global user exit programs that can issue EXEC CICS commands can obtain storage by:
  - Explicit EXEC CICS GETMAIN commands
  - Implicit storage requests as a result of EXEC CICS commands that use the SET option

  The default storage key for storage obtained by EXEC CICS commands is set by the TASKDATAKEY of the transaction under which the exit program is invoked.

  As an example, consider a transaction defined with TASKDATAKEY(USER) that issues a file control request, which causes an XFCREQ global user exit program to be invoked. In this case, any implicit or explicit storage acquired by the exit program by means of an EXEC CICS command is, by default, in user-key storage. However, on an EXEC CICS GETMAIN command, the exit program can override the TASKDATAKEY option by specifying either CICSDATAKEY or USERDATAKEY.
- When an exit program obtains storage by means of an XPI GETMAIN call, the storage key depends on the value specified on the STORAGE_CLASS option, which is mandatory, and which overrides the value of TASKDATAKEY.

Errors in user exit programs

Because global user exit programs are an extension to CICS code, they are subject to the environment that CICS is running in when they are called. If an error is detected at an exit point, CICS issues messages indicating which exit program was in error, the place in the program at which the error occurred, and the name of the associated exit point. The detection of an error is not guaranteed, because it depends on the CICS environment at the time of error, and on the nature of the error. For example, CICS might not recognize a looping user exit program, since the detection mechanism may have been turned off. Also, an abend in one of the exits XPCABND, XPCTA, or XSRAB may cause CICS to terminate abnormally, because an abend during abend processing causes CICS to terminate.

Exit programs invoked at some exit points (for example, XTSEREQ, XTSEREQC, XICEREQ, XICEREQC, XTDEREQ, or XTDEREQC) can enter a loop by issuing a recursive command (such as a TS command at exit point XTSEREQ). The exits most likely to be affected provide a recursion count parameter, UEPRECUR, that you can use to prevent such loops.

Warning: When coding user exit programs, you should bear in mind that the code is executed as an extension of CICS code, rather than as a transaction, and any errors could have disastrous results.

Defining, enabling, and disabling an exit program

When you have written an exit program, you must define it to CICS using the CEDA DEFINE PROGRAM command. (Note that you must specify RELOAD(NO).)

Having defined the exit program, you must also enable it. You do this using the EXEC CICS ENABLE command[3] . When you have finished using the exit program, you should disable it, using the EXEC CICS DISABLE command.

Note: If a global user exit program is enabled before it has been installed, CICS scans the SVA for the program and may issue message DFHLD0107I, meaning that it was unable to find the program in the SVA and is using the version found in the LIBDEF library search chain for the CICS job.

For programming information about the EXEC CICS ENABLE and DISABLE commands, see the *CICS System Programming Reference* manual. For examples of how to enable and disable global user exit programs, see the sample programs listed on page 14.

Invoking more than one exit program at a single exit

There may be times when you want to invoke more than one exit program from a single global user exit point. For example, you might have two or more application packages that supply programs for the same CICS exit. Although such programs may work independently, you should note the following points:

- An exit program is only called at an exit if it has been made available for execution with the START option of the EXEC CICS ENABLE command. The order of invocation, when more than one exit program has been started at an exit point, is the order in which the programs were activated (that is, the order in which the EXEC CICS ENABLE commands associated them with the exit point). When programs work on the same data area, you should consider the order in which they are invoked. For example, in a terminal control output exit, an exit program might manipulate the same message in different ways, depending on the way an earlier exit program acted.
- Return code management is more complicated than it is for single programs. Each exit program sets a return code in register 15 as usual. The second and subsequent programs invoked from a single exit point can access the return code value set by the preceding program (the "current return code") using the parameter UEPCRCA of DFHUEPAR.

  The following rules apply to return codes if a second user exit program sets a different return code value from that selected by the previous program:

  – If the new program supplies the same return code value as the current return code (addressed by UEPCRCA), then CICS acts on that value.

  – If the new program supplies a different return code value from the current value addressed by UEPCRCA, CICS ignores both values and resets the "current return code" to the default value, usually UERCNORM, before calling any further exit programs for that exit point.

[3] Exit programs for exits in the transaction backout programs can also be enabled using the TBEXITS system initialization parameter.

  – If the new program sets an eligible value in register 15 **and** changes the "current value" field to match (as addressed by UEPCRCA), the new value is adopted and passed on to the next program (if any), or back to the calling CICS module or domain.

Invoking a single exit program at more than one exit

To invoke a single exit program from more than one exit point, you must issue an ENABLE command for each of the exit points. For programming information about how to issue an ENABLE command, see the *CICS System Programming Reference* manual. Be careful to specify GALENGTH or GAENTRYNAME on only the first ENABLE command, otherwise 'INVEXITREQ' may be returned.

Take into account the restrictions that apply to the use of CICS services, because these are dictated by the exit point itself rather than by the exit program. A command that can be issued from one exit point may cause problems when issued from a different exit point.

The global work area is associated with the exit **program**, rather than with the exit **point**: this means that the same global work area is used at each of the exit points at which the exit program is invoked.

Sample global user exit programs

CICS supplies a set of sample programs that show you how to:

- Enable a global user exit program and allocate a global work area (GWA).
- Obtain the address of an exit program's GWA.
- Access CICS system information, and make that information available to user exit programs.
- Share a GWA between global user exit programs, thereby making the information it contains available to more than one program, and overcoming limitations on the size of GWAs.
- Access information held in a global user exit program's GWA.
- Write a program to be invoked from a specific exit, to do a specific task. For example, the DFH$SXP4 sample program shows you how to use the XMEOUT exit to reroute a console message to a transient data queue.

The supplied programs and copy books are:

DFH$DTAD	A sample global user exit program, designed to be invoked from the XDTAD exit.
DFH$DTLC	A sample global user exit program, designed to be invoked from the XDTLC exit.
DFH$DTRD	A sample global user exit program, designed to be invoked from the XDTRD exit.
DFH$PCPI	This is designed to be invoked as part of program list table post initialization (PLTPI) processing, and is described in detail in "The DFH$PCPI program" on page 15.
DFH$PCPL	A dummy program, invoked by DFH$PCPI, that causes the XPCFTCH user exit to be driven.
DFH$PCEX	A sample global user exit program, designed to be invoked from the XPCFTCH exit.
DFH$PCGA	Copy book of the DFH$PCEX global work area.

DFH$PCTA	A sample global user exit program, designed to be invoked from the XPCTA exit. It is described on page 121.
DFH$SXPn	A set of sample global user exit programs designed to be invoked from the XMEOUT exit (where ‘n’ is 1 through 6).
DFH$XDRQ	A sample global user exit program, designed to be invoked from the XDUREQ exit.
DFH$XZIQ	A sample global user exit program, designed to be invoked from the XZIQUE exit.
DFH$ZCAT	A sample global user exit program, designed to be invoked from the XZCATT exit.
DFH$ZCGA	Copy book of the DFH$ZCAT global work area.
DFHXIS	A sample global user exit program, designed to be invoked from the XISCONA exit.
DFHXTENF	A sample global user exit program, designed to be invoked from the XALTENF or XICTENF exit. It is listed on page 166.

The source of all the sample programs and copy books is supplied, in assembler language, in the PRD1.BASE library. You should use the supplied programs as models upon which to base your own versions.

The DFH$PCPI program

DFH$PCPI consists of three main sections:

1. Section 1 obtains and processes any parameters passed to DFH$PCPI on the INITPARM system initialization parameter.
2. Section 2 shows how to use standard CICS facilities to obtain system information, and make that information available to a global user exit program. It performs the following processing:
   - Uses the EXEC CICS ENABLE command to enable the XPCFTCH sample user exit program, DFH$PCEX, and allocate it a global work area.
   - Uses the EXEC CICS EXTRACT EXIT command to obtain the address of DFH$PCEX’s global work area.
   - Obtains CICS system information, and places it in DFH$PCEX’s global work area. The information obtained includes:
     - Job name
     - Applid
     - Sysid
     - CICS release
     - Date in various formats, including DATFORM
     - The address of the common work area (CWA)
     - CICS startup type (COLD, WARM)

     Most of the above information is obtained using EXEC CICS API commands such as:

     - INQUIRE SYSTEM
     - ASSIGN
     - ADDRESS
     - ASKTIME
     - FORMATTIME
   - Uses the START option of the EXEC CICS ENABLE command to make DFH$PCEX available for execution. This causes DFH$PCEX to be driven for all LINKs and XCTLs.

- Links to the dummy program, DFH$PCPL, in order to drive DFH$PCEX.
- Uses the STOP option of the EXEC CICS DISABLE command to make DFH$PCEX unavailable for execution. Note that this leaves DFH$PCEX's global work area still allocated and accessible through the EXEC CICS EXTRACT EXIT command.

3. Section 3 of DFH$PCPI shows how to share the system information in an exit program's global work area with other exit programs. (In doing so it demonstrates how application programs can access the same information by means of the EXEC CICS EXTRACT EXIT command.) It shows too how to use CICS shared storage to overcome the limitation of 32KB on the size of a GWA. The program obtains an area of 64KB below the 16MB line and an area of 128KB above it (using EXEC CICS GETMAIN). The use of shared storage enables the second user exit program (DFH$ZCAT) to use a global work area of only 12 bytes below 16MB.

   The section performs the following processing:

   - Uses EXEC CICS ENABLE to enable the DFH$ZCAT user exit program, and allocate it a global work area
   - Uses EXEC CICS EXTRACT EXIT to obtain the address of DFH$ZCAT's global work area
   - Stores the address of DFH$PCEX's global work area in DFH$ZCAT's global work area
   - Uses EXEC CICS GETMAIN to obtain the shared storage above and below the 16MB line, and stores the addresses in DFH$ZCAT's global work area.

Sample program definitions

The following are examples of the RDO definitions required to define the sample programs to the CSD:

```
DEFINE PROGRAM(DFH$PCEX) GROUP(EXITGRP)
     LANGUAGE(ASSEMBLER) RELOAD(NO) RESIDENT(NO) USAGE(NORMAL)
     USESVACOPY(NO) STATUS(ENABLED) CEDF(YES) DATALOCATION(ANY)
     EXECKEY(CICS)
DEFINE PROGRAM(DFH$PCPI) GROUP(EXITGRP)
     LANGUAGE(ASSEMBLER) RELOAD(NO) RESIDENT(NO) USAGE(NORMAL)
     USESVACOPY(NO) STATUS(ENABLED) CEDF(NO) DATALOCATION(ANY)
     EXECKEY(CICS)
DEFINE PROGRAM(DFH$PCPL) GROUP(EXITGRP)
     LANGUAGE(ASSEMBLER) RELOAD(NO) RESIDENT(NO) USAGE(NORMAL)
     USESVACOPY(NO) STATUS(ENABLED) CEDF(NO) DATALOCATION(ANY)
     EXECKEY(CICS)
DEFINE PROGRAM(DFH$ZCAT) GROUP(EXITGRP)
     LANGUAGE(ASSEMBLER) RELOAD(NO) RESIDENT(NO) USAGE(NORMAL)
     USESVACOPY(NO) STATUS(ENABLED) CEDF(YES) DATALOCATION(ANY)
     EXECKEY(CICS)
```

DFH$PCPI is designed to be run as a PLT program. If you write a similar program, you should define it in the **second** part of the PLTPI list (after the PROGRAM=DFHDELIM entry) so that it executes in the **third** stage of CICS initialization. Information about how to do this is in the *CICS Resource Definition Guide*.

Example program

As well as the sample programs supplied in source code, there is an example listing, DFH$XTSE, that shows you how to:

- Use EXEC CICS commands in a global user exit program
- Use EXEC CICS commands and XPI calls in the same exit program
- Modify the command parameter list in EXEC interface exits such as XTSEREQ and XICEREQ

DFH$XTSE is listed on page 673.

The global user exit points

The following table lists the exits in alphabetical order, giving a brief description and a page reference at which more information about each exit can be found. After the table, the following detailed information is provided for each of the global user exit points:

- The exit identifier
- The location of the exit
- The DFHUEPAR parameters, if any, that are unique to the exit
- The return codes that are valid for this exit point
- XPI calls that can be issued
- API and SPI commands that can be issued

In the detailed part of this section, the exit points are grouped according to their functional relationships. This usually means according to the CICS module or domain in which they occur. However, where exit points in different modules share the same identifier and set of parameters (as with XRCINIT in the DL/I backout program and the file control backout program, for example), or where exit points in different modules serve a similar function (XALTENF in the terminal allocation program and XICTENF in the interval control program, for example), the exits are grouped under a generic name (for example, "Exits in the transaction backout programs"). The groups of exits are presented in alphabetical order of module or generic name.

Accessing fields in CICS control blocks

When writing a program to be invoked from any of the global user exit points, note the warning contained in "Restrictions on the use of fields as programming interfaces" on page 11 about the use of control block fields as programming interfaces.

Table 4 (Page 1 of 5). Alphabetical list of global user exit points

Exit name	Module or domain	Where or when invoked	Page
XAKUSER	Activity keypoint program	Immediately before the ‘end of keypoint’ record is written.	23
XALCAID	Terminal allocation program	Whenever an AID with data is canceled.	156
XALTENF		When an ATI request from transient data or interval control requires a terminal that is unknown in this system.	162
XBMIN	Basic Mapping Support	When an input mapping operation completes successfully.	25
XBMOUT		When a page of output has been built successfully.	25
XDBDERR	Dynamic transaction backout program	When the DL/I backout routine detects an error.	39
XDBFERR		If the dynamic transaction backout program or the file control program detects an error.	37
XDBIN		Each time CICS reads a non-DL/I dynamic log record.	36
XDBINIT		On entry to the dynamic transaction backout program.	36
XDSAWT	Dispatcher domain	After an operating system wait.	29
XDSBWT		Before an operating system wait.	29
XDTAD	Shared data tables management program	When a write request is issued to a data table.	131
XDTLC		At the completion of loading of a data table.	132
XDTRD		During the loading of a data table, whenever a record is retrieved from the source data set.	129
XDUCLSE	Dump domain	After the domain closes a transaction dump data set.	34
XDUOUT		Before the domain writes a record to the transaction dump data set.	34
XDUREQ		Before the domain takes a system or transaction dump.	30
XDUREQC		After a system or transaction dump has been taken (or failed or been suppressed).	32
XEIIN	EXEC interface program	Before the execution of an EXEC CICS command.	41
XEIOUT		After the execution of an EXEC CICS command.	42
XFCAREQ	File control EXEC interface program	Before CICS processes a file control SPI request.	57
XFCAREQC		After a file control SPI request has completed.	57

Table 4 (Page 2 of 5). Alphabetical list of global user exit points

Exit name	Module or domain	Where or when invoked	Page
XFCNREC	File control open/close program	When a mismatch is detected between the backout recovery setting for a file and its associated dataset during file open processing.	44
XFCREQ	File control EXEC interface program	Before CICS processes a file control API request.	54
XFCREQC		After a file control API request has completed.	55
XFCSREQ	File control file state program	Before a file OPEN, CLOSE, ENABLE, or DISABLE command is attempted.	71
XFCSREQC		After a file OPEN, CLOSE, ENABLE, or DISABLE command has been completed.	71
XGMTEXT	“Good morning” message program	Before the “good morning” message is sent.	79
XICEREQ	Interval control EXEC interface program	Before CICS processes an interval control API request.	88
XICEREQC		After an interval control API request has completed.	89
XICEXP	Interval control program	After expiry of an interval control time interval.	86
XICREQ		At the start of the interval control program, before request analysis.	85
XICTENF		When an EXEC CICS START command requires a terminal that is unknown in this system.	164
XISCONA	Intersystem communication program	After an attempt to allocate a session for function shipping fails because no sessions are immediately available.	80
XISLCLQ		After an attempt to allocate a session for a function shipped START NOCHECK request fails because the remote system is not in service, a connection to the remote system cannot be established, or no sessions are immediately available and your XISCONA exit program has specified that the request is not to be queued in the issuing region.	84
XJCWB	Journal control program	Before each physical WRITE to each non-DMF journal.	100
XJCWR		After building a journal record in the buffer, but before writing it.	100
XKCREQ	Task control program	Before an ENQUEUE or DEQUEUE request.	143

Table 4 (Page 3 of 5). Alphabetical list of global user exit points

Exit name	Module or domain	Where or when invoked	Page
XLDLOAD	Loader domain	After an instance of a program is brought into storage, and before the program is made available for use.	101
XLDELETE		After an instance of a program is released by CICS and just before the program is freed from storage.	102
XMEOUT	Message domain	Before a message is sent from the message domain to its destination.	105
XMNOUT	Monitoring domain	Before a record is either written to DMF or buffered before a write to DMF.	107
XPCABND	Program control program	Before a dump call is made.	122
XPCFTCH		Before an application program is given control.	116
XPCHAIR		Before a HANDLE ABEND routine is given control.	118
XPCREQ		Before a LINK request is processed.	109
XPCREQC		After a LINK request has been completed.	110
XPCTA		After an abend occurs, and before the environment is modified.	120
XRCDBER	DL/I backout program	When PSB schedule, PSB termination, or DB backout failures occur.	170
XRCINIT	DL/I backout program	At the beginning and end of the DL/I backout program.	170
	File control backout program	At the beginning and end of the file control backout program.	171
	Message and ISC state recovery program	At the beginning and end of the message and ISC state recovery program.	171
	User backout program	At the beginning and end of the user backout program.	172
XRCINPT	File control backout program	Whenever a non-DL/I record is read from the restart data set.	172
	Message and ISC state recovery program	Whenever a non-DL/I record is read from the restart data set.	173
	User backout program	Whenever a non-DL/I record is read from the restart data set.	173
XRCFCER	File control backout program	When the file control program returns an error during backout processing.	174
XRCOPER		If an error occurs while opening a file control data set.	174

Table 4 (Page 4 of 5). Alphabetical list of global user exit points

Exit name	Module or domain	Where or when invoked	Page
XRMIIN	Resource manager interface program	Before execution of an EXEC DLI, EXEC SQL, or RMI command.	123
XRMIOUT		After execution of an EXEC DLI, EXEC SQL, or RMI command.	123
XRSINDI	Resource management modules	Immediately after a successful install or discard of a resource.	125
XSNOFF	Security manager domain	After a terminal user signs off.	134
XSNON		After a terminal user signs on.	133
XSRAB	System recovery program	When the system recovery program finds a match for a VSE/ESA abend code in the SRT.	137
XSTERM	System termination program	During a normal system shutdown, immediately before TD buffers are cleared.	140
XSTOUT	Statistics domain	Before a statistics record is written to DMF.	135
XSZARQ	Front End Programming Interface	After a FEPI request has completed.	78
XSZBRQ		Before a FEPI request is actioned.	78
XTCATT	Terminal control program	Before task attach.	159
XTCIN		After an input event.	158
XTCOUT		Before an output event.	158
XTDEREQ	Transient data EXEC interface program	Before CICS processes a transient data API request.	182
XTDEREQC		After a transient data API request has completed.	183
XTDIN	Transient data program	After receiving data from SAM (extrapartition) or VSAM (intrapartition).	179
XTDOUT		Before passing data to a SAM (extrapartition) or VSAM (intrapartition) user-defined transient data queue.	180
XTDREQ		Before request analysis.	179
XTSEREQ	Temporary storage EXEC interface program	Before CICS processes a temporary storage API request.	147
XTSEREQC		After a temporary storage API request has completed.	148
XTSIN	Temporary storage control program	After an input event.	144
XTSOUT		Before an output event.	145
XTSREQ		Before request analysis.	144
XXMATT	Transaction manager domain	When a user transaction is attached.	177

Table 4 (Page 5 of 5). Alphabetical list of global user exit points

Exit name	Module or domain	Where or when invoked	Page
XXRSTAT	Takeover request processing program	After a VTAM failure or a predatory takeover.	141
XZCATT	VTAM terminal management program	Before task attach.	189
XZCIN	VTAM working set module	After an input event.	190
XZCOUT		Before an output event.	190
XZCOUT1		Before a message is broken into RUs.	191
XZIQUE		1. When an allocate request for a session is about to be queued. 2. When an allocate request succeeds following previous suppression of queuing.	192

Activity keypoint program exit XAKUSER

The XAKUSER exit is invoked during the activity keypointing process. This exit should be used to record, on the system log, user data that must be restored following an emergency restart. For further information about the use of the exit, see the *CICS Recovery and Restart Guide*.

For best performance, journal control requests should not specify WAIT or STARTIO. CICS will force the records by writing a synchronous end of keypoint record upon return from the exit program.

Your exit program should be translated with the NOEDF option. Any program it links to should also be translated with this option. It is not possible to link to programs written in PL/I.

To ensure that it is called during every keypoint, including the one taken at CICS startup, your exit program should be enabled by means of a first phase PLTPI program (that is, a program that is invoked during the *second* stage of CICS initialization—see “Initialization programs” on page 339). However, if it is enabled at this stage, your program should not attempt to link to any program coded in COBOL or C, as it may be invoked before these are initialized.

Table 5. Exit XAKUSER

When invoked	During the activity keypointing process.
Exit-specific parameters	None.
Return codes	**UERCNORM** Continue processing.
XPI calls	XPI must not be used.
API and SPI commands	The following commands are supported: ADDRESS CWA ADDRESS EIB LINK (but only to local programs; distributed program links may not be used). RETURN WRITE JOURNALNUM

Important

Only the listed EXEC CICS commands are allowed in the XAKUSER exit. The exit should link only to other programs with the same restrictions.

Basic Mapping Support exits XBMIN and XBMOUT

The XBMIN exit allows you to intercept a RECEIVE MAP request after BMS has successfully processed the request. The XBMOUT exit allows you to intercept a SEND MAP request after BMS has successfully processed the request; or, if cumulative mapping is in progress, on completion of each page of output.

The XBMIN exit is called, if enabled, when all the following are true:

- A RECEIVE MAP command has been successfully processed.
- The map referenced in the command contains at least one field specified as VALIDN=USEREXIT.
- At least one USEREXIT field has been returned in the inbound datastream and has been mapped into the application data structure.

Using XBMIN, you can:

- Analyze each field defined as VALIDN=USEREXIT mapped to the application on this request
- Use the mapset name, map name, and field length defined in the map, and the actual length of field data returned in the inbound datastream
- Modify the data in each field.

The XBMOUT exit is called, if enabled, when all the following are true:

- A SEND MAP command has been successfully processed.
- The map referenced in the command contains at least one field specified as VALIDN=USEREXIT.
- At least one USEREXIT field has been generated in the outbound datastream.

Using XBMOUT, you can:

- Analyze each field defined as VALIDN=USEREXIT which has been generated in the outbound datastream
- Use the mapset name, map name, and field length defined in the map, and the actual length of field data placed in the outbound datastream
- Modify the data in each field
- Modify the attributes sent with each field.

Both exits are passed four exit-specific parameters:

1. The address of the TCTTE associated with the mapping request
2. The address of the system EIB associated with the task issuing the mapping request
3. The address of a halfword binary count of the number of elements in the *field element table*
4. The address of the field element table.

Example program, DFH$BMXT

CICS supplies an example program, DFH$BMXT, that shows how mapped input and output data can be modified with reference to the information provided in the "field element" table. A copybook, DFHXBMDS, is also supplied. This copybook is a DSECT which defines the structure of the field element.

Table 6. Exit XBMIN

When invoked	After BMS has successfully processed an input mapping operation.	
Exit-specific parameters	**UEPBMTCT**	Address of the TCTTE associated with the mapping request.
	UEPEXECB	Address of the system EIB associated with the task.
	UEPBMCNT	Address of the halfword binary number of "field elements" in the field element table.
	UEPBMTAB	Address of the field element table.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Table 7. Exit XBMOUT

When invoked	After BMS has successfully completed a page of output during an output mapping operation.	
Exit-specific parameters	**UEPBMTCT**	Address of the TCTTE associated with the mapping request.
	UEPEXECB	Address of the system EIB associated with the task.
	UEPBMCNT	Address of the halfword binary number of "field elements" in the field element table.
	UEPBMTAB	Address of the field element table.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

The field element table structure

The *field element table* contains one or more elements which provide information about each "field of interest" passed to the exit. A "field of interest" is a field which has been defined as VALIDN=USEREXIT in the map source file used to create the mapset referenced in the mapping operation.

Each field element has the following structure:

BMXMAPST
is an 8-byte area which contains the name of the mapset associated with this field. If terminal or alternate suffixes are used with mapset names in your CICS installation, the mapset name may have a suffix appended to the name specified in the mapping request.

BMXMAP
is a 7-byte area which contains the name of the map associated with this field.

BMXFDFB
is a one-byte field copied from the field specification in the map load module. It contains indicators as follows:

X'80'	CASE=MIXED
X'40'	Group field entry
X'20'	Group field descriptor
X'10'	ATTRB=DET
X'08'	JUSTIFY=ZERO
X'04'	JUSTIFY=RIGHT
X'02'	INITIAL,XINIT, or GINIT specified
X'01'	Named field (DSECT entry exists)

BMXMAPLN
is a halfword binary value which contains the field length defined in the LENGTH option of the DFHMDF macro.

BMXACTLN
is a halfword binary value which contains the actual length of the data received or transmitted in this field.

BMXDATA
is the address of the field data.

In the XBMIN exit, BMXDATA points into a work area which BMS has obtained for input mapping purposes. When the exit returns control, this work area is copied to the application data structure associated with this map.

In the XBMOUT exit, BMXDATA points into a terminal input/output area (TIOA) in which BMS has generated an output datastream. When the exit returns control, the TIOA is disposed of in accordance with the disposition of the TERMINAL (the default), SET, or PAGING option specified on the SEND MAP request.

BMXATTR
is only relevant in the XBMOUT exit. It is the address of the attributes (if any) which BMS has placed in the output datastream preceding this field.

BMXMAPOF
is the offset of the field in the map. For example, if a map is defined as

```
MYMAP  DFHMDI SIZE=(12,40)
```

and a field in this map is defined as

```
FLDA   DFHMDF POS=(5,1)
```

the offset of this field (relative to zero) is 160 in decimal notation. In this example, BMXMAPOF would contain the value `X'00A0'`.

BMXBUF
is the offset of the field in the device buffer. Usually—that is, when the map dimensions are the same as the current screensize in use by the device—this value will be the same as that of BMXMAPOF. However, using the example given in the BMXMAPOF description above, if MYMAP is sent to a device currently using a 24 by 80 screensize, the offset of the field in the device buffer (again relative to zero) is 320 in decimal notation. In this example, BMXBUF would contain the value `X'0140'`.

Programming the XBMIN exit

This section contains some considerations specific to the XBMIN exit.

The actual data length (in BMXACTLN) may be less than the length defined in the map (in BMXMAPLN). This could happen, for example, if a terminal operator does not completely fill a data entry field. In this case, BMS will have right- or left-justified the data in the field and padded the field with blank or zero characters. This justification and padding occurs before the exit is invoked. Your exit program can, by checking the bit settings in the BMXFDFB field, determine how BMS performed justification and padding for the field.

The actual data length (in BMXACTLN) may be greater than the length defined in the map (in BMXMAPLN). This could happen, for example, if a map contains an unprotected field which is not immediately followed by another field. This allows the terminal operator to enter data past the end of the field. When this occurs, the data field is truncated by BMS according to the length defined for the field in the map. However, BMXACTLN contains the length of data found in the inbound datastream.

When modifying data in the XBMIN exit, the safest method is to use the length provided in BMXMAPLN, but to ensure that any pad characters added by BMS are preserved.

BMXATTR must be ignored in the XBMIN exit; it always contains binary zeroes.

Programming the XBMOUT exit

This section contains some considerations specific to the XBMOUT exit.

The actual data length (in BMXACTLN) may be less than the length defined in the map (in BMXMAPLN). This occurs due to the compression of trailing nulls performed by BMS for each output field.

The actual length of data cannot be changed in the exit program. The exit is invoked after the output datastream has been generated; consequently, an attempt to alter the data length could result in an invalid datastream. Therefore, if an XBMOUT exit program modifies data, it must do so with reference to the length value in BMXACTLN.

BMXDATA may contain a null value. This can be caused by a SEND MAP request with the MAPONLY option when the map has fields without default data; this causes BMS to send an attribute sequence for the field but no data.

BMXATTR may contain a null value. This can be caused by a SEND MAP request with the DATAONLY option, when the application is updating the data in a field and not the attributes.

Cumulative mapping operations: When an application is performing cumulative mapping—that is, issuing a sequence of SEND MAP commands with the ACCUM option—BMS builds a composite display in which a single page of output might be constructed from multiple SEND MAP requests. When cumulative mapping occurs, the XBMOUT exit is called when a page has been built, not as each SEND MAP request is processed.

Message routing: When an application builds a routing message—for example, it issues a ROUTE command followed by one or more SEND MAP commands with the SET or PAGING option specified—the XBMOUT exit is invoked in the same way as for a non-routed mapping request.

However, the UEPBMTCT parameter is passed as a null value for a routed message. This is because a routed message may be destined for multiple devices, and BMS has optimized the features supported by the devices targeted by the routed message. When processing a routed message in the XBMOUT exit, referencing the TCTTE for any of these devices would probably not be relevant.

Dispatcher domain exits XDSBWT and XDSAWT

The XDSBWT and XDSAWT exit points are located before and after an operating system wait. CICS services **cannot** be used in any exit program invoked from these exit points.

XDSBWT

Table 8. Exit XDSBWT

When invoked	Before an operating system wait issued by the quasireentrant CICS TCB.
Exit-specific parameters	None.
Return codes	**UERCNORM** Continue processing.
XPI calls	Must not be used.
API and SPI commands	Must not be used.

XDSAWT

Table 9. Exit XDSAWT

When invoked	After an operating system wait issued by the quasireentrant CICS TCB.
Exit-specific parameters	**None**
Return codes	**UERCNORM** Continue processing.
XPI calls	Must not be used.
API and SPI commands	Must not be used.

Dump domain exits XDUREQ, XDUREQC, XDUCLSE, and XDUOUT

There are four exits in the dump domain.

XDUREQ

Table 10 (Page 1 of 2). Exit XDUREQ

When invoked	Immediately before a system or transaction dump is taken.	
Exit-specific parameters	**UEPTRANID**	Address of the 4-byte transaction ID.
	UEPUSER	Address of the 8-byte user ID.
	UEPTERM	Address of the 4-byte terminal ID.
	UEPPROG	Address of the 8-byte application program name.
	UEPDUMPC	Address of copy of the 8-byte dump code.
	UEPDUMPT	Address of the 1-byte dump-type identifier, which contains one of the following values: **UEPDTRAN** A transaction dump was requested. **UEPDSYST** A system dump was requested. **Note:** The dump-type identifier indicates the type of dump request that was passed to the dump domain. It does not reflect any modification that may have been made to the original request by a user entry in the dump table.
	UEPABCDE	Address of a copy of the 8-byte Kernel error code in the format xxx/yyyy. xxx denotes the 3-digit hexadecimal VSE/ESA completion code (for example 0C1). If a VSE/ESA completion code is not applicable, xxx is three hyphens. The 4-digit code yyyy is a user abend code produced either by CICS or by another product on your system. UEPABCDE is completed only for abend codes corresponding to the following dump codes: AP0001 SR0001 ASRA ASRB ASRD Otherwise this field contains null characters.
	UEPXDSCP	4-byte reserved field.
	UEPXDTXN	Address of a 1-byte field which represents the current dump table TRANDUMP setting. It contains one of the following values: **UEPXDYES** A transaction dump was taken. **UEPXDNO** A transaction dump was not taken. This field may be modified by the exit to update the dump table TRANDUMP setting. **Note:** This field is only valid if UEPDUMPT contains the value UEPDTRAN.

Table 10 (Page 2 of 2). Exit XDUREQ

	UEPXDSYS	Address of a 1-byte field which represents the current dump table SYSDUMP setting. It contains one of the following values: **UEPXDYES** A system dump was taken. **UEPXDNO** A system dump was not taken. This field may be modified by the exit to update the dump table SYSDUMP setting.
	UEPXDTRM	Address of a 1-byte field which represents the current dump table SHUTDOWN setting. It contains one of the following values: **UEPXDYES** The CICS system is to shutdown. **UEPXDNO** The CICS system is not to shutdown. This field may be modified by the exit to update the dump table SHUTDOWN setting.
	UEPXDMAX	Address of a 4-byte field which contains the current dump table MAXIMUM setting. This field may be modified by the exit to change the current dump table MAXIMUM setting. A change to the MAXIMUM setting will not suppress this dump request. A return code of UERCBYP may be used to suppress the current dump request.
	UEPXDCNT	Address of a 4-byte field which contains the current dump table CURRENT setting.
	UEPXDTST	Address of a 16-byte field which contains the current dump table statistics for this dumpcode. The addressed field consists of four 4-byte fields containing binary integers: Number of transaction dumps taken Number of transaction dumps suppressed Number of system dumps taken Number of system dumps suppressed **Note:** Statistics for transactions dumps are only valid if UEPDUMPT contains the value UEPDTRAN.
	UEPXDDAE	4-byte reserved field.
	UEPDMPID	Address of a 9-character field in the format xxxx/xxxx, containing the dump identifier. The dump ID is in the same format as that output by the corresponding dump message.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Suppress dump.
	UERCPURG	Task purged during XPI call.
XPI calls	WAIT_EXTERNAL can be used **only** when UEPDUMPT indicates that a transaction dump is being taken. **Do not use any other calls**.	
API and SPI commands	Must not be used.	

The sample program for the XDUREQ exit, DFH$XDRQ

CICS supplies a sample program for the XDUREQ exit, which shows you how to manipulate the dump table entry, and how to permit or suppress the dump.

XDUREQC

Table 11 (Page 1 of 2). Exit XDUREQC

When invoked	Immediately after a system or transaction dump has been taken (or has failed or been suppressed).	
Exit-specific parameters	**UEPTRANID**	Address of the 4-byte transaction ID.
	UEPUSER	Address of the 8-byte user ID.
	UEPTERM	Address of the 4-byte terminal ID.
	UEPPROG	Address of the 8-byte application program name.
	UEPDUMPC	Address of copy of the 8-byte dump code.
	UEPDUMPT	Address of the 1-byte dump-type identifier, which contains one of the following values: **UEPDTRAN** A transaction dump was requested. **UEPDSYST** A system dump was requested. **Note:** The dump-type identifier indicates the type of dump request that was passed to the dump domain. It does not reflect any modification that may have been made to the original request by a user entry in the dump table.
	UEPABCDE	Address of a copy of the 8-byte Kernel error code in the format xxx/yyyy. xxx denotes the 3-digit hexadecimal VSE/ESA completion code (for example X'0C1'). If a VSE/ESA completion code is not applicable, xxx is three hyphens. The 4-digit code yyyy is a user abend code produced either by CICS or by another product on your system. UEPABCDE is completed only for abend codes corresponding to the following dump codes: AP0001 SR0001 ASRA ASRB ASRD Otherwise this field contains null characters.
	UEPXDSCP	4-byte reserved field.
	UEPXDTXN	Address of a 1-byte field indicating the current dump table TRANDUMP setting. It contains one of the following values: **UEPXDYES** A transaction dump was taken. **UEPXDNO** A transaction dump was not taken. This field may be modified by the exit to update the dump table TRANDUMP setting. **Note:** This field is only valid if UEPDUMPT contains the value UEPDTRAN.

Table 11 (Page 2 of 2). Exit XDUREQC

	UEPXDSYS	Address of a 1-byte field indicating the current dump table SYSDUMP setting. It contains one of the following values: **UEPXDYES** A system dump was taken. **UEPXDNO** A system dump was not taken. This field may be modified by the exit to update the dump table SYSDUMP setting.
	UEPXDTRM	Address of a 1-byte field indicating the current dump table SHUTDOWN setting. It contains one of the following values: **UEPXDYES** The CICS system is to shutdown. **UEPXDNO** The CICS system is not to shutdown. This field may be modified by the exit to update the dump table SHUTDOWN setting.
	UEPXDMAX	Address of a 4-byte field which contains the current dump table MAXIMUM setting. This field may be modified by the exit to change the current dump table MAXIMUM setting.
	UEPXDCNT	Address of a 4-byte field which contains the current dump table CURRENT setting.
	UEPXDTST	Address of a 16-byte field which contains the current dump table statistics for this dumpcode. The addressed field consists of four 4-byte fields containing binary integers: Number of transaction dumps taken Number of transaction dumps suppressed Number of system dumps taken Number of system dumps suppressed **Note:** Statistics for transactions dumps are valid only if UEPDUMPT contains the value UEPDTRAN.
	UEPXDDAE	4-byte reserved field.
	UEPDMPID	Address of a 9-character field in the format xxxx/xxxx, containing the dump identifier. The dump ID is the same as that output by the corresponding dump message.
	UEPDRESP	Address of the 2-byte dump response code.
	UEPDREAS	Address of the 2-byte dump reason code.
Return codes	**UERCNORM**	Continue processing.
XPI calls	WAIT_EXTERNAL can be used only when UEPDUMPT indicates that a transaction dump is being taken. Do not use any other calls.	
API and SPI commands	Must not be used.	

XDUCLSE

Table 12. Exit XDUCLSE

When invoked	Immediately after a transaction dump data set has been closed.	
Exit-specific parameters	**UEPTRANID**	Address of the 4-byte transaction ID.
	UEPUSER	Address of the 8-byte user ID.
	UEPTERM	Address of the 4-byte terminal ID.
	UEPPROG	Address of the 8-byte application program name.
	UEPDMPDD	Address of an 8-byte field containing the 7-byte dump data set ddname, padded with a blank.
	UEPDMPDSN	Address of the 44-byte dump data set dsname.
Return codes	**UERCNORM**	Continue processing.
	UERCSWCH	The autoswitch flag is set on.
XPI calls	WAIT_EXTERNAL can be used. **Do not use any other calls**.	
API and SPI commands	Must not be used.	

XDUOUT

Table 13. Exit XDUOUT

When invoked	Before a record is written to the transaction dump data set.	
Exit-specific parameters	**UEPTRANID**	Address of the 4-byte transaction ID.
	UEPUSER	Address of the 8-byte user ID.
	UEPTERM	Address of the 4-byte terminal ID.
	UEPPROG	Address of the 8-byte application program name.
	UEPDMPFC	Address of the 1-byte function code. The equated values are: **UEPDMPWR** Buffer is about to be written. **UEPDMPRE** Dump is about to restart after autoswitch. **UEPDMPAB** Abnormal termination of dump. **UEPDMPDY** Buffer is about to be written, and the CICS dump data set is a dummy file or is closed.
	UEPDMPBF	Address of the dump buffer, whose length is addressed by the parameter UEPDMPLEN.
	UEPDMPLEN	Address of the 2-byte dump-buffer length.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Suppress dump record output.
XPI calls	WAIT_EXTERNAL can be used. **Do not use any other calls**.	
API and SPI commands	Must not be used.	

Dynamic transaction backout program exits XDBINIT, XDBIN, XDBFERR, and XDBDERR

For guidance information about the exits in the dynamic transaction backout program, refer to the *CICS Recovery and Restart Guide*.

Coding the exit programs

You can modify recoverable resources in dynamic transaction backout exit programs, but note the following:

- CICS services can be invoked from exit programs at any of these exits using the XPI or EXEC CICS commands, but there are restrictions on the use of EXEC CICS:
  - Your exit program must not issue EXEC CICS commands if recovery is as the result of an EXEC CICS SYNCPOINT ROLLBACK request. (You can discover whether this is the case by examining the UEPDBTYP exit-specific parameter passed to the XDBINIT exit, which is invoked on entry to the dynamic transaction backout program.)
  - It is unwise to issue any file control requests when backing out file resources. If your exit program does issue file control requests, note that:
    - A READ UPDATE should be properly unlocked, either implicitly or explicitly, or backout may be locked out.
    - In the XDBFERR exit, do not disable or close files, or you could cause further error conditions.
  - In the XDBINIT exit, avoid changes to recoverable transient data and temporary storage because they will back out immediately.
  - In the XDBINIT exit, the current DL/I PSB should be left scheduled; it should not be terminated.
  - Exit programs that issue EXEC CICS commands must first address the EIB. See “Using CICS services” on page 5.
  - Exit programs which issue EXEC CICS requests cannot link to a program running AMODE 24.
  - Exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. See “Returning values to CICS” on page 10.
  - If they issue EXEC CICS commands, programs invoked from these exits must be translated with the NOEDF option. See “Using EDF with global user exits” on page 6.
- File control operations are performed by the dynamic transaction backout program and changes made to files (including those performed in user exits) are recorded in the system log by the file control program.
- In the XDBIN exit, you can set a return code to ignore a file-related record if, for example, backout for a particular file is to be suppressed for some reason.

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when a dynamic transaction backout request is issued from any of these exits.

Use of the recursion counter UEPRECUR is recommended.

XDBINIT

Table 14. Exit XDBINIT

When invoked	On entry to the dynamic transaction backout program.	
Exit-specific parameters	**UEPDBTYP**	1-byte flag indicating why dynamic backout was invoked: **UEPROLLB** SYNCPOINT ROLLBACK request **UEPABEND** Abend processing.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCBYPD	Suppress all DL/I backout.
	UERCBYPA	Suppress all backout.
	UERCPURG	Task purged during XPI call.
	Return code values of 'UERCBYPD' and 'UERCBYPA' cause any databases updated by DL/I to be closed by DL/I backout failure processing.	
XPI calls	All can be used.	
API and SPI commands	Most can be used. See page 35 for restrictions.	

XDBIN

Table 15. Exit XDBIN

When invoked	Each time a non-DL/I dynamic log record is read in.	
Exit-specific parameters	**UEPDLOGR**	Address of dynamic log record. The dynamic log record can be mapped using the DSECT DFHDBRDS. You can determine the type of dynamic log record read by testing field DBRMODFN (defined in DFHDBRDS) with values provided by copy book DFHFMIDS.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	The dynamic transaction backout program should ignore this dynamic log record.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Most can be used. See page 35 for restrictions.	

XDBFERR

Table 16 (Page 1 of 2). Exit XDBFERR

When invoked	The dynamic transaction backout program invokes the file control program to perform backout. Exit XDBFERR is invoked if the file control program returns with an error, or if the dynamic transaction backout program itself detects an error during its file backout processing.	
Exit-specific parameters	**UEPDLOGR**	The address of the dynamic log record. The dynamic log record can be mapped using the DSECT DFHDBRDS.
	This parameter is followed by a 4-byte reserved field in the parameter list.	
	UEPFCTE	The address of the file control table (FCT) entry, if any. (See the note that follows this parameter list.) The FCT can be mapped using the DSECT DFHFCTDS.
	UEPFCRSP	The address of the file control response byte. This can have one of the following values: **UENORESP** Normal response. **UEFILERR** File not found. **UEINVREQ** Invalid request. **UEILOGIC** VSAM illogical error. **UENOTOPN** Not open. **UEDISAB** Disabled. **UEENDFIL** End of file. **UEIOEROR** I/O error. **UENOTFND** Record not found. **UEDUPREC** Duplicate record. **UENOSPAC** No space available. **UELENGER** Length error. **UEDUPKEY** Duplicate key in alternate index (AIX). **UEPURGED** Transaction canceled. **UEDISAST** Disastrous error detected. A value of UEPFCRSP other than one of those listed above indicates that File Control detected an invalid request.
	UEPERR	The address of a one-byte field containing the error type. The values of the error-byte and their meanings are described in “Values of the error byte pointed to by UEPERR” on page 38, and are defined using copy book DFHDBRDS.
	UEPFDATA	Address of a variable-length field containing the data in the file control request.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.

Table 16 (Page 2 of 2). Exit XDBFERR

	UEPFLEN	Address of a fullword containing the length of the data in the file control request.
	Note: UEPFCTE, UEPFDATA, and UEPFLEN contain valid values depending on the type of error reported by UEPFCRSP. For example, if the byte addressed by UEPFCRSP contains 'UEFILERR' (file not found), then UEPFCTE and UEPFDATA are zero.	
Return codes	**UERCNORM**	Continue processing and invoke CICS backout failure control.
	UERCBYP	Ignore the error (do not invoke CICS backout failure control) and continue.
	UERCRTRY	Retry the request or, if the error type (UEPERR) is DBFEWA, reapply the record.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Most can be used. See page 35 for restrictions.	

Values of the error byte pointed to by UEPERR

Field UEPERR in the XDBFERR parameter list points to the error byte in the dynamic log record. The error byte can contain one of the following values:

DBFEGU
An error response has been returned from the file control program (DFHFCVS) while servicing a GET UPDATE request. DFHDBP has attempted to retrieve the existing copy of the record before backing it out. Parameter UEPFCRSP (which gives the address of the byte containing the response to the file control request) in combination with the type of dynamic log record pointed to by UEPDLOGR ("read for update" or "write add") can be used in the exit to determine the specific problem.

DBFELE
The area acquired in DFHFCVS is not large enough to receive the before-copy data picked up from the dynamic log to perform the backout. The parameter UEPFDATA points to the record. Parameter UEPFLEN points to a field containing the length of the record. Parameter UEPFCRSP does not apply to this error.

DBFEPU
An error response has been returned from DFHFCVS while servicing a PUT UPDATE request. DFHDBP has attempted to replace the existing copy of the record on the file with the "before-copy" held in the dynamic log record pointed to by UEPDLOGR. Use parameter UEPFCRSP to determine which error occurred.

DBFEPN
An error response has been returned from DFHFCVS while servicing a PUT NEW request. DFHDBP has attempted to add the "before-copy" of a deleted VSAM KSDS record. Use parameter UEPFCRSP to determine the specific error.

DBFEWA

If the record read from the restart data set is a WRITE ADD, the record is read in from the file using a GET UPDATE. For DAM and VSAM-ESDS data sets, no delete function exists. Because DFHDBP does not attempt to delete the record that has been added, you may, in your exit program, “mark” the existing record on the file as deleted according to application-dependent logic. Mark the version of the record to which UEPFDATA points. If you want to reapply this version, specify return code ‘UERCRTRY’. UEPFLEN points to a field containing the length of the record.

Parameter UEPFCRSP does not apply; it contains a normal response from the READ UPDATE.

DBFEVD

An error response has been returned from the DFHFCVS while servicing a VSAM-DELETE request. DFHDBP has attempted to delete a new record added to a VSAM key-sequenced data set or a VSAM relative-record data set. Use parameter UEPFCRSP to determine the specific error.

XDBDERR

Table 17. Exit XDBDERR

When invoked	When the DL/I backout routine detects an error, its error message is routed to CSMT and exit XDBDERR is given control.	
Exit-specific parameters	**UEPDLOGR**	Address of dynamic log record. The dynamic log record can be mapped using the DSECT DFHDBRDS.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing. **Note:** Any databases updated by DL/I are now closed by DL/I backout failure control.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Most can be used. See page 35 for restrictions.	

EXEC interface program exits XEIIN and XEIOUT

There are two global user exit points in the EXEC interface program. XEIIN is invoked before the execution of an EXEC CICS command. The sequence is:

TRACE – XEIIN – EDF – command

XEIOUT is invoked after execution of an EXEC CICS command. The sequence is:

command – EDF – XEIOUT – TRACE

Note: Asynchronous processing of XEIIN and XEIOUT may occur if the transaction is suspended (for example, during file I/O wait). This situation may also occur under CEDF because it issues its own EXEC CICS commands between the application's XEIIN and XEIOUT exits.

Thus if the same GWA is shared between the XEIIN and XEIOUT exits, these possibilities must be allowed for to ensure integrity of the data and to prevent unpredictable results.

On entry to the exits, the exit-specific parameter UEPARG contains the address of the command parameter list.

The command parameter list

The first parameter in the list points to a string of data known as **argument 0**. The other parameters point to the values specified for the parameters passed on the command.

Argument 0 begins with a 2-byte function code that identifies the command. (Function codes are documented in Appendix A of the *CICS Application Programming Reference* manual.) The function code is followed by a 2-byte field containing "existence bits", that indicate whether arguments are passed on the command. For example, consider the command:

```
EXEC CICS LINK PROGRAM('MYPROG')
```

Here, argument 0 begins with the function code `X'0E02'` (LINK). Existence bit 1 is set, indicating that there is an argument 1 (namely, 'MYPROG').

The correspondence between command parameters (such as PROGRAM) and their positions and values in the parameter list (in this case, argument 1, 'MYPROG') can be deduced from the translated code for the particular command.

Warning: Modifying CICS commands by tampering with argument 0 is ***not*** supported, and leads to unexpected errors or results.

For example, if an application program is written in assembler or PL/I and you modify argument 0, you will be writing to program storage (that is, storage occupied by the program itself), which could cause protection exception abends. Furthermore, modifying argument 0 not only alters the CICS command for *this execution* of the command in the application program, it changes the CICS command in the virtual storage copy of the application program. This means that the next task to invoke the same copy of the program will also execute the modified command.

This particular example of the danger of tampering with argument 0 does not apply to COBOL or C application programs, but nevertheless you should not modify CICS commands for application programs written in any supported language.

Bypassing commands

Your XEIIN exit program can bypass execution of a command by setting the UERCBYP return code. If you do this, EDF is not invoked, but XEIOUT and exit trace are invoked if they are active.

Before setting UERCBYP, your program should check the value pointed to by UEPPGM, to ensure that it is not bypassing an EXEC CICS command issued by CICS.

XEIIN

Table 18. Exit XEIIN

When invoked	Before the execution of an EXEC CICS command.	
Exit-specific parameters	**UEPARG**	Address of the EXEC command parameter list.
	UEPEXECB	Address of the system EIB.
	UEPUSID	Address of the 8-character userid.
	UEPPGM	Address of the 8-character application program name.
	UEPLOAD	Address of the application program's load-point.
	UEPRSA	Address of the application's register save area. This contains the contents of the registers at the point when the program issued the EXEC CICS command.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Bypass the execution of this command.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

XEIOUT

Table 19. Exit XEIOUT

When invoked	After the execution of an EXEC CICS command.	
Exit-specific parameters	**UEPARG**	Address of the EXEC command parameter list.
	UEPEXECB	Address of the system EIB.
	UEPUSID	Address of the 8-character userid.
	UEPPGM	Address of the 8-character application program name.
	UEPLOAD	Address of the application program's load-point.
	UEPRSA	Address of the application's register save area. This contains the contents of the registers at the point when the program issued the EXEC CICS command.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

File control open/close program exit XFCNREC

You can use XFCNREC to suppress the open failure that occurs when a mismatch is detected between the backout recovery setting for the file and its associated data set.

XFCNREC is invoked only if a mismatch is detected.

It is intended for use by those who wish to continue with open processing even though the backout recovery settings for different files associated with the same base data set are not consistent.

After an open failure has been suppressed, CICS can no longer guarantee the integrity of the data set and will mark it accordingly. Any subsequent EXEC CICS INQUIRE DSNAME or CEMT INQUIRE DSNAME RECOVSTATUS returns NOTRECOVABLE. Logging continues for the data set for requests using any file that has BACKOUT on its definitions, but not for those that do not have BACKOUT.

The mismatch state of the data set survives until the next EXEC CICS or CEMT SET DSNAME REMOVE or COLD START (if the associated data set is not in backout failed state).

At the point at which the mismatch is accepted, CICS issues a message to warn that integrity can no longer be guaranteed.

The order in which files are opened for the same base data set will determine the content of the message received on suppression of an open failure using XFCNREC. If the base cluster block is set as unrecoverable and a mismatch has been allowed, access may be allowed to the data set, through an unrecoverable file, before the data set is fully recovered.

To provide a means of selecting which mismatches to accept and which to reject, three parameters are passed to the exit. These are the address of the filename, the address of the base data set name, and the address of a byte containing the file backout indicator. Because the exit is driven only if there is a mismatch, the data set backout indicator can be derived from the setting for the file.

Note: If XFCNREC is used to suppress an open failure due to a mismatch, the global user exit XFCSREQC will pass the base data set backout setting as the exit parameter UEFBCLOG, and not the file backout setting, which may be different.

Table 20. Exit XFCNREC

When invoked	Before file open when a mismatch is detected between the backout recovery setting for the file and its associated data set.	
Exit-specific parameters	**UEFILE**	Address of an 8-byte field containing the 7-byte file name. CICS pads the field with blanks.
	UEDSETN	Address of the 44-byte base data set name. If the data set name is less than 44 characters in length, it will be padded with blanks.
	UEPFRCV	Address of a 1-byte field containing the backout recovery setting for the file. Possible values are: **UEFBCLOG** Backout specified for file.
Return codes	**UERCNORM**	Fail open as normal.
	UERCBYP	Bypass open failure—accept mismatch.
XPI calls	Must not be used.	
API and SPI calls	Must not be used.	

File control EXEC interface API exits XFCREQ and XFCREQC

The XFCREQ exit allows you to intercept a file control **application programming interface** (**API**) request before any action has been taken on it by file control. The XFCREQC exit allows you to intercept a file control API request after file control has completed its processing.

Note: For information about the XFCAREQ and XFCAREQC exits that are invoked for file control **SPI** requests, see “File control EXEC interface SPI exits XFCAREQ and XFCAREQC” on page 57.

The API commands affected are:

- READ
- WRITE
- REWRITE
- DELETE
- UNLOCK
- STARTBR
- READNEXT
- READPREV
- ENDBR
- RESETBR

Using XFCREQ, you can:

- Analyze the request, to determine its type, the keywords specified, and their values.
- Modify any value specified by the request before the command is executed.
- Set return codes to specify that either:
  - CICS should continue with the (possibly modified) request.
  - CICS should bypass the request. (Note that if you set this return code, you must also set up return codes for the EXEC interface block (EIB), as if you had processed the request yourself.)

Using XFCREQC, you can:

- Analyze the request, to determine its type, the keywords specified, and their values.
- Set return codes for the EIB.

Both exits are passed seven parameters as follows:

- The address of the command-level parameter structure
- The address of a token (UEPFCTOK) used to pass 4 bytes of data from XFCREQ to XFCREQC
- The addresses of copies of three pieces of return code information from the EIB
- The address of a token (UEPTSTOK) that is valid throughout the life of a task
- The address of a recursion count field

The command-level parameter structure

The command-level parameter structure consists of a series of addresses. The first address points to the EXEC interface descriptor (EID), which consists of a bit string that describes the type of request and identifies each keyword specified with the request. The remaining addresses point to pieces of data associated with the request. (For example, the second address always points to the file name.)

Only the first 8 addresses and the last address can be referenced by the user exit. Addresses nine through eleven are reserved for CICS internal use.

You can examine the EID to determine the type of request and the keywords specified. You can examine the other parameters in the list to determine the values of the keywords. You can also modify values of keywords specified on the request. (For example, you could change the name of the file involved in the request.)

End of parameter list indicator

The high-order bit is set on in the last address set in the parameter list to indicate that it is the last one in the list. On return from your user exit program, CICS scans the parameter list for the high-order bit to find the last parameter. Therefore, if you modify the length of the parameter list, you must also reset the high-order bit to indicate which is the new last address.

For example, if the parameter list specifies only the first six addresses (FC_ADDR0, the address of the EID, to FC_ADDR5, the address of the KEYLENGTH), the high-order bit is set on in FC_ADDR5. If you extend the parameter list by setting the address of a SYSID in FC_ADDR7, you must unset the high-order bit in FC_ADDR5 and set it on in FC_ADDR7 instead.

The original parameter list, as it was before XFCREQ was invoked, is restored after the completion of XFCREQC. It follows that the execution diagnostic facility (EDF) displays the original command before **and** after execution. **EDF does not display any changes made by the exit**.

The UEPCLPS exit-specific parameter: The UEPCLPS exit-specific parameter is included in both exit XFCREQ and exit XFCREQC. The command-level parameter structure contains 12 addresses, FC_ADDR0 through FC_ADDRB. It is defined in the DSECT FC_ADDR_LIST, which you should copy into your exit program by including the statement COPY DFHFCEDS.

The command-level parameter list is made up as follows:

FC_ADDR0
is the address of a 9-byte area called the EID, which is made up as follows:

FC_GROUP
FC_FUNCT
FC_BITS1
FC_BITS2
FC_EIDOPT5
FC_EIDOPT6
FC_EIDOPT7
FC_EIDOPT8

The name of the DSECT mapping the EID is FC_EID.

FC_GROUP Always X'06', indicating that this is a file control request.

FC_FUNCT One byte that defines the type of request:

X'02'	READ
X'04'	WRITE
X'06'	REWRITE
X'08'	DELETE
X'0A'	UNLOCK
X'0C'	STARTBR
X'0E'	READNEXT
X'10'	READPREV
X'12'	ENDBR
X'14'	RESETBR

FC_BITS1 Existence bits that define which keywords that contain values were specified. To obtain the value associated with a keyword, you need to use the appropriate address from the command-level parameter structure. Before using this address, you must check the associated existence bit. If the existence bit is set off, the keyword was not specified in the request and the address should not be used.

X'80'	Set if the request contains the keyword FILE. If set, **FC_ADDR1** is meaningful.
X'40'	Set if the request contains any of the keywords INTO, SET, or FROM. If set, **FC_ADDR2** is meaningful.
X'20'	Set if the request specifies LENGTH or NUMREC, or if a STARTBR, RESETBR, or ENDBR request specifies REQID. If set, **FC_ADDR3** is meaningful.
X'10'	Set if the request specifies RIDFLD. If set, **FC_ADDR4** is meaningful.
X'08'	Set if the request specifies KEYLENGTH. If set, **FC_ADDR5** is meaningful.
X'04'	Set if the request is READNEXT or READPREV and specifies REQID. If set, **FC_ADDR6** is meaningful.
X'02'	Set if the request specifies SYSID. If set, **FC_ADDR7** is meaningful.
X'01'	Not used by file control.

FC_BITS2 Second set of existence bits.

X'20'	Set if the request specifies TOKEN. If set, **FC_ADDRB** is meaningful.

FC_EIDOPT5 Indicates whether certain keywords that do not take values were specified on the request.

X'04'	MASSINSERT specified.
X'02'	RRN specified.
X'01'	SET (and not INTO) was specified.

Note: Your program must test for keywords at the bit level, because there may be more than one of these keywords present.

FC_EIDOPT6
Indicates whether certain keywords that do not take values were specified on the request.

X'80'	RBA specified.
X'40'	GENERIC specified.
X'20'	GTEQ specified.

Note: Your program must test for keywords at the bit level, because there may be more than one of these keywords present.

FC_EIDOPT7
Indicates whether certain keywords that do not take values were specified on the request.

X'04'	UPDATE specified.
X'01'	Either DEBREC or DEBKEY specified. (See **FC_EIDOPT8**)

Note: Your program must test for keywords at the bit level, because there may be more than one of these keywords present.

FC_EIDOPT8
Indicates whether certain keywords that do not take values were specified on the request.

X'80'	DEBKEY specified.
X'40'	DEBREC specified.
X'20'	TOKEN specified.

FC_ADDR1
is the address of an 8-byte area containing the name from FILE.

FC_ADDR2
is the address of one of the following:

- A 4-byte address returned for SET (if the request is READ, READNEXT, or READPREV, and if **FC_EIDOPT5** indicates that this is SET).
- Data returned for INTO (if the request is READ, READNEXT, or READPREV, and if **FC_EIDOPT5** indicates that this is not SET).
- Data from FROM (if the request is WRITE or REWRITE).

FC_ADDR3
is the address of one of the following:

- The halfword value of LENGTH (if the request is READ, WRITE, REWRITE, READNEXT, or READPREV).

  Warning: For requests that specify INTO, do not change the value of LENGTH to a value greater than that specified by the application. To do so causes a storage overlay in the application.
- The returned halfword value of NUMREC (if the request is DELETE).
- The halfword value of REQID (if the request is STARTBR, RESETBR, or ENDBR).

FC_ADDR4
is the address of an area containing the value of the RIDFLD keyword.

FC_ADDR5
is the address of the halfword value of KEYLENGTH.

FC_ADDR6
is the address of the halfword value of REQID (if the request is READNEXT or READPREV).

FC_ADDR7
is the address of an area containing the value of SYSID.

FC_ADDR8
is the address of a value intended for CICS internal use only. It must not be used.

FC_ADDR9
is the address of a value intended for CICS internal use only. It must not be used.

FC_ADDRA
is the address of a value intended for CICS internal use only. It must not be used.

FC_ADDRB
is the address of the fullword value of TOKEN (if the request is READ, REWRITE, DELETE, or UNLOCK).

Modifying fields in the command-level parameter structure

Some fields that are passed to file control are used as input to the request, some are used as output fields, and some are used for both input and output. The method your user exit program uses to modify a field depends on the usage of the field.

A list of input and output fields: The following are always input fields:

FILE
FROM
KEYLENGTH
REQID
SYSID

The following are always output fields:

INTO
NUMREC
SET

Whether LENGTH and RIDFLD are input or output fields depends on the request, as shown in Table 21. A dash (—) means that the keyword cannot be specified on the request.

Table 21. LENGTH and RIDFLD as input and output fields

Request	LENGTH	RIDFLD
READ	Output	See Note 1.
WRITE	Input	See Note 2.
REWRITE	Input	—
DELETE	—	Input
UNLOCK	—	—
STARTBR	—	Input
READNEXT	Output	Output
READPREV	Output	Output
ENDBR	—	—
RESETBR	—	Input

Notes:

1. Normally, this is an input field. However, if UPDATE is specified and the file is a DAM file using extended key search, RIDFLD is used for both input and output.
2. The use of RIDFLD on a WRITE request depends on the file type. For a VSAM KSDS or RRDS, or a fixed-format DAM file, RIDFLD is an input field. For all other file types, it is used either for output only, or for both input and output, and should be treated like an output field.

Modifying input fields: The correct method of modifying an input field is to create a new copy of it, and to change the address in the command-level parameter list to point to your new data.

Warning: You must never modify an input field by altering the data that is pointed to by the command-level parameter list. To do so would corrupt storage belonging to the application program and would cause a failure when the program attempted to reuse the field.

Modifying output fields: The technique described in “Modifying input fields” is not suitable for modifying output fields. (The results would be returned to the new area instead of the application’s area, and would be invisible to the application.)

An output field is modified by altering the data that is pointed to by the command-level parameter list. In the case of an output field, you can modify the application’s data in place, because the application is expecting the field to be modified anyway.

Modifying fields used for both input and output: An example of a field that is used for both input and output is LENGTH on a READ request that specifies INTO. You can treat such fields in the same way as output fields, and they are considered to be the same.

Modifying the EID

It is not possible to modify the EID to make major changes to requests. It is not possible, for example, to change a WRITE request to a READ request.

However, you can make minor changes to requests, such as to turn on the existence bit for SYSID so that the request can be changed into one that is shipped to a remote system.

The list that follows shows the bits in the EID that can be modified. Any attempt to modify any other part of the EID is ignored.

FC_BITS1

X'20'	The existence bit for LENGTH, NUMREC, or REQID.
X'08'	The existence bit for KEYLENGTH.
X'04'	The existence bit for REQID if the request is READNEXT or READPREV.
X'02'	The existence bit for SYSID.

FC_EIDOPT5

X'04'	MASSINSERT specified.

FC_EIDOPT6

X'40'	GENERIC specified.
X'20'	GTEQ specified.

Bits in the EID should be modified in place. You should not modify the pointer to the EID: any attempt to do so is ignored by CICS.

The EID is reset to its original value before return to the application program. That is, changes made to the EID are retained for the duration of the file control request only.

Warning: Your user exit program is prevented from making major changes to the EID. However, you must take great care when making the minor modifications that **are** permitted. For instance, it is possible to change a DELETE into a GENERIC DELETE, but to make such a change may be dangerous.

Use of the task token UEPTSTOK

UEPTSTOK provides the address of a 4-byte area that you can use to pass information between successive file control requests in the same task. (By contrast, UEPFCTOK is usable only for the duration of a single file control request, because its contents may be destroyed at the end of the request.) For example, if you need to pass information between successive invocations of the XFCREQ exit, UEPTSTOK provides a means of doing this.

Use of the parameter UEPFSHIP

UEPFSHIP contains the address of a 16-byte area. This area consists of 4 characters, followed by 3 fullwords. If the first byte contains `'Y'`, this request has been function shipped to this region. In this case, if your exit program wants to bypass file control (by setting a return code of UERCBYP), it must set the 3 fullwords as follows:

Fullword 1	The length of the buffer area.
Fullword 2	The length of the record.
Fullword 3	The length of the modified RIDFLD.

Doing this ensures that the data and RIDFLD are correctly shipped back.

The EIB

Copies of EIBRCODE, EIBRESP, and EIBRESP2 are passed to the exit, so that you can:

- Modify or set completion information in XFCREQ and XFCREQC.
- Examine completion information in XFCREQC.

You can update the copies of EIBRCODE, EIBRESP, and EIBRESP2 that you are given in the parameter list. File Control copies your values into the real EIB after the completion of XFCREQC; or if you specify a return code of ‘bypass’ in XFCREQ.

You must set valid file control responses. You must set all three of EIBRCODE, EIBRESP, and EIBRESP2 to a consistent set of values, such as would be set by File Control to describe a valid completion. **File Control does not police the consistency of EIBRCODE, EIBRESP, and EIBRESP2**. To aid you in setting the values of EIBRCODE, EIBRESP, and EIBRESP2, the values used by File Control are specified in DFHFCEDS.

Example of how XFCREQ and XFCREQC can be used

XFCREQ and XFCREQC can be used for a variety of purposes. One example of a possible use is given below.

In this example, XFCREQ and XFCREQC are used to obtain a record containing compressed data, to decompress the data, and to return it to the area specified by the user program as INTO. The example shows only the capabilities of the exits; it is not intended to indicate an ideal way of achieving the function.

In XFCREQ:

1. Issue an EXEC CICS GETMAIN to obtain an area large enough to hold the decompressed data.
2. Change the INTO pointer to point to this new area, so that File Control uses it when it processes the request. (The decompressed data is copied to the *user’s* INTO area, and the INTO pointer reset, before return to the application program—see stages 4 on page 53 and 7 on page 53 of the processing to be done by XFCREQC.)
3. Set UEPFCTOK to be the address of the new area so that XFCREQC can also use this area.
4. Return to CICS.

In XFCREQC:

1. Check ‘UEPRCODE’ to make sure that the file control request completed without error.
2. Use UEPFCTOK to find the address of the area. This area now holds the compressed data.
3. Decompress the data in place.
4. Copy the data from the new area to the user’s INTO area. Use the user-specified LENGTH (from the command-level parameter list) to ensure that the data fits and that the copy does not cause a storage violation.
5. Set ‘LENGERR’ in UEPRESP, UEPRESP2, and UEPRCODE if the data does not fit.
6. Use EXEC CICS FREEMAIN to free the work area pointed to by UEPFCTOK.
7. At this point the command-level parameter list points to the now free area as the address for INTO. This is not a problem, because after completion of XFCREQC File Control restores this pointer to point to the area supplied by the user program.
8. Return to CICS.

XFCREQ

Table 22. Exit XFCREQ

When invoked	Before CICS processes a file control API request.	
Exit-specific parameters	**UEPCLPS**	Address of the command-level parameter structure. See "The UEPCLPS exit-specific parameter" on page 46.
	UEPFCTOK	Address of the 4-byte token to be passed to XFCREQC. This allows you, for example, to pass a work area to exit XFCREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code 'EIBRCODE'. For details of EIB return codes, refer to the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code 'EIBRESP'.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code 'EIBRESP2'.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See "Use of the task token UEPTSTOK" on page 51.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
	UEPFSHIP	Address of a 16 byte area. See "Use of the parameter UEPFSHIP" on page 52.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	The file control EXEC interface program should ignore this request.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, we recommend that you use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when a file control request is issued from the XFCREQ exit. Use of the recursion counter UEPRECUR is recommended.

Notes:

1. Exit programs that issue EXEC CICS commands must first address the EIB. See "Using CICS services" on page 5.
2. Exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. See "Returning values to CICS" on page 10.

XFCREQC

Table 23. Exit XFCREQC

When invoked	After a file control API request has completed, and before return from the file control EXEC interface program.	
Exit-specific parameters	**UEPCLPS**	Address of the command-level parameter structure. See "The UEPCLPS exit-specific parameter" on page 46.
	UEPFCTOK	Address of the 4-byte token to be passed to XFCREQC. This allows you, for example, to pass a work area to exit XFCREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code 'EIBRCODE'. For details of EIB return codes, refer to the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code 'EIBRESP'.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code 'EIBRESP2'.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See "Use of the task token UEPTSTOK" on page 51.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, we recommend that you use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when a file control request is issued from the XFCREQC exit.

Use of the recursion counter UEPRECUR is recommended.

Notes:

1. Exit programs that issue EXEC CICS commands must first address the EIB. See "Using CICS services" on page 5.
2. Exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. See "Returning values to CICS" on page 10.

Example program

CICS supplies—in hardcopy only—an example program, DFH$XTSE, that shows how to modify fields in the command-level parameter structure passed to EXEC interface exits. DFH$XTSE is listed on page 673.

File control EXEC interface SPI exits XFCAREQ and XFCAREQC

The XFCAREQ exit allows you to intercept a file control **system programming interface** (**SPI**) request before any action has been taken it by file control. The XFCAREQC exit allows you to intercept the response after a file control SPI request has completed.

Note: For information about the XFCREQ and XFCREQC exits that are invoked for file control **API** requests, see “File control EXEC interface API exits XFCREQ and XFCREQC” on page 45.

The SPI requests affected are:

- EXEC CICS INQUIRE FILE
- EXEC CICS SET FILE.

Using XFCAREQ, you can:

- Analyze the SPI parameter list (function, keywords, argument values, and responses)
- Modify any input parameter prior to execution of the request
- Prevent execution of a request and set appropriate responses.

Using XFCAREQC, you can:

- Analyze the SPI parameter list
- Modify any output parameter value and set responses after execution.

You can also:

- Pass data between your XFCAREQ and XFCAREQC exit programs when they are invoked for the same request.
- Pass data between your file control exit programs when they are invoked within the same task. You can pass data between successive invocations of XFCAREQ and XFCAREQC and also between invocations of other EXEC-enabled user exits.

If you make changes to file states (that is, if you open, close, enable, or disable a file) it is possible that exits in the file state change program (XFCSREQ and XFCSREQC) could modify situations set up by XFCAREQ. Therefore you must consider the order in which the exits are invoked. If all four exits are enabled, the order of invocation is as follows:

- For the SET FILE command:
  1. XFCAREQ
  2. XFCSREQ
  3. XFCSREQC
  4. XFCAREQC
- For the INQUIRE FILE command, only the XFCAREQ and XFCAREQC exits are invoked:
  1. XFCAREQ
  2. XFCAREQC

The command-level parameter structure

The command-level parameter structure consists of a series of addresses. The first address points to the EXEC interface descriptor (EID), which consists of a bit string that describes the type of request and identifies each keyword specified with the request. The remaining addresses point to pieces of data associated with the request.

You can examine the EID to determine the type of request and the keywords specified. You can examine the other parameters in the list to determine the values of the keywords. You can also modify values of keywords specified on the request.

Note: The relationship between arguments, keywords, data types, and input/output types on the file control SPI commands is summarized in the following tables:

- For INQUIRE FILE, see Table 24 on page 65.
- For SET FILE, see Table 25 on page 66.

End of parameter list indicator

The high-order bit is set on in the last address set in the parameter list to indicate that it is the last one in the list. On return from your user exit program, CICS scans the parameter list for the high-order bit to find the last parameter. Therefore, if you modify the length of the parameter list, you must also reset the high-order bit to indicate which is the new last address.

For example, if the parameter list specifies only the first seven addresses (FC_ADDR0, the address of the EID, to FC_ADDR6, the address of the LSRPOOLID), the high-order bit is set on in FC_ADDR6. If you extend the parameter list by setting the address of ACCESSMETHOD in FC_ADDR17, you must unset the high-order bit in FC_ADDR6 and set it on in FC_ADDR17 instead.

The UEPCLPS exit-specific parameter: The UEPCLPS exit-specific parameter is passed to both XFCAREQ and XFCAREQC. It is the address of the command-level parameter structure. The command-level parameter list contains 58 addresses, FC_ADDR0 through FC_ADDR57. These are described in DSECT DFHFAUED, which you should copy into your program by including the statement COPY DFHFAUED.

The command-level parameter list is made up as follows:

FC_ADDR0
is the address of a 13-byte area called the EID which is made up as follows:

FC_GROUP
FC_FUNCT
FC_BITS1
FC_BITS2
FC_EIDOPT4
FC_EIDOPT5
FC_EIDOPT6
FC_BITS3
FC_BITS4
FC_BITS5

FC_BITS6
FC_BITS7
FC_BITS8

FC_GROUP	Always X'4C', indicating that this is a file control SPI request.
FC_FUNCT	One byte that defines the type of request:

X'02'	INQUIRE FILE
X'04'	SET FILE.

FC_BITS1
Existence bits which specify which arguments were specified. To obtain the argument associated with a keyword, you need to obtain the appropriate address from the command-level parameter structure. Before using this address you must check the associated existence bit. If the existence bit is set off, the argument was not specified in the request and the address should not be used.

X'80'	Set if the request contains an argument for the FILE keyword. If set, FC_ADDR1 is meaningful.
X'40'	Set if the request contains an argument for the DSNAME keyword. If set, FC_ADDR2 is meaningful.
X'20'	Set if the request contains an argument for the FWDRECSTATUS keyword. If set, FC_ADDR3 is meaningful.
X'10'	Set if the request contains an argument for the STRINGS keyword. If set, FC_ADDR4 is meaningful.
X'08'	Set if the request contains an argument for the BASEDSNAME keyword. If set, FC_ADDR5 is meaningful.
X'04'	Set if the request contains an argument for the LSRPOOLID keyword. If set, FC_ADDR6 is meaningful.
X'02'	Set if the request contains an argument for the READ keyword. If set, FC_ADDR7 is meaningful.
X'01'	Set if the request contains an argument for the UPDATE keyword. If set, FC_ADDR8 is meaningful.

FC_BITS2
Existence bits which specify which arguments were specified. The comments below FC_BITS1 also apply to FC_BITS2.

X'80'	Set if the request contains an argument for the BROWSE keyword. If set, FC_ADDR9 is meaningful.
X'40'	Set if the request contains an argument for the ADD keyword. If set, FC_ADDR10 is meaningful.

X'20'	Set if the request contains an argument for the DELETE keyword. If set, FC_ADDR11 is meaningful.
X'10'	Not used by file control.
X'08'	Set if the request contains an argument for the EMPTYSTATUS keyword. If set, FC_ADDR13 is meaningful.
X'04'	Set if the request contains an argument for the OPENSTATUS keyword. If set, FC_ADDR14 is meaningful.
X'02'	Set if the request contains an argument for the ENABLESTATUS keyword. If set, FC_ADDR15 is meaningful.
X'01'	Set if the request contains an argument for the RECOVSTATUS keyword. If set, FC_ADDR16 is meaningful.

FC_EIDOPT4 Not used by file control

FC_EIDOPT5 Not used by file control

FC_EIDOPT6 Not used by file control

FC_BITS3 Existence bits which specify which arguments were specified. The comments below FC_BITS1 also apply to FC_BITS3.

X'80'	Set if the request contains an argument for the ACCESSMETHOD keyword. If set, FC_ADDR17 is meaningful.
X'40'	Set if the request contains an argument for the TYPE keyword. If set, FC_ADDR18 is meaningful.
X'20'	Set if the request contains an argument for the OBJECT keyword. If set, FC_ADDR19 is meaningful.
X'10'	Set if the request contains an argument for the REMOTESYSTEM keyword. If set, FC_ADDR20 is meaningful.
X'08'	Set if the request contains an argument for the REMOTENAME keyword. If set, FC_ADDR21 is meaningful.
X'04'	Set if the request contains an argument for the RECORDFORMAT keyword. If set, FC_ADDR22 is meaningful.
X'02'	Set if the request contains an argument for the BLOCKFORMAT keyword. If set, FC_ADDR23 is meaningful.
X'01'	Set if the request contains an argument for the KEYLENGTH keyword. If set, FC_ADDR24 is meaningful.

FC_BITS4
Existence bits which specify which arguments were specified. The comments below FC_BITS1 also apply to FC_BITS4.

X'80' Set if the request contains an argument for the KEYPOSITION keyword. If set, FC_ADDR25 is meaningful.

X'40' Set if the request contains an argument for the RECORDSIZE keyword. If set, FC_ADDR26 is meaningful.

X'20' Set if the request contains an argument for the RELTYPE keyword. If set, FC_ADDR27 is meaningful.

X'10' Set if the request contains an argument for the EXCLUSIVE keyword. If set, FC_ADDR28 is meaningful.

X'08' Set if the request contains an argument for the BLOCKKEYLEN keyword. If set, FC_ADDR29 is meaningful.

X'04' Set if the request contains an argument for the BLOCKSIZE keyword. If set, FC_ADDR30 is meaningful.

X'02' Not used by file control.

X'01' Set if the request contains an argument for the BUSY keyword. If set, FC_ADDR32 is meaningful.

FC_BITS5
Existence bits which specify which arguments were specified. The comments below FC_BITS1 also apply to FC_BITS5.

X'80' Set if the request contains an argument for the TABLE keyword. If set, FC_ADDR33 is meaningful.

X'40' Set if the request contains an argument for the MAXNUMRECS keyword. If set, FC_ADDR34 is meaningful.

X'20' Not used by file control.

X'10' Not used by file control.

X'08' Not used by file control.

X'04' Not used by file control.

X'02' Not used by file control.

X'01' Not used by file control.

FC_BITS6
Specifies whether certain keywords were specified on the File control SPI command.

X'80' Set if the request contains the START keyword.

X'40' Set if the request contains the NEXT keyword.

X'20'	Set if the request contains the END keyword.
X'10'	Set if the request contains the WAIT keyword.
X'08'	Set if the request contains the NOWAIT keyword.
X'04'	Set if the request contains the FORCE keyword.
X'02'	Set if the request contains the ENABLED keyword.
X'01'	Set if the request contains the DISABLED keyword.

FC_BITS7 Specifies whether certain keywords were specified on the File control SPI command. Also contains the existence bit for JOURNALNUM, which seems to be far from home.

X'80'	Set if the request contains the OPEN keyword.
X'40'	Set if the request contains the CLOSED keyword.
X'20'	Set if the request contains the EMPTY keyword.
X'10'	Set if the request contains an argument for the JOURNALNUM keyword. If set, FC_ADDR52 is meaningful.
X'08'	Not used by file control.
X'04'	Not used by file control.
X'02'	Not used by file control.
X'01'	Not used by file control.

FC_BITS8 Existence bits which specify which arguments were specified. The comments below FC_BITS1 also apply to FC_BITS8.

X'80'	Set if the request contains the REMOTETABLE keyword. If set, FC_ADDR57 is meaningful.
X'40'	Set if the request contains the CATNAME keyword. If set, FC_ADDR58 is meaningful.
X'20'	Not used by file control.
X'10'	Not used by file control.
X'08'	Not used by file control.
X'04'	Not used by file control.
X'02'	Not used by file control.
X'01'	Not used by file control.

FC_ADDR1
is the address of an 8-byte area containing the name from FILE.

FC_ADDR2
is the address of a 44-byte area containing the name from DSNAME.

FC_ADDR3
is the address of a 4-byte area containing the CVDA from FWDRECOVSTATUS.

FC_ADDR4
is the address of a 4-byte area containing the data from STRINGS.

FC_ADDR5
is the address of a 44-byte area containing the name from BASEDSNAME.

FC_ADDR6
is the address of a 4-byte area containing the data from LSRPOOLID.

FC_ADDR7
is the address of a 4-byte area containing the CVDA from READ.

FC_ADDR8
is the address of a 4-byte area containing the CVDA from UPDATE.

FC_ADDR9
is the address of a 4-byte area containing the CVDA from BROWSE.

FC_ADDR10
is the address of a 4-byte area containing the CVDA from ADD.

FC_ADDR11
is the address of a 4-byte area containing the CVDA from DELETE.

FC_ADDR12
is not used by file control.

FC_ADDR13
is the address of a 4-byte area containing the CVDA from EMPTYSTATUS.

FC_ADDR14
is the address of a 4-byte area containing the CVDA from OPENSTATUS.

FC_ADDR15
is the address of a 4-byte area containing the CVDA from ENABLESTATUS.

FC_ADDR16
is the address of a 4-byte area containing the CVDA from RECOVSTATUS.

FC_ADDR17
is the address of a 4-byte area containing the CVDA from ACCESSMETHOD.

FC_ADDR18
is the address of a 4-byte area containing the CVDA from TYPE.

FC_ADDR19
is the address of a 4-byte area containing the CVDA from OBJECT.

FC_ADDR20
is the address of a 4-byte area containing the name from REMOTESYSTEM.

FC_ADDR21
is the address of an 8-byte area containing the name from REMOTENAME.

FC_ADDR22
is the address of a 4-byte area containing the CVDA from RECORDFORMAT.

FC_ADDR23
is the address of a 4-byte area containing the CVDA from BLOCKFORMAT.

FC_ADDR24
is the address of a 4-byte area containing the CVDA from KEYLENGTH.

FC_ADDR25
is the address of a 4-byte area containing the data from KEYPOSITION.

FC_ADDR26
is the address of a 4-byte area containing the data from RECORDSIZE.

FC_ADDR27
is the address of a 4-byte area containing the CVDA from RELTYPE.

FC_ADDR28
is the address of a 4-byte area containing the CVDA from EXCLUSIVE.

FC_ADDR29
is the address of a 4-byte area containing the data from BLOCKKEYLEN.

FC_ADDR30
is the address of a 4-byte area containing the data from BLOCKSIZE.

FC_ADDR31
is not used by file control.

FC_ADDR32
is the address of a 4-byte area containing the CVDA from BUSY.

FC_ADDR33
is the address of a 4-byte area containing the CVDA from TABLE.

FC_ADDR34
is the address of a 4-byte area containing the data from MAXNUMRECS.

FC_ADDR35 to FC_ADDR51
are not used by file control.

FC_ADDR52
is the address of a 4-byte area containing the data from JOURNALNUM.

FC_ADDR53 to FC_ADDR56
Not used by file control.

FC_ADDR57
is the address of a 4-byte area containing the CVDA from REMOTETABLE.

FC_ADDR58
is the address of a 7-byte area containing data from CATNAME.

Modifying fields in the command-level parameter structure

Some fields that are passed to file control SPI requests are used as input to the request and some are used as output to the request. The method that your user exit program uses to modify a field depends upon the usage of the field. As a general rule:

- On INQUIRE FILE requests, all fields except FILE are output fields.
- On SET FILE requests, all fields are input fields.

For a full description of the parameters to INQUIRE FILE, see Table 24. For a full description of the parameters to SET FILE, see Table 25 on page 66.

Table 24 (Page 1 of 2). INQUIRE FILE requests. The relationship between arguments, keywords, data types, and input/output types.

Argument	Keyword	Data Type	Input/Output
Arg1	FILE	CHAR(8)	See note.
Arg2	DSNAME	CHAR(44)	Output
Arg3	FWDRECSTATUS	BIN(31)	Output
Arg4	STRINGS	BIN(31)	Output
Arg5	BASEDSNAME	CHAR(44)	Output
Arg6	LSRPOOLID	BIN(31)	Output
Arg7	READ	BIN(31)	Output
Arg8	UPDATE	BIN(31)	Output
Arg9	BROWSE	BIN(31)	Output
Arg10	ADD	BIN(31)	Output
Arg11	DELETE	BIN(31)	Output
Arg12	*	*	*
Arg13	EMPTYSTATUS	BIN(31)	Output
Arg14	OPENSTATUS	BIN(31)	Output
Arg15	ENABLESTATUS	BIN(31)	Output
Arg16	RECOVSTATUS	BIN(31)	Output
Arg17	ACCESSMETHOD	BIN(31)	Output
Arg18	TYPE	BIN(31)	Output
Arg19	OBJECT	BIN(31)	Output
Arg20	REMOTESYSTEM	CHAR(4)	Output
Arg21	REMOTENAME	CHAR(8)	Output
Arg22	RECORDFORMAT	BIN(31)	Output
Arg23	BLOCKFORMAT	BIN(31)	Output
Arg24	KEYLENGTH	BIN(31)	Output
Arg25	KEYPOSITION	BIN(31)	Output
Arg26	RECORDSIZE	BIN(31)	Output
Arg27	RELTYPE	BIN(31)	Output
Arg28	EXCLUSIVE	BIN(31)	Output
Arg29	BLOCKKEYLEN	BIN(31)	Output
Arg30	BLOCKSIZE	BIN(31)	Output
Arg31	*	*	*
Arg32	*	*	*
Arg33	TABLE	BIN(31)	Output
Arg34	MAXNUMRECS	BIN(31)	Output
Arg35 to Arg51	*	*	*

Table 24 (Page 2 of 2). INQUIRE FILE requests. The relationship between arguments, keywords, data types, and input/output types.

Argument	Keyword	Data Type	Input/Output
Arg52	JOURNALNUM	BIN(15)	Output
Arg53 to Arg56	*	*	*
Arg57	REMOTETABLE	BIN(31)	Output
Arg58	CATNAME	CHAR(7)	Output

Note: The file parameter on INQUIRE FILE commands is:

- An input field if the request does not specify START, NEXT, or END.
- An output field if the request specifies NEXT.
- Omitted if the request specifies START or END.

Table 25 (Page 1 of 2). SET FILE requests. The relationship between arguments, keywords, data types, and input/output types.

Argument	Keyword	Data Type	Input/Output
Arg1	FILE	CHAR(8)	Input
Arg2	DSNAME	CHAR(44)	Input
Arg3	FWDRECSTATUS	BIN(31)	Input
Arg4	STRINGS	BIN(31)	Input
Arg5	*	*	*
Arg6	LSRPOOLID	BIN(31)	Input
Arg7	READ	BIN(31)	Input
Arg8	UPDATE	BIN(31)	Input
Arg9	BROWSE	BIN(31)	Input
Arg10	ADD	BIN(31)	Input
Arg11	DELETE	BIN(31)	Input
Arg12	*	*	*
Arg13	EMPTYSTATUS	BIN(31)	Input
Arg14	OPENSTATUS	BIN(31)	Input
Arg15	ENABLESTATUS	BIN(31)	Input
Arg16	RECOVSTATUS	BIN(31)	Input
Arg17	*	*	*
Arg18	*	*	*
Arg19	*	*	*
Arg20	*	*	*
Arg21	*	*	*
Arg22	*	*	*
Arg23	*	*	*
Arg24	*	*	*
Arg25	*	*	*

Table 25 (Page 2 of 2). SET FILE requests. The relationship between arguments, keywords, data types, and input/output types.

Argument	Keyword	Data Type	Input/Output
Arg26	*	*	*
Arg27	*	*	*
Arg28	EXCLUSIVE	BIN(31)	Input
Arg29	*	*	*
Arg30	*	*	*
Arg31	*	*	*
Arg32	BUSY	BIN(31)	Input
Arg33	TABLE	BIN(31)	Input
Arg34	MAXNUMRECS	BIN(31)	Input

Modifying input fields: The correct method of modifying an input field is to create a new copy of it, and to change the address in the command-level parameter list to point to your new data.

Warning: You must never modify an input field by altering the data that is pointed to by the command-level parameter list. To do so would corrupt storage belonging to the application program and would cause a failure when the program attempted to reuse the field.

Modifying output fields: The technique described in “Modifying input fields” is not suitable for modifying output fields. (The results would be returned to the new area instead of the application’s area, and would be invisible to the application.)

An output field is modified by altering the data that is pointed to by the command-level parameter list. In the case of an output field, you can modify the application’s data in place, because the application is expecting the field to be modified anyway.

Modifying the EID

It is not possible to modify the EID to make major changes to requests. It is not possible, for example, to change an INQUIRE FILE request to a SET FILE request. However, you can make minor changes to requests, such as to turn on the existence bit for a variable that had not been specified on the current request. The following paragraph lists the bits in the EID that can be modified. Any attempt to modify any other part of the EID is ignored.

Your exit program can modify any bit in FC_BITS1, FC_BITS2, FC_BITS3, FC_BITS4, FC_BITS5, FC_BITS6, FC_BITS7, and FC_BITS8 *except for*:

- The existence bit for the FILE keyword.
- The bits for the START, NEXT, and END keywords.
- Any bits described as “not used by file control”.
- Any bit corresponding to a keyword that is not applicable to the command being executed. For example, the bit for the CLOSED keyword can be modified on a SET FILE request but not on an INQUIRE FILE request, because

CLOSED has meaning only for a SET FILE request. See the descriptions in Table 24 on page 65 and Table 25 on page 66.

Your program can provide its own command-level parameter structure and EID, in which case you should modify UEPCLPS and FC_ADDR0 respectively to point to the new structures.

The EID is reset to its original value before return to the application program. That is, changes to the EID are retained for the duration of the file control SPI request only.

Warning: If you modify the EID, you must be careful not to create inconsistent parameters. For example, if the original request specified SET FILE OPEN and your exit turned on the EID bit for CLOSED, the resulting SET FILE request would specify both OPEN and CLOSED. In this case, the results of the command would be unpredictable.

Use of the task token UEPTSTOK

UEPTSTOK provides the address of a 4-byte area that you can use to pass information between successive file control SPI requests in the same task. (By contrast, UEPFATOK is usable only for the duration of a single file control SPI request, because its contents may be destroyed at the end of the request.) For example, if you need to pass information between successive invocations of XFCAREQ exit, UEPTSTOK provides a means of doing this.

Modifying user arguments

User exit programs can modify user arguments as follows:

- For input arguments, your exit program should obtain sufficient storage to hold the modified argument, set up the required value, and set the associated pointer in the parameter list to the address of the newly acquired area.
- For output and input/output arguments, your exit program can update the argument in place, because the area of storage is represented in the application by a variable that is expected to receive a value from CICS.

Adding user arguments: Your exit program can add user arguments, provided that it is allowed to modify the corresponding existence bit in the EID. Assuming that the argument to be added does not already exist, your exit program must:

1. Obtain storage for the argument to be added.
2. Initialize the storage to the required value.
3. Select and set up the appropriate pointer from the parameter list.
4. Select and set up the appropriate existence bit in Arg0.
5. If necessary, modify the parameter list to reflect the new end-of-list indicator.

Removing user arguments: Your exit program can remove user arguments, provided that it is allowed to modify the corresponding existence bit in the EID. Assuming that the argument to be removed exists, your exit program must:

1. Switch the corresponding argument existence bit in Arg0 to zero.
2. Modify the parameter list to reflect the new end-of-list indicator.

XFCAREQ

Table 26. Exit XFCAREQ

When invoked	Before CICS processes a file control SPI request.	
Exit-specific parameters	**UEPCLPS**	Address of a copy of the SPI command parameter list. See “The command-level parameter structure” on page 58.
	UEPFATOK	Address of a 4-byte area that can be used to pass information between XFCAREQ and XFCAREQC on a single file control SPI request.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code EIBRCODE. For details of EIB return codes, see the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code EIBRESP.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code EIBRESP2.
	UEPTSTOK	Address of a 4-byte token which can be used to pass information between successive file control SPI requests within the same task (for example, between successive invocations of the XFCAREQC exit).
	UEPRECUR	Address of a halfword recursion counter. The counter is set to zero when the exit is first invoked and is incremented for each recursive call.
Return codes	**UERCBYP**	Bypass this request.
	UERCNORM	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI commands	All can be used.	
API and SPI commands	All can be used.	

Warning: Care should be taken when using recursive commands. For example, you must avoid entering a loop when issuing a file control SPI request from the XFCAREQ exit. Use of the recursion counter UEPRECUR is recommended.

XFCAREQC

Table 27. Exit XFCAREQC

When invoked	After a file control SPI request has completed, before return from the file control SPI EXEC interface program.	
Exit specific parameters:	**UEPCLPS**	Address of a copy of the SPI command parameter list. See "The command-level parameter structure" on page 58.
	UEPFATOK	Address of a 4-byte area that can be used to pass information between XFCAREQ and XFCAREQC on a single file control SPI request.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code EIBRCODE. For details of EIB return codes, see the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code EIBRESP.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code EIBRESP2.
	UEPTSTOK	Address of a 4-byte token which can be used to pass information between successive file control SPI requests within the same task (for example, between successive invocations of the XFCAREQC exit).
	UEPRECUR	Address of a halfword recursion counter. The counter is set to zero when the exit is first invoked and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI commands	All can be used.	
API and SPI commands	All can be used.	

You can update the copies of EIBRCODE, EIBRESP, and EIBRESP2 that you are given in the parameter list. If you update the values, file control copies the new values into the application program's EXEC interface block (EIB) after the completion of XFCAREQC or if you specify a return code of UERCBYP in XFCAREQ.

You must set valid file control responses. You must set all three of EIBRCODE, EIBRESP, and EIBRESP2 to a consistent set of values, such as would be set by file control to describe a valid completion. CICS does not check the consistency of the values you set. If EIBRCODE is set to a non-zero value and EIBRESP is set to zero, CICS overrides EIBRESP with a non-zero value. To help you set values for EIBRCODE, EIBRESP, and EIBRESP2, the values used by file control for SPI requests are specified in DSECT DFHFAUED.

Warning: Care should be taken when using recursive commands. For example, you must avoid entering a loop when issuing a file control SPI request from the XFCAREQ exit. Use of the recursion counter UEPRECUR is recommended.

File control file state program exits XFCSREQ and XFCSREQC

Two user exits are provided in the file control state program. You can use XFCSREQ, which is invoked **before** a file ENABLE, DISABLE, OPEN, or CLOSE request is acted on, to gather information about the state of the file—for example, which file requests (SERVREQs) are valid, which journaling options are set. Based on this information, you can suppress the request, if appropriate. (See return code UERCBYP on page 73.)

You can use XFCSREQC, which is invoked **after** the file request has been acted on, to gather information about the data set associated with the file—for example, which recovery options are set. Note that XFCSREQC is invoked even if you have used XFCSREQ to suppress the file request.

For ENABLE, DISABLE, and OPEN requests, each exit is invoked only once. However, for CLOSE requests, because a file can be quiesced before actual closure, the exits might be invoked more than once.

For a single CLOSE request, XFCSREQ and XFCSREQC are invoked more than once if closure is attempted while the file is being accessed by other tasks. For example, the result of a CLOSE NOWAIT command in these circumstances is that XFCSREQ is invoked before the closure is attempted. Because there are still users of the file, the closure is delayed. However, because it specified NOWAIT, the CLOSE request completes, and invokes XFCSREQC with UEPFSRSP set to ‘UEFSPEND’, meaning closure is pending. When all activity against the file is complete, the file is closed, and XFCSREQ and XFCSREQC are invoked under the task that actually closed it.

For a CLOSE WAIT command, the exits are invoked as follows. XFCSREQ is invoked, the task requests a closure of the file and waits for the closure to happen. When all activity against the file is complete, the file is closed, and XFCSREQ and XFCSREQC are invoked under the task that closed it. Finally, because the closure has now been completed, the task that issued the CLOSE WAIT is resumed, completes its CLOSE request, and invokes XFCSREQC.

Note: There are three occasions when the user exits XFCSREQ and XFCSREQC are not invoked during a close request:

1. On a controlled, non-immediate shutdown of CICS, when CICS closes all files.
2. After an I/O error has been encountered on a VSAM file. (For an I/O error the file is not closed immediately. CICS quiesces the file, setting the status to ‘close pending’. When all activity against the file, including the task receiving the I/O error is complete, CICS issues a subsequent close request and XFCSREQ and XFCSREQC are invoked.)
3. After loading a user maintained data table. When the data table load has completed the source dataset is no longer required. CICS subsequently closes and de-allocates the file, leaving the data table open.

XFCSREQ

Table 28 (Page 1 of 2). Exit XFCSREQ

When invoked	Before a file ENABLE, DISABLE, OPEN, or CLOSE is attempted.	
Exit-specific parameters	**UEPFSREQ**	Address of a 2-byte field that indicates the type of file request. The first byte contains one of the following values: **UEPFSOPN** Open request. **UEPFSCLS** Close request. **UEPFSENB** Enable request. **UEPFSDIS** Disable request. If the first byte indicates a close request (UEPFSCLS), the second byte shows the type of close: **UEPFSNC** Normal close. **UEPFSCP** Close pending. **UEPFSELM** End of load mode close.
	UEPFILE	Address of an 8-character field containing the 7-byte file name.
	UEPFINFO	Address of a storage area containing information about the file. The area can be mapped using the DSECT DFHUEFDS, which contains the following fields: **UEFLNAME** An 8-character field containing the 7-character file name. **UEDSNAME** The 44-character dsname (file-id) of the data set associated with the file, if this has been set before the file request was issued. **UEFSERV** One byte indicating the SERVREQ settings for this file. The possible values are: **UEFRDIM** Read valid. **UEFUPDIM** Update valid. **UEFADDIM** Add valid. **UEFDELIM** Delete valid. **UEFBRZIM** Browse valid. **UEFDSJL** One byte indicating the automatic journaling options set for this file. The possible values are: **UEFJRO** Journal read-only. **UEFJRU** Journal read for update. **UEFJWU** Journal write update. **UEFJWA** Journal write add. **UEFJDSN** Dsname has been journaled. **UEFJSYN** Journal read synchronously. **UEFJASY** Journal write asynchronously.

Table 28 (Page 2 of 2). Exit XFCSREQ

		UEFDSVJL	One byte indicating a further automatic journaling option which applies to VSAM files only. The value is: **UEFJWAC** Write add complete.
		UEFDSJID	One byte containing the number of the journal to be used for automatic journaling, if any.
		UEFDSACC	One byte indicating the access method of the file. The possible values are: **UEFVSAM** VSAM file **UEFBDAM** DAM file.
		UEFBCRV	Set to nulls for this exit.
		UEFFRLOG	Set to nulls for this exit.
		UEFCDATE	Set to nulls for this exit.
		UEFCTIME	Set to nulls for this exit.
		UEFBCBS	Set to nulls for this exit.
		UEFACBCP	Set to nulls for this exit.
		Note: Only the first seven fields of UEPFINFO are set for this exit. The remaining fields are set to nulls.	
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.	
Return codes	**UERCNORM**	Continue processing.	
	UERCBYP	Suppress the file request. The specific effect of setting UERCBYP depends on the type of file request. In the case of a file ENABLE, DISABLE, or CLOSE request, the request is ignored; that is, the state of the file is not changed. In the case of a file OPEN request, the file is set to a closed, unenabled state. In either case, CICS issues message DFHFC0996: `OPEN/CLOSE/ENABLE/DISABLE of file filename suppressed due to intervention of user exit` Note that, in one special case, setting UERCBYP to suppress a file request has no effect. If a file is to be closed as a result of backout failure processing, CICS does not allow the CLOSE request to be suppressed, as this would cause a failure in backout failure processing.	
	UERCPURG	Task purged during XPI call.	
XPI calls	All can be used.		
API and SPI commands	All can be used.		

Warning:

Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when a file control request is issued from the XFCSREQ exit. Use of the recursion counter UEPRECUR is recommended.

Notes:

1. Exit programs that issue EXEC CICS commands must first address the EIB. See "Using CICS services" on page 5.
2. Exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. See "Returning values to CICS" on page 10.

XFCSREQC

Table 29 (Page 1 of 4). Exit XFCSREQC

When invoked	After a file ENABLE, DISABLE, OPEN, or CLOSE command has completed.	
Exit-specific parameters	**UEPFSREQ**	Address of a 2-byte field that indicates the type of file request. The first byte contains one of the following values: **UEPFSOPN** Open request. **UEPFSCLS** Close request. **UEPFSENB** Enable request. **UEPFSDIS** Disable request. If the first byte indicates a close request (UEPFSCLS), the second byte shows the type of close: **UEPFSNC** Normal close. **UEPFSCP** Close pending. **UEPFSELM** End of load mode close.
	UEPFILE	Address of an 8-byte field containing the 7-byte file name.
	UEPFINFO	Address of a storage area containing information about the file. The area can be mapped using the DSECT DFHUEFDS, which contains the following fields: **UEFLNAME** An 8-character field containing the 7-character file name. **UEDSNAME** The 44-character dsname (file-id) of the data set associated with the file. **UEFSERV** One byte indicating the SERVREQ settings for this file. The possible values are: **UEFRDIM** Read valid. **UEFUPDIM** Update valid. **UEFADDIM** Add valid. **UEFDELIM** Delete valid. **UEFBRZIM** Browse valid.

4 A VSAM sphere consists of a base cluster, and all the associated components that refer to it.

Table 29 (Page 2 of 4). Exit XFCSREQC

UEFDSJL		One byte indicating the automatic journaling options set for this file. The possible values are:
	UEFJRO	Journal read-only.
	UEFJRU	Journal read for update.
	UEFJWU	Journal write update.
	UEFJWA	Journal write add.
	UEFJDSN	Dsname has been journaled.
	UEFJSYN	Journal read synchronously.
	UEFJASY	Journal write asynchronously.
UEFDSVJL		One byte indicating a further automatic journaling option which applies to VSAM files only. The value is:
	UEFJWAC	Write add complete.
UEFDSJID		One byte containing the number of the journal to be used for automatic journaling, if any.
UEFDSACC		One byte indicating the access method of the file. The possible values are:
	UEFVSAM	VSAM file.
	UEFBDAM	DAM file.
UEFBCRV		One byte indicating the recovery attributes of the data set associated with this file. The possible values are:
	UEFBCFR	Forward recovery specified.
	UEFBCLOG	Logging specified.
	UEFBCVAL	Flag indicating that recovery attributes are valid.
UEFFRLOG		One byte containing the number of the journal to be used for forward recovery, if any.
UEFCDATE		A date (YYYYDDD+) in packed decimal format. This field is set only when the file is the last file to close against the VSAM sphere[4] with which it is associated. It contains the date when activity against the VSAM sphere was quiesced.

Table 29 (Page 3 of 4). Exit XFCSREQC

		UEFCTIME	A time (HHMMSST+) in packed decimal format. This field is set only when the file is the last file to close against the VSAM sphere[4] with which it is associated. It contains the time when activity against the VSAM sphere was quiesced.	
		UEFBCBS	A byte containing flags indicating the backout failure status of this data set. The possible values are:	
			UEFBCBF	Backout failed.
			UEFBCBE	Backout failure complete.
		UEFACBCP	Address of a readonly copy of the ACB (for a VSAM file) or the DTF (for a DAM file).	
	UEPFSRSP	Address of a byte containing the return codes for the request. This has one of the following values:		
		UEFSNORM	Normal response.	
		UEFSWARN	Warning response.	
		UEFSFAIL	Failure response.	
		UEFSPEND	Pending response. The 'Pending' response can be returned only after a CLOSE request. It indicates that, as a result of the CLOSE request, a closure is pending on the file, the file is being quiesced. When all activity against the file has completed, it is closed. Note that, if enabled, the XFCSREQ and XFCSREQC exits are driven again, when the actual closure takes place.	
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.		
	Notes: 1. The first seven fields of UEPFINFO (UEFLNAME through UEFDSACC) are set for all requests; that is, following an OPEN, CLOSE, ENABLE, or DISABLE request. 2. The next two fields (UEFBCRV and UEFFRLOG) are set only after a successful OPEN request. After all other requests, or if the OPEN fails, these fields are set to nulls. 3. Fields UEFCDATE through UEFBCBS are set only after a successful CLOSE request. After all other requests, if the file is already closed, if the closure fails, or if the closure is pending, these fields are set to nulls. 4. Field UEFACBCP is set only after a successful OPEN request. After all other requests, or if the OPEN fails, the field is set to nulls.			
Return codes	**UERCNORM**	Continue processing.		
	UERCPURG	Task purged during XPI call.		
XPI calls	All can be used.			

Table 29 (Page 4 of 4). Exit XFCSREQC	
API and SPI commands	All can be used.

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when a file control request is issued from the XFCSREQC exit. Use of the recursion counter UEPRECUR is recommended.

Notes:

1. Exit programs that issue EXEC CICS commands must first address the EIB. See "Using CICS services" on page 5.
2. Exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. See "Returning values to CICS" on page 10.

Front End Programming Interface exits XSZARQ and XSZBRQ

Exits XSZARQ and XSZBRQ are invoked from the CICS Transaction Server for VSE/ESA Front End Programming Interface (FEPI), if FEPI is installed. For details of these exits, see the *CICS Front End Programming Interface User’s Guide*.

“Good morning” message program exit XGMTEXT

Table 30. Exit XGMTEXT

When invoked	Before the “good morning” message is transmitted.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	All can be used.	

Intersystem communication program exits XISCONA and XISLCLQ

The two exits in the intersystem communication program allow you to control the queuing of function shipping requests.

Note: There are several methods that you can use to control the length of intersystem queues. For a description of the available methods, see the *CICS Intercommunication Guide*.

The XISCONA exit

Important

It is recommended that you use the XZIQUE exit, in the VTAM working-set module, to control the length of intersystem queues, rather than XISCONA. (XZIQUE is described on page 192.) XZIQUE provides more functions, and is of more general use than XISCONA (it is driven for transaction routing, DPL, and distributed transaction processing requests, as well as for function shipping, whereas XISCONA is driven only for function shipping). If you enable both exits, XZIQUE and XISCONA could both be driven for function shipping requests, which is not recommended.

The purpose of XISCONA is to help you prevent the performance problems that can occur when function shipping requests awaiting free sessions for a connection are queued in the issuing region. The exit permits you to control the number of outstanding ALLOCATE requests by allowing you to reject any function shipping request that would otherwise be queued.

Requests that are to be function shipped to a resource-owning region are queued by default if all bound contention winner[5] sessions are busy, so that no sessions are immediately available. If the resource-owning region is unresponsive (for example, if it is a file-owning region, it may be waiting for a system journal to be archived), the queue can become so long that the performance of the issuing region is severely impaired. Further, if the issuing region is an application-owning region, its impaired performance can spread back to the terminal-owning region.

To control the queuing of function shipping requests, use the XISCONA exit to tell CICS, whenever a session cannot be allocated immediately, whether to queue the request, or to return ‘SYSIDERR’ to the application. The exit works like this:

1. If the XISCONA exit program is **not** active, CICS queues the request when necessary.
2. If the exit program is active, it is invoked *only if all bound contention winner sessions are in use*. For other failures (for example, ‘Mode name not found’ or ‘Out of service’), CICS bypasses the exit and returns to the application.
3. If it is invoked, your exit program must decide whether or not to queue the request by analyzing the statistics provided through the user exit parameter list. Your exit program could:

5 “Contention winner” is the terminology used for LU6.2 connections. The XISCONA exit applies also to MRO and LU6.1 connections: in these, the SEND sessions (defined in the session definitions) are used first for ALLOCATE requests; when all SEND sessions are in use, queuing starts.

- Stipulate that queuing is never to be used. This is the simplest way to code the exit, and avoids complexities of tuning. It should be effective if you define enough contention winner sessions to handle the peak transaction load for the connection. If you suppress all queuing, you must specify AUTOCONNECT(YES) on the SESSIONS definition, because the queuing mechanism no longer binds sessions for you.

  With this approach, a danger arises if you base your estimate of required sessions on average conditions and the transaction load subsequently varies widely; when CICS cannot use queuing to cope with the variation, users may suffer transaction abends when there is no significant problem in the resource-owning region.
- Examine the number of requests currently in the queue. The program could, for example, stop queuing when the number exceeds 120% of the maximum number of sessions. You could use this approach to cope with intermittent stoppages in the resource-owning region.

  You could use a table of thresholds for the connections in your system, with values determined from previous experience of queuing problems. Alternatively, you could use the EXEC CICS interface in a separate program to inquire about the state of the connection, and pass the information in a work area to the XISCONA exit program.
- Examine the type of request and the resource being accessed (which can be discovered by examining the request parameter list). The program could, for example, reject file read requests but queue file updates.

Warning: Because a failure of the exit program could affect system availability, it is recommended that you make the logic of your program as simple as possible, thus reducing the possibility of errors.

There are some function shipping problems that XISCONA cannot solve. For example, if you have specified both a large number of sessions and a large value for MXT, CICS may develop the short-on-storage (SOS) condition *before* XISCONA is invoked because there are no further sessions available.

The sample XISCONA global user exit program, DFHXIS

Note that there is a CICS-supplied sample exit program, DFHXIS, that shows one way of limiting the queue of ALLOCATE requests, based on the information passed to the program. For more information about the sample global user exit programs, see “Sample global user exit programs” on page 14.

Table 31 (Page 1 of 2). Exit XISCONA

When invoked	After an attempt to function ship a request to a remote system has failed because all bound contention winner sessions are in use.	
Exit-specific parameters	**UEPISPCA**	Address of a parameter list containing the following fields. You can map the parameter list using the DSECT DFHXISDS. **UEPCONST** Address of the Connection statistics record. Connection statistics records are of type STICONSR (STID value 52). Your exit program can map the record using the DSECT DFHA14DS. See notes below. **UEPMODST** Address of the Mode Entry statistics record, or zero. A Mode Entry statistics record is built *only* if: • The connection-type is LU6.2 (see field UEPCONTY). • The profile DFHCICSF (which is always used for function shipping) defines a specific MODENAME to be used in the allocation of LU6.2 sessions. Mode Entry statistics records are of type STICONMR (STID value 76). Your exit program can map the record (if present) using the DSECT DFHA20DS. See notes below. **UEPEIPPL** Address of the request parameter list. **UEPCONTY** A 1-byte field indicating the connection-type. Possible values are: **UEPMRO (X'80')** Request for an MRO connection. **UEPLU6 (X'40')** Request for an LU6.1 connection. **UEPLUC (X'20')** Request for an LU6.2 connection.

Table 31 (Page 2 of 2). Exit XISCONA

		UEPNETNM An 8-character field containing the NETNAME for the connection– that is, the identifier (applid) of the remote CICS region or system.
	Notes: 1. The general format of statistics records is described in “CICS statistics record format” on page 573. 2. For a list of statistics record-types and their associated copy books, see Figure 68 on page 577. 3. For a description of the fields in Connection and Mode Entry statistics records, see the *CICS Performance Guide*.	
Return codes	**UERCAQUE**	Queue the request. This is the default.
	UERCAPUR	Do not queue the request, unless local queuing is possible.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Important

There is no ‘UERCNORM’ return code at this exit point, because the exit is invoked after a failure. The choice is whether or not to take the system default action of queuing the request.

The XISLCLQ exit

XISLCLQ enables you to specify what action to take after a function shipping request fails to allocate a session with a remote system for one of the following reasons:

- The remote system is not in service.
- A connection to the remote system cannot be established.
- No sessions are immediately available, and your XISCONA exit program has specified that the request is not to be queued in the issuing region.

Note that this exit is invoked *only* if the request to be shipped is of type EXEC CICS START NOCHECK. For EXEC CICS requests other than those with the NOCHECK option (which is only available on EXEC CICS START commands) the ‘SYSIDERR’ condition is raised in the application program.

You can use the exit to specify whether or not the failed request is to be locally queued, to be executed when the connection is reestablished.

Table 32. Exit XISLCLQ

When invoked	After a function shipping request of type EXEC CICS START NOCHECK has failed because the remote system is not in service, a connection to the remote system cannot be established, or no sessions are immediately available, and your XISCONA exit program has specified that the request is not to be queued in the issuing region.	
Exit-specific parameters	**UEPISPP**	Address of a parameter list that contains: **UEPTCTSE** Address of the relevant terminal control table system entry. The TCT system entry can be mapped using the DSECT DFHTCTTE. **UEPXXTE** Address of the local transaction name, or 0 if SYSID was specified in the command. **Note:** Your program can use the transaction manager XPI call INQUIRE_TRANDEF to obtain details of the local transaction (see page 323). **UEPPLIST** Address of the parameter list for the command.
	Note: No DSECT is provided for the above parameter list. You have to code your own DSECT to access the named fields.	
Return codes	**UERCSYS**	Take the system action. This is determined by the value of the LOCALQ attribute in the local TRANSACTION definition for the remote transaction: **LOCALQ(YES)** The request is queued locally. **LOCALQ(NO)** 'SYSIDERR' is returned to the application program.
	UERCQUE	Queue the request locally (overriding the LOCALQ(NO) attribute, if specified).
	UERCIGN	Override the LOCALQ(YES) attribute, if specified, and return with 'SYSIDERR'.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Important

There is no 'UERCNORM' return code at this exit point, because the exit is invoked after a failure. The choice is whether to take the system default action or to handle the error in some other way.

Interval control program exits XICREQ, XICEXP, and XICTENF

You can use some XPI calls in exit programs invoked from the interval control program. However, when any of these exits are invoked for expiry analysis, any actions that delay the execution of the interval control program can have adverse effects on other transactions that are waiting for intervals to expire. You can determine whether the exits have been invoked for expiry analysis by examining the type-of-request field, TCAICTR, a copy of which is pointed to by the UEPICRQ1 exit-specific parameter.

Note: The XICREQ exit is invoked by internal requests made by CICS code, as well as by requests made by applications. For example, if you use the CICS extended recovery facility (XRF), the XRF surveillance program uses interval control services. DFHXRSP issues an interval control WAIT every 2 seconds; this means that any interval control exit programs are also invoked every 2 seconds.

XICREQ

Table 33 (Page 1 of 2). Exit XICREQ

When invoked	At the beginning of the interval control program, before request analysis.	
Exit-specific parameters	**UEPICQID**	Address of an 8-byte field containing the request ID parameter on request. See notes below.
	UEPICTID	Address of a 4-byte field containing the terminal ID, if any, specified on an EXEC CICS START command. See notes below.
	UEPICTI	Address of 4 bytes containing the transaction ID specified on an EXEC CICS START command. See notes below.
	UEPICRQ1	Address of a 1-byte field containing a copy of TCAICTR, the first request code field for requests to the interval control program.
	UEPICRQ2	Address of a 1-byte field containing a copy of TCAICTR2, the second request code field for requests to the interval control program.
	UEPICRT	Address of a 4-byte field containing the expiry time or interval, in packed decimal format. The value is in the form 0HHMMSSF, where H=hours, M=minutes, S=seconds, and F is a positive sign.
	Notes: 1. The contents of the fields addressed by UEPICQID and UEPICTID are unpredictable if the associated data items were not specified on the request. You must test the copy of TCAICTR to determine whether they contain meaningful values. 2. Your exit program can change the values of the fields addressed by UEPICQID, UEPICTID UEPICTI, and UEPICRT. Changing the values of the fields addressed by UEPICRQ1 or UEPICRQ2 has no effect.	
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.

Table 33 (Page 2 of 2). Exit XICREQ

XPI calls	The following must not be used: ADD_SUSPEND DELETE_SUSPEND RESUME SUSPEND WAIT_EXTERNAL	
API and SPI commands	Must not be used.	

XICEXP

Table 34. Exit XICEXP

When invoked	After an interval control time interval has expired.	
Exit-specific parameters	**UEPICE**	Address of the interval control element (ICE) that has just expired. The ICE can be mapped using the DSECT DFHICEDS.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	The following must not be used: ADD_SUSPEND DELETE_SUSPEND RESUME SUSPEND WAIT_EXTERNAL	
API and SPI commands	Must not be used.	

XICTENF

Table 35. Exit XICTENF

When invoked	Exit XICTENF is also invoked from the interval control program. However, this exit relates to the ‘terminal not known’ condition and so is considered in detail in “‘Terminal not known’ condition exits XALTENF and XICTENF” on page 160.

Interval control EXEC interface program exits XICEREQ and XICEREQC

XICEREQ is invoked on entry to the interval control program before CICS processes an interval control request. Using XICEREQ, you can:

- Analyze the request to determine its type, the keywords specified, and their values.
- Modify any value specified by the request before the command is executed.
- Set return codes to specify that either:
  - CICS should continue with the request, modified or unmodified.
  - CICS should bypass the request. (Note that if you set this return code, you must also set up return codes for the EXEC interface block (EIB), as if you had processed the request yourself.)

XICEREQC is invoked after the interval control program request is completed. Using XICEREQC, you can:

- Analyze the request, to determine its type, the keywords specified, and their values.
- Set return codes for the EIB.

CICS passes seven parameters to these exits as follows:

- The address of the command-level parameter structure (UEPCLPS)
- The address of a token (UEPICTOK) used to pass 4 bytes of data from XICEREQ to XICEREQC
- The addresses of copies of three pieces of return code information from the EIB (UEPRCODE, UEPRESP, and UEPRESP2)
- The address of a token (UEPTSTOK) that is valid throughout the life of a task
- The address of an exit recursion count (UEPRECUR)

Note: The XICEREQ exit is invoked by internal requests made by CICS code, as well as by requests made by applications.

XICEREQ

Table 36. Exit XICEREQ

When invoked	Before CICS processes an interval control API request.	
Exit-specific parameters	**UEPCLPS**	Address of the command-level parameter structure. See “The UEPCLPS exit-specific parameter” on page 91.
	UEPICTOK	Address of a 4-byte token to be passed to XICEREQC. This allows you, for example, to pass a work area to exit XICEREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code ‘EIBRCODE’. For details of EIB return codes, refer to the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code ‘EIBRESP’.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code ‘EIBRESP2’.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See “Using the task token UEPTSTOK” on page 98.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	The interval control EXEC interface program should ignore this request.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, you are recommended to use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when an interval control request is issued from the XICEREQ exit. Use of the recursion counter UEPRECUR is recommended.

XICEREQC

Table 37. Exit XICEREQC

When invoked	After an interval control API request has completed, and before return from the interval control EXEC interface program.	
Exit-specific parameters	**UEPCLPS**	Address of the command-level parameter structure. See "The UEPCLPS exit-specific parameter" on page 91.
	UEPICTOK	Address of a 4-byte token passed from XICEREQ. This allows XICEREQ to, for example, pass a work area to XICEREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code 'EIBRCODE'. For details of EIB return codes, refer to the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code 'EIBRESP'.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code 'EIBRESP2'.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See "Using the task token UEPTSTOK" on page 98.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, you are recommended to use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands. For example, you must avoid entering a loop when issuing an interval control request from the XICEREQC exit. Use of the recursion counter UEPRECUR is recommended.

The command-level parameter structure

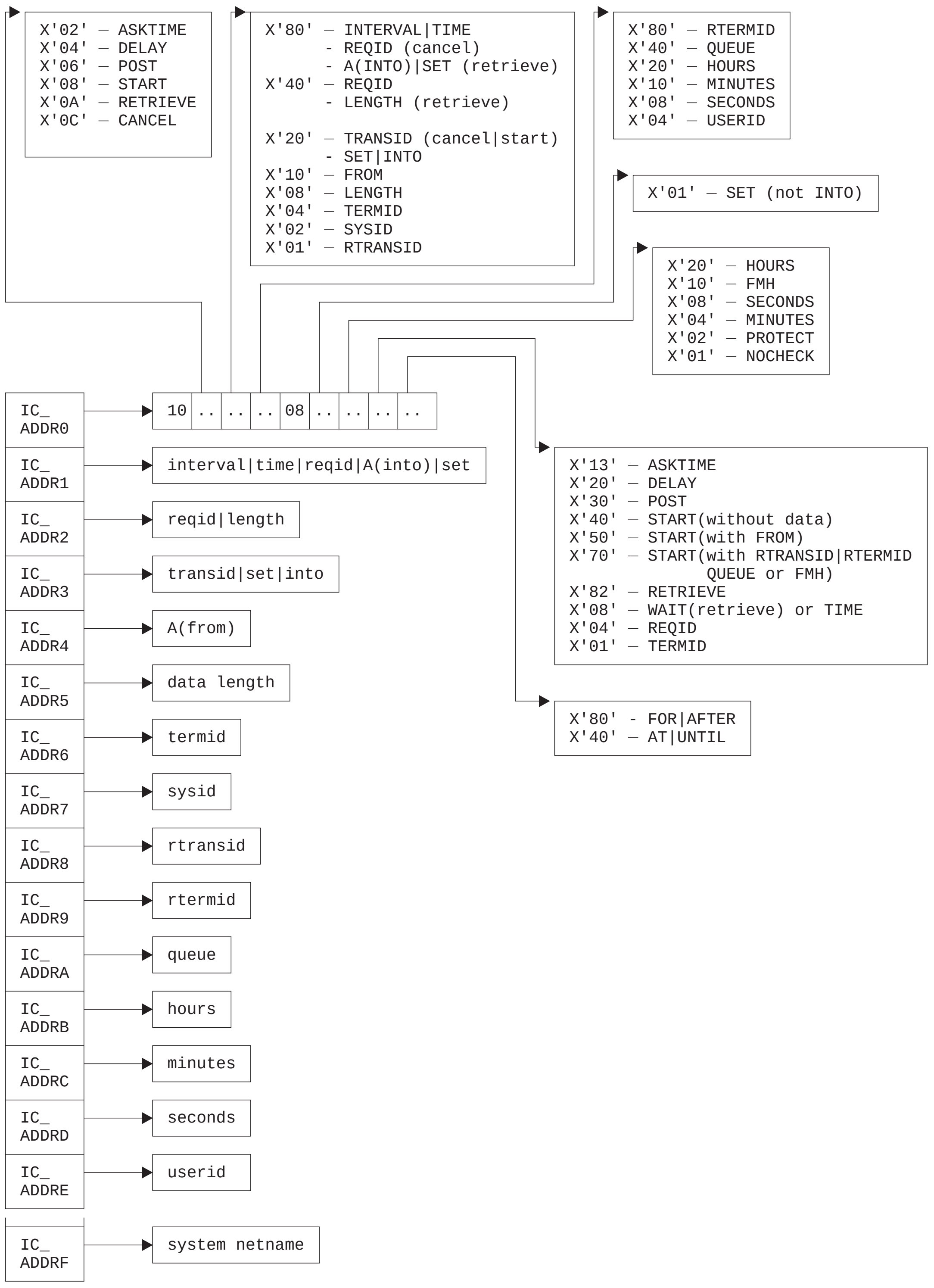


Figure 1. The command-level parameter structure for interval control

The command-level parameter structure consists of a series of addresses. The first address points to the EXEC interface descriptor (EID), which consists of a 9-byte area that describes the type of request and identifies each keyword specified with the request. The remaining addresses point to pieces of data associated with the request. For example, the second address points to the interval for START requests.

You can examine the EID to determine the type of request and the keywords specified. You can examine the other parameters in the list to determine the values of the keywords. You can also modify values of keywords specified on the request. For example, you could change the SYSID specified in the request.

End of parameter list indicator

The high-order bit is set on in the last address set in the parameter list to indicate that it is the last one in the list. On return from your user exit program, CICS scans the parameter list for the high-order bit to find the last parameter. Therefore, if you modify the length of the parameter list, you must also reset the high-order bit to indicate which is the new last address.

For example, if the parameter list specifies only the first four addresses (IC_ADDR0, the address of the EID, to IC_ADDR3, the address of the name of the transaction named in a START request), the high-order bit is set on in IC_ADDR3. If you extend the parameter list by setting the address of a SYSID in IC_ADDR7, you must unset the high-order bit in IC_ADDR3 and set it on in IC_ADDR7 instead.

The maximum size of parameter list is supplied to the exit, thus allowing your exit program to add any parameters not already specified without needing to first obtain more storage.

The original parameter list, as it was before XICEREQ was invoked, is restored after the completion of XICEREQC. It follows that the execution diagnostic facility (EDF) displays the original command before **and** after execution: **EDF does not display any changes made by the exit**.

The UEPCLPS exit-specific parameter: The UEPCLPS exit-specific parameter is included in both exit XICEREQ and exit XICEREQC. It is the address of the command-level parameter structure. The command-level parameter structure contains 16 addresses, IC_ADDR0 through IC_ADDRF. It is defined in the DSECT IC_ADDR_LIST, which you should copy into your exit program by including the statement COPY DFHICUED.

The command-level parameter list is made up as follows:

IC_ADDR0
is the address of a 9-byte area called the EXEC interface descriptor (EID), which is made up as follows:

IC_GROUP
IC_FUNCT
IC_BITS1
IC_BITS2
IC_EIDOPT5
IC_EIDOPT6
IC_EIDOPT7
IC_EIDOPT8
IC_EIDOPT9

IC_EIDOPT10
IC_EIDOPT11
IC_EIDOPT12
IC_EIDOPT13

IC_GROUP Always X'10', indicating that this is an interval control request.

IC_FUNCT One byte that defines the type of request:

X'02'	ASKTIME.
X'04'	DELAY.
X'06'	POST.
X'08'	START.
X'0A'	RETRIEVE.
X'0C'	CANCEL.

IC_BITS1 Existence bits that define which arguments were specified. To obtain the argument associated with a keyword, you need to use the appropriate address from the command-level parameter structure. Before using this address, you must check the associated existence bit. If the existence bit is set off, the argument was not specified in the request and the address should not be used.

X'80'	Set if the request contains INTERVAL or TIME arguments, or if a CANCEL request specifies REQID, or if a RETRIEVE request specifies SET or INTO. If set, **IC_ADDR1** is meaningful.
X'40'	Set if the request other than CANCEL specifies REQID or if a RETRIEVE request specifies LENGTH. If set, **IC_ADDR2** is meaningful.
X'20'	Set if the request specifies TRANSID or if a request other than RETRIEVE specifies SET or INTO. If set, **IC_ADDR3** is meaningful.
X'10'	Set if the request specifies FROM. If set, **IC_ADDR4** is meaningful.
X'08'	Set if a request other than RETRIEVE specifies LENGTH. If set, **IC_ADDR5** is meaningful.
X'04'	Set if the request specifies TERMID. If set, **IC_ADDR6** is meaningful.
X'02'	Set if the request specifies SYSID. If set, **IC_ADDR7** is meaningful.
X'01'	Set if the request specifies RTRANSID. If set, **IC_ADDR8** is meaningful.

IC_BITS2 Further argument existence bits.

X'80'	Set if the request specifies RTERMID. If set, **IC_ADDR9** is meaningful.
X'40'	Set if the request specifies QUEUE. If set, **IC_ADDRA** is meaningful.
X'20'	Set if the request specifies HOURS. If set, **IC_ADDRB** is meaningful.
X'10'	Set if the request specifies MINUTES. If set, **IC_ADDRC** is meaningful.

	X'08'	Set if the request specifies SECONDS. If set, **IC_ADDRD** is meaningful.
	X'04'	Set if the request specifies USERID. If set, **IC_ADDRE** is meaningful.
IC_BITS3	One byte not used by interval control.	
IC_EIDOPT5	Indicates whether certain keywords were specified on the request.	
	X'01'	On a RETRIEVE command, SET (and not INTO) was specified. On a START command, ATTACH was specified. You cannot modify this field in your user exit.
IC_EIDOPT6	Indicates whether certain keywords were specified on the request.	
	X'02'	HOURS specified.
	X'04'	FMH specified.
	X'06'	SECONDS specified.
	X'08'	MINUTES specified.
	X'0A'	PROTECT specified.
	X'0C'	NOCHECK specified.
IC_EIDOPT7	Indicates whether certain functions or keywords were specified on the request.	
	X'F0'	CANCEL specified.
	X'82'	RETRIEVE specified.
	X'40'	START specified.
	X'30'	POST specified.
	X'20'	DELAY, RTRANSID, RTERMID, or QUEUE specified, and/or FMH.
	X'13'	ASKTIME specified.
	X'10'	FROM, RTRANSID, or RTERMID specified, and/or QUEUE.
	X'08'	TIME or WAIT specified.
	X'04'	REQID specified.
	X'01'	TERMID specified.
IC_EIDOPT8	Indicates whether certain keywords were specified on the request.	
	X'80'	FOR or AFTER specified.
	X'40'	AT or UNTIL specified.

IC_ADDR1
is the address of one of the following:

- An 8-byte area containing the value of the INTERVAL keyword (or TIME keyword if **IC_EIDOPT7** indicates that TIME is specified).
- An 8-byte area containing the value of REQID (if the request is CANCEL).
- Data returned for INTO (if the request is RETRIEVE, and if **IC_EIDOPT5** indicates that this is not SET).
- A 4-byte address returned for SET (if the request is RETRIEVE and **IC_EIDOPT5** indicates that this is SET).

IC_ADDR2
is the address of one of the following:

- An 8-byte area containing the value of REQID (if the request is DELAY, POST or START).
- A halfword containing the value of LENGTH (if the request is RETRIEVE).

  Warning: For requests that specify INTO, do not change the value of LENGTH to a value greater than that specified by the application. To do so causes a storage overlay in the application.

IC_ADDR3
is the address of one of the following:

- An area containing the value of TRANSID (if the request is CANCEL or START).
- A 4-byte address returned for SET (if the request is START or POST and **IC_EIDOPT5** indicates that this is SET).

IC_ADDR4
is the address of an area containing the data from FROM.

IC_ADDR5
is the address of the halfword value of LENGTH.

Warning: For requests that specify INTO, do not change the value of LENGTH to a value greater than that specified by the application. To do so causes a storage overlay in the application.

IC_ADDR6
is the address of an area containing the value of TERMID.

IC_ADDR7
is the address of an area containing the value of SYSID.

IC_ADDR8
is the address of an area containing the value of RTRANSID.

IC_ADDR9
is the address of an area containing the value of RTERMID.

IC_ADDRA
is the address of an area containing the value of QUEUE.

IC_ADDRB
is the address of an area containing the value of HOURS.

IC_ADDRC
is the address of an area containing the value of MINUTES.

IC_ADDRD
is the address of an area containing the value of SECONDS.

IC_ADDRE
is the address of an area containing the value of USERID.

IC_ADDRF
is the address of an area containing the value of the system netname.

Modifying fields in the command-level parameter structure: Some fields that are passed to interval control are used as input to the request, some are used as output fields, and some are used for both input and output. The method your user exit program uses to modify a field depends on the usage of the field.

The following are always input fields:

INTERVAL
TIME
REQID
FROM
TERMID
SYSID
HOURS
MINUTES
SECONDS
USERID

The following are always output fields:

INTO
SET

The following are input fields on a START request and output fields on a RETRIEVE request:

RTRANSID
RTERMID
QUEUE

LENGTH is an input field on a START request, an output field on a RETRIEVE with SET specified, and an input/output field on a RETRIEVE with INTO specified.

Modifying input fields: The correct method of modifying an input field is to create a new copy of it, and to change the address in the command-level parameter list to point to your new data.

Warning: You must never modify an input field by altering the data that is pointed to by the command-level parameter list. To do so would corrupt storage belonging to the application program and would cause a failure when the program attempted to reuse the field.

Modifying output fields: The technique described in “Modifying input fields” is not suitable for modifying output fields. (The results would be returned to the new area instead of the application’s area, and would be invisible to the application.)

An output field is modified by altering the data that is pointed to by the command-level parameter list. In the case of an output field, you can modify the application's data in place, because the application is expecting the field to be modified anyway.

Modifying the EID: It is not possible to modify the EID to make major changes to requests, such as changing a DELAY request to a START request.

However, you can make minor changes to requests, such as turning on the existence bit for SYSID so that the request can be changed into one that is shipped to a remote system.

Some interval control commands use 2 bits in the EID to indicate a single keyword; the EXEC CICS START command, for example, uses 2 bits to indicate TERMID. The first bit, in IC_BITS1, indicates that ADDR6 in the command parameter list is valid (ADDR6 points to TERMID) and the second, in IC_EIDOPT7, is the keyword existence bit to show that the TERMID keyword was specified on the command.

Where this occurs you must ensure that both bit settings are changed (consistently) if you wish to modify these commands from within a user exit program, or the results will be unpredictable.

The list that follows shows the bits in the EID that **can** be modified. Any attempt to modify any other part of the EID is ignored.

IC_BITS1

X'80'	The existence bit for REQID (if the request is CANCEL).
X'40'	The existence bit for REQID (if the request is DELAY, POST, or START).
X'20'	The existence bit for TRANSID (if the request is CANCEL).
X'10'	The existence bit for FROM (if the request is START).
X'08'	The existence bit for LENGTH (if the request is START).
X'04'	The existence bit for TERMID (if the request is START).
X'02'	The existence bit for SYSID (if the request is START or CANCEL).
X'01'	The existence bit for RTRANSID (if the request is START or RETRIEVE).

IC_BITS2

X'80'	The existence bit for RTERMID (if the request is START or RETRIEVE).
X'40'	The existence bit for QUEUE (if the request is START or RETRIEVE).
X'20'	The existence bit for HOURS (if the request is DELAY, POST. or START).
X'10'	The existence bit for MINUTES (if the request is DELAY, POST. or START).
X'08'	The existence bit for SECONDS (if the request is DELAY, POST. or START).

IC_EIDOPT6

X'20'	Secondary existence bit for HOURS.

X'10'	Existence bit for FMH.
X'08'	Secondary existence bit for SECONDS.
X'04'	Secondary existence bit for MINUTES.
X'02'	Existence bit for PROTECT.
X'01'	Existence bit for NOCHECK.

IC_EIDOPT7
Bits in IC_EIDOPT7 should only be modified within the same functional group – that is, only those existence bits defined as valid for a START request should be set on a START request.

ASKTIME requests

X'13'	ASKTIME request. This value is fixed for all ASKTIME requests, and should not be modified.

DELAY requests

X'20'	DELAY request.
X'08'	TIME specified.
X'04'	REQID specified.

POST requests

X'30'	POST request.
X'08'	TIME specified.
X'04'	REQID specified.

START requests

X'40'	START request (without DATA).
X'50'	START with DATA request.
X'70'	START with one or more of RTRANSID, RTERMID, QUEUE, or FMH specified.
X'08'	TIME specified.
X'04'	REQID specified.
X'01'	TERMID specified.

RETRIEVE requests

X'82'	RETRIEVE request.

CANCEL requests

X'F0'	CANCEL request.
X'04'	REQID specified.

The EID is reset to its original value before return to the application program. That is, changes made to the EID are retained for the duration of the interval control request only.

Warning: Your user exit program is prevented from making major changes to the EID. However, you must take great care when making the minor modifications that **are** permitted.

Using the interval control request token UEPICTOK: UEPICTOK provides the address of a 4-byte area that you can use to pass information between the XICEREQ and XICEREQC user exits for the same interval control request. For example, the address of a piece of storage obtained by the XICEREQ user exit, which is to be freed by the XICEREQC exit, can be passed in the UEPICTOK field.

Using the task token UEPTSTOK: UEPTSTOK provides the address of a 4-byte area that you can use to pass information between successive interval control requests in the same task. (By contrast, UEPICTOK is usable only for the duration of a single interval control request, because its contents may be destroyed at the end of the request.) For example, if you need to pass information between successive invocations of the XICEREQ exit, UEPTSTOK provides a means of doing this.

The EIB: Copies of EIBRCODE, EIBRESP, and EIBRESP2 are passed to the exit, so that you can:

- Modify or set completion information in XICEREQ and XICEREQC
- Examine completion information in XICEREQC.

You can update the copies of EIBRCODE, EIBRESP, and EIBRESP2 that you are given in the parameter list. Interval control copies your values into the real EIB after the completion of XICEREQC; or if you specify a return code of ‘bypass’ in XICEREQ.

You must set valid interval control responses. You must set all three of EIBRCODE, EIBRESP, and EIBRESP2 to a consistent set of values, such as would be set by CICS interval control to describe a valid completion. **CICS does not police the consistency of EIBRCODE, EIBRESP, and EIBRESP2**. However, if EIBRCODE is set to a non–zero value and EIBRESP is set to zero, CICS overrides EIBRESP with a non–zero value. To aid you in setting the values of EIBRCODE, EIBRESP, and EIBRESP2, the values used by interval control are specified in DFHICUED.

Example of how XICEREQ and XICEREQC can be used: XICEREQ and XICEREQC can be used for a variety of purposes. One example of a possible use is given below.

In this example, XICEREQ and XICEREQC are used to route START requests to a number of different CICS regions to provide a simple load balancing mechanism. The example shows only the capabilities of the exits; it is not intended to indicate an ideal way of achieving the function.

In XICEREQ:

1. Scan the global work area (GWA) to locate a suitable CICS region (for example, the region currently processing the least number of START requests).
2. Having decided which system to route the request to, increment the use count for this system.
3. Obtain a 4-byte area in which to store the SYSID for this request. This can be allocated from the GWA to avoid issuing a GETMAIN. If the area is obtained by issuing a GETMAIN, set UEPICTOK to the address of the storage obtained.
4. Set IC_ADDR7 to be the address of the 4–byte area so that XICEREQC can also use this area.

5. If setting IC_ADDR7 now makes it the last address, set the high-order bit in the address, and reset the high-order bit in what was previously the last address.
6. Set the X'02' existence bit on in IC_BITS1 to indicate that a SYSID is specified.
7. Return to CICS.

In XICEREQC:

1. Scan the global work area (GWA) and locate the entry for the CICS region specified in the SYSID parameter.
2. Decrement the use count for this system.
3. If a GETMAIN was issued in XICEREQ to obtain an area to hold the SYSID, issue a FREEMAIN for the address held in UEPICTOK.
4. Return to CICS.

Example program

CICS supplies—in hardcopy only—an example program, DFH$XTSE, that shows how to modify fields in the command-level parameter structure passed to EXEC interface exits. DFH$XTSE is listed on page 673.

Journal control program exits XJCWR and XJCWB

There are two global user exits in the journal control program. CICS invokes XJCWR after building a journal record in the buffer, but before writing it to its target journal. XJCWB is invoked before each physical WRITE to each non-DMF-controlled journal. It could be used, for example, to pass copies of CICS log records to another system to aid in recovery of the prime-site system after a disaster.

XJCWR

Table 38. Exit XJCWR

When invoked	After a journal record is built in the buffer and before it is written to its target journal.	
Exit-specific parameters	**UEPJCTE**	Address of the JCT entry of the journal being written to. The JCT entry can be mapped using the DSECT DFHJCTTE.
	UEPJREC	Address of the journal record. The journal control record can be mapped using the information supplied in Chapter 17, “CICS journaling” on page 513.
Return codes	**UERCNORM**	Continue processing.
XPI calls	Must not be used.	
API and SPI commands	Must not be used.	

XJCWB

Table 39. Exit XJCWB

When invoked	Before each physical WRITE to each non-DMF-controlled journal.	
Exit-specific parameters	**UEPJCJID**	Address of a halfword containing the number (ID) of the journal being written to. The value of the journal ID is restricted to the range 1 through 99.
	UEPJCSFX	Address of an area containing the single character suffix of the journal being written to. The suffix is either ‘A’ or ‘B’.
	UEPJCDCB	Address of the SAM DTF of the journal data set.
	UEPJCBUF	Address of the journal data block. This is the 31-bit address of the current block of journal records.
	UEPJCBFL	Address of a fullword containing the length of the journal data block.
Return codes	**UERCNORM**	Continue processing.
XPI calls	Must not be used.	
API and SPI commands	Must not be used.	

Loader domain exits XLDLOAD and XLDELETE

There are two global user exits in the loader domain. XLDLOAD is invoked when a new instance of a program is loaded into storage, before the program is made available for use.

XLDELETE is invoked after an instance of a program is released by CICS and before the program is freed from storage.

For LPA-resident programs, the exits are still invoked when a program is acquired or released, even though the program is not physically loaded or freed.

These are both information-only exits. Any changes made to the exit parameters by the exit program are ignored by CICS, as is any return code which it sets.

Table 40. Exit XLDLOAD

When invoked	After an instance of a program is brought into storage, and before the program is made available for use.	
Exit-specific parameters	**UEPPROGN**	Address of an 8-character field containing the name of the program that is being loaded.
	UEPPROGL	Address of a 4-byte field containing the length, in bytes, of the program that is being loaded.
	UEPLDPT	Address of a 4-byte field containing the address at which the program has been loaded.
	UEPENTRY	Address of a 4-byte field containing the address of the program's entry point.
	UEPTRANID	Zero, or the address of a 4-byte field containing the transaction ID which applied when the exit was invoked.
	UEPUSER	Zero, or the address of an 8-byte field containing the userid in control at the time the exit was invoked.
	UEPTERM	Zero, or the address of a 4-byte field containing the terminal name associated with the transaction under which the exit was invoked.
	UEPPROG	Zero, or the address of an 8-character field containing the name of the program that was in control at the time the exit was invoked.
Return codes	**UERCNORM**	Continue processing.
XPI calls	Must not be used.	
API and SPI calls	Must not be used.	

Table 41. Exit XLDELETE

When invoked	After an instance of a program is released by CICS, and before the program is freed from storage.	
Exit-specific parameters	**UEPPROGN**	Address of an 8-character field containing the name of the program that is being freed.
	UEPPROGL	Address of a 4-byte field containing the length, in bytes, of the program that is being freed.
	UEPLDPT	Address of a 4-byte field containing the address at which the program resides in storage.
	UEPENTRY	Address of a 4-byte field containing the address of the program's entry point.
	UEPTRANID	Zero, or the address of a 4-byte field containing the transaction ID which applied when the exit was invoked.
	UEPUSER	Zero, or the address of an 8-byte field containing the userid in control at the time the exit was invoked.
	UEPTERM	Zero, or the address of a 4-byte field containing the terminal name associated with the transaction under which the exit was invoked.
	UEPPROG	Zero, or the address of an 8-character field containing the name of the program that was in control at the time the exit was invoked.
Return codes	**UERCNORM**	Continue processing.
XPI calls	Must not be used.	
API and SPI calls	Must not be used.	

Message domain exit XMEOUT

The XMEOUT exit allows you to suppress or reroute CICS messages that use the message domain.

Note that your exit program is subject to certain restrictions:

- It can only suppress or reroute messages that use the message domain. You can deduce which messages this applies to from the *VSE/ESA Messages and Codes Volume 3* manual: the description of each message that causes XMEOUT to be driven contains a list of "XMEOUT parameters"; if no XMEOUT parameters are listed for a message, the latter does not cause the exit to be driven. For example, message 'DFHAC2008' causes XMEOUT to be invoked, but message 'DFHDU0205' does not.
- It cannot change the text of a message, nor the message inserts. (If it tries to do so, CICS ignores the changes.)
- It cannot suppress or reroute messages issued during the first phase of CICS initialization (because the exit cannot be enabled before the second phase).
- It cannot reroute a message to transient data queues during CICS shutdown unless the original message destination included one or more transient data queues. If it attempts to do so, the message in question is routed to its original destination, and message DFHME0120I is issued to the console. Message DFHME0120I cannot be re-routed by the user exit program but it may be suppressed.

  This restriction is necessary because the message domain is required to handle messages during CICS shutdown even after the transient data queue function has ended.

  To discover whether CICS shutdown has started, your exit program can check for the first instance of message DFHME0120. It can stop rerouting messages to TD queues after DFHME0120 has been issued.
- It cannot suppress or reroute messages sent to terminal operators, but only those sent to the system console or to transient data queues. (XMEOUT is not invoked for the former type of message.)

Note: If a message is being rerouted to a transient data queue and the transient data request fails, the message is lost. The MEME exception trace point ID X'0328' is written. The interpretation string of this trace entry provides an explanation of why the transient data request failed.

Important

Because of the danger of recursion, your XMEOUT exit program should **not** try to reroute:

- Any DFHTDxxxx messages, produced by the transient data program.
- User domain messages in the range DFHUS0002–DFHUS0006, plus message DFHUS0150.
- Transaction manager messages DFHXM0212, DFHXM0213, DFHXM0304 and DFHXM0308.
- Application messages DFHAP0001, DFHAP0002, DFHAP0004, DFHAP0601, DFHAP0602, and DFHAP0603.
- *Any* user domain (DFHUSxxxx) messages to an intrapartition queue defined with a TRIGLEV value of anything other than zero, if the messages are produced while the user domain is performing error recovery processing.

The message definition template contains an indicator called "noreroute". This indicator is set on if the message being issued cannot be rerouted to a transient data queue by the XMEOUT exit program. The address of the indicator is passed to XMEOUT in the UEPNRTE exit-specific parameter. Your exit program can check the value of the indicator before deciding whether or not to reroute a particular message.

Note: If the exit program tries to reroute an ineligible message, the message domain inhibits the rerouting and issues the message to the console instead, along with message DFHME0137.

Each of the messages affected by this restriction is identified by a note in the *VSE/ESA Messages and Codes Volume 3* manual.

Your exit program can suppress or reroute messages by altering the values held in the addresses pointed to by the UEPMROU, UEPMNRC, UEPMTDQ, and UEPMNTD fields of the parameter list. These four sets of values (route codes, number of route codes, transient data queue names, and number of TDQs) are the only ones that your program can change.

Table 42 (Page 1 of 2). Exit XMEOUT

When invoked	Before the message domain sends a CICS message to its destination.	
Exit-specific parameters	**UEPTRANID**	Address of the 4-byte transaction ID.
	UEPUSER	Address of the 8-byte user ID.
	UEPTERM	Address of the 4-byte ID of the terminal under which the current transaction is running. If the current transaction is not associated with a terminal, the addressed field contains hexadecimal zeroes.
	UEPPROG	Address of the 8-byte application program name.
	UEPMNUM	Address of a 4-byte field containing the message number.
	UEPMDOM	Address of a 2-byte field containing the domain identifier of the CICS message.
	UEPMROU	Address of an array of up to 28 route codes. Route codes must be numbers in the range 1 through 28.
	UEPMNRC	Address of a halfword containing the number of route codes in the route code array.
	UEPMTDQ	Address of an array of up to 25 transient data queue names to which the message is to be sent. TD queue names must consist of 4 alphanumeric characters.
	UEPMNTD	Address of a halfword containing the number of TD queues in the queues array.
	UEPINSN	Address of a 2-byte field containing the number of message inserts.

Table 42 (Page 2 of 2). Exit XMEOUT

	UEPINSA Address of an array, each element of which contains information about a single message insert. The size of the array depends on the number of inserts. Each array element has the following structure:
	`INSERT_FORMAT_P  DS  A  Address of the 1-byte insert type-code, which has one of the following hexadecimal values:`
	`0    Not present`
	`1    Character`
	`2    Hexadecimal`
	`3    Decimal`
	`4    The insert is a number representing one item in a list of options. (See the example below.)`
	`INSERT_P         DS  A  Address of the message insert`
	`INSERT_LENGTH_P  DS  A  Address of a fullword containing the length of the insert`
	`INSERT_TYPE_P    DS  A  Reserved.`
	You can find the order of the inserts in the array from the entry for the particular message in the *VSE/ESA Messages and Codes Volume 3* manual. For example,
	DFHJC4512 *date time applid* CICS {System Log | Journal} *nn* no longer available - output volume-switch failure
	The XMEOUT inserts are *date, time, applid*, a number, and *nn*. The fourth insert (number) has a value of 1 or 2, representing ‘System Log’ or ‘Journal’ respectively.
	UEPNRTE Address of 1-character flag indicating whether or not the message can be rerouted by XMEOUT. The possible values are:
	X'0' The message can be routed.
	X'1' The message cannot be routed.

Return codes	**UERCNORM** Continue processing. **UERCBYP** Suppress the message for all destinations.
XPI calls	WAIT_EXTERNAL can be used. **Do not use any other calls**.
API and SPI commands	Must not be used.

The sample XMEOUT global user exit programs

CICS supplies the following sample programs, which show you how to use the XMEOUT exit to suppress or reroute messages:

DFH$SXP1	Suppress a message by message number.
DFH$SXP2	Suppress a message by destination route code.
DFH$SXP3	Suppress a message destined for the CSCS transient data queue (which receives signon and sign-off messages).
DFH$SXP4	Reroute a console message to a TDQ.
DFH$SXP5	Reroute a TDQ message to another TDQ.
DFH$SXP6	Reroute a TDQ message to a console.

Monitoring domain exit XMNOUT

XMNOUT is invoked before an exception class monitoring record is passed to DMF, and before a performance class monitoring record is written to the performance record buffer. You can use this exit to examine the record, to suppress its output to DMF, or to change the data it contains. You must ensure that any changes you make do not conflict with the dictionary description of the data.

You can also add data to performance class data records. To do this you need to define dummy user event-monitoring points (EMPs) in the monitoring control table (MCT) to reserve data fields of the required size and type.

Table 43 (Page 1 of 2). Exit XMNOUT

When invoked	Before an exception class monitoring record is written to DMF, and before a performance class monitoring record is buffered for a later write to DMF.	
Exit-specific parameters	**UEPTRANID**	Address of the 4-byte transaction ID. This field is not available at task termination.
	UEPUSER	Address of the 8-byte user ID. This field is not available at task termination.
	UEPTERM	Address of the 4-byte terminal ID. This field is not available at task termination.
	UEPPROG	Address of the 8-byte application program name. This field is not available at task termination.
	UEPDICT	Address of the dictionary. The sequence of dictionary entries is mapped by the DSECT generated from the macro DFHMCTDR. This field only has meaning for performance class records. If the monitoring record type is exception class (refer to parameter UEPMRTYP), this field is set to 0.
	UEPDICTE	Address of the fullword number of dictionary entries. This field only has meaning for performance class records. If the monitoring record type is exception class (refer to parameter UEPMRTYP), this field is set to 0.
	UEPFCL	Address of the field connector list, containing a series of halfword connector values. This field only has meaning for performance class records. If the monitoring record type is exception class (refer to parameter UEPMRTYP), this field is set to 0.
	UEPFCLNO	Address of the fullword number of field connectors. This field only has meaning for performance class records. If the monitoring record type is exception class (refer to parameter UEPMRTYP), this field is set to 0.

Table 43 (Page 2 of 2). Exit XMNOUT

	UEPMRTYP	Address of the halfword monitoring record type. If the value is 4, the type is exception class. If the value is 3, the type is performance class.
	UEPMRLEN	Address of the fullword monitoring record length.
	UEPMREC	Address of monitoring record, whose length is addressed by the parameter UEPMRLEN.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Suppress monitor record output.
	UERCPURG	Task purged during XPI call.
XPI calls	WAIT_EXTERNAL can be used. **Do not use any other calls**.	
API and SPI commands	Must not be used.	

Program control program exits XPCREQ, XPCREQC, XPCFTCH, XPCHAIR, XPCTA, and XPCABND

There are six user exit points in the program control program.

XPCREQ and XPCREQC

XPCREQ is invoked by the EXEC interface program before a link request is processed. If the request is a distributed program link, the XPCREQ exit is driven on both sides of the link; that is, in both the client and the server regions. The exit program is passed the address of the application's parameter list (in UEPCLPS), and can modify this as required. For example, you can use this exit to modify the SYSID at the time of a distributed program link request. One way you can achieve this is to write an application program to manage a list of SYSIDs in a global work area (GWA). The global user exit program can obtain access to the GWA, and use the information stored there to redirect DPL requests.

XPCREQC is invoked after the link request is completed. You can use this exit to pass back a response to the application via the EIBRESP or EIBRESP2 fields. Such responses could be used to keep status information about a link request up-to-date. For example, if a link request fails because a connection is unavailable, XPCREQC could set EIBRESP=500 (a response code not used by CICS) to indicate the failure, enabling the application, in conjunction with the other exit, XPCREQ, to determine a suitable course of action.

Table 44. Exit XPCREQ

When invoked	By the EXEC interface program before a link request is processed.	
Exit-specific parameters	**UEPCLPS**	Address of the command parameter list.
	UEPPCTOK	Address of a 4-byte token to be passed to XPCREQC. This allows you, for example, to pass a work area to exit XPCREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of EIBRCODE.
	UEPRESP	Address of a 4-byte copy of EIBRESP.
	UEPRESP2	Address of a 4-byte copy of EIBRESP2.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See "Using the task token UEPTSTOK" on page 114.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCBYP**	Program control is to ignore the request.
	UERCNORM	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, we recommend that you use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Table 45. Exit XPCREQC

When invoked	On completion of a program control link request.	
Exit-specific parameters	**UEPCLPS**	Address of the command parameter list.
	UEPPCTOK	Address of a 4-byte token passed from XPCREQ. This allows XPCREQ to, for example, pass a work area to XPCREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of EIBRCODE.
	UEPRESP	Address of a 4-byte copy of EIBRESP.
	UEPRESP2	Address of a 4-byte copy of EIBRESP2.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See “Using the task token UEPTSTOK” on page 114.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, we recommend that you use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when a program control request is issued from the XPCREQ or XPCREQC exits.

Use of the recursion counter UEPRECUR is recommended.

The command parameter structure

The command parameter structure consists of a series of addresses. The first address points to the EXEC interface descriptor (EID), which consists of a bit string that describes the type of request and identifies each keyword specified with the request. The remaining addresses point to pieces of data associated with the request; for instance, the second address always points to the program name. You can examine the parameters in the list to determine the values of the keywords. You can also modify values of parameters specified on the request. For example, you could change the name of the program involved in the request, or add the SYSID to route the link request to a remote system.

End of parameter list indicator

The high-order bit is set on in the last address set in the parameter list to indicate that it is the last one in the list. On return from your user exit program, CICS scans the parameter list for the high-order bit to find the last parameter. Therefore, if you modify the length of the parameter list, you must also reset the high-order bit to indicate which is the new last address.

For example, if the parameter list specifies only the first two addresses (PC_ADDR0, the address of the EID, and PC_ADDR1, the address of the name of the program named in the link request), the high-order bit is set on in PC_ADDR1. If you extend the parameter list by setting the address of a SYSID in PC_ADDR7, you must unset the high-order bit in PC_ADDR1 and set it on in PC_ADDR7 instead.

The original parameter list, as it was before XPCREQ was invoked, is restored after the completion of XPCREQC. It follows that EDF will display the original command before **and** after execution: **EDF will not display any changes made by the exit**.

The UEPCLPS exit-specific parameter: The UEPCLPS exit-specific parameter is included in both exit XPCREQ and exit XPCREQC. It is the address of the command-level parameter structure. The command-level parameter structure contains 9 addresses, PC_ADDR0 through PC_ADDR8. It is defined in the DSECT PC_ADDR_LIST, which you should copy into your exit program by including the statement COPY DFHPCEDS.

The command-level parameter list is made up as follows:

PC_ADDR0
is the address of a 7-byte area called the EXEC interface descriptor (EID), which is made up as follows:

PC_GROUP
PC_FUNCT
PC_BITS1
PC_BITS2
PC_EIDOPT5
PC_EIDOPT6

PC_GROUP	Always X'0E', indicating that this is a program control request.
PC_FUNCT	One byte which defines the type of request, which for XPCREQ and XPCREQC is always X'02', indicating a LINK request.
PC_BITS1	Existence bits that define which keywords that contain values were specified. To obtain the value associated with a keyword, you need to use the appropriate address from the command-level parameter list. Before using this address you must check the associated existence bit to ensure that the address is valid. If the existence bit is set off, the keyword was not specified in the request and the address should not be used. The symbolic and hexadecimal values of the existence bits are as follows:

PC_EXIST1 (X'80 ')
Set if the request contains the keyword PROGRAM. If set, **PC_ADDR1** is meaningful. (This bit should always be set for a LINK request.)

PC_EXIST2 (X'40 ')
Set if the request specifies the COMMAREA parameter. If set, **PC_ADDR2** is meaningful.

PC_EXIST3 (X'20 ')
Set if the request specifies the LENGTH parameter. If set, **PC_ADDR3** is meaningful.

PC_EXIST4 (X'10 ')
Set if the request specifies the INPUTMSG parameter. If set, **PC_ADDR4** is meaningful.

PC_EXIST5 (X'08 ')
Set if the request specifies the INPUTMSGLEN parameter. If set, **PC_ADDR5** is meaningful.

PC_EXIST6 (X'04 ')
Set if the request specifies the DATALENGTH parameter. If set, **PC_ADDR6** is meaningful.

PC_EXIST7 (X'02 ')
Set if the request specifies the SYSID parameter. If set, **PC_ADDR7** is meaningful.

PC_EXIST8 (X'01 ')
Set if the request specifies the TRANSID parameter. If set, **PC_ADDR8** is meaningful.

PC_BITS2 Two bytes not used by program control.

PC_EIDOPT5 Not used by program control.

PC_EIDOPT6 Indicates whether the request specifies the SYNCONRETURN option. If it does, X'80' is set.

PC_ADDR1
is the address of an 8-byte area containing the program name from the PROGRAM parameter.

PC_ADDR2
is the address of the COMMAREA data.

PC_ADDR3
is the address of a 2-byte area containing the length of the COMMAREA, as a half-word binary value.

PC_ADDR4
is the address of the INPUTMSG data.

PC_ADDR5
is the address of a 2-byte area containing the length of the INPUTMSG, as a half-word binary value.

PC_ADDR6
is the address of a 2-byte area containing the length specified on the DATALENGTH parameter, defining how much data is to be sent from the COMMAREA. The length is held as a half-word binary value.

PC_ADDR7
is the address of the 4-byte name of the remote system the LINK request is to be shipped to, as specified on the SYSID parameter.

PC_ADDR8
is the address of the 4-byte name of the mirror transaction to be attached in the remote system, as specified on the TRANSID parameter.

Modifying fields in the command parameter structure

Some fields that are passed to program control are used as input to the request, some are used as output fields, and some are used for both input and output. The method your user exit program uses to modify a field depends on the usage of the field.

Modifying input fields: The correct method of modifying an input field is to create a new copy of it, and to change the address in the command parameter list to point to your new data.

Warning: You must never modify an input field by altering the data that is pointed to by the command parameter list. To do so would corrupt storage belonging to the application program and could cause a failure when the program attempted to reuse the field.

Modifying output fields: The technique described in “Modifying input fields” is not suitable for modifying output fields. (The results would be returned to the new area instead of the application’s area, and would be invisible to the application.)

An output field is modified by altering the data that is pointed to by the command-level parameter list. In the case of an output field you can modify the application’s data in place, because the application is expecting the field to be modified anyway.

Modifying the EID

It is not possible to modify the EID to make major changes to requests. It is not possible, for example, to change a LINK request to a different type of Program Control request.

However, you can make minor changes to requests, such as to turn on the existence bit for SYSID so that the request can be changed into one that is shipped to a remote system.

The list that follows shows the bits in the EID that can be modified. Any attempt to modify any other part of the EID is ignored.

PC_BITS1

X'40'	The existence bit for the COMMAREA.
X'20'	The existence bit for LENGTH.
X'10'	The existence bit for INPUTMSG.
X'08'	The existence bit for INPUTMSGLEN.
X'04'	The existence bit for DATALENGTH.
X'02'	The existence bit for SYSID.
X'01'	The existence bit for TRANSID.

PC_EIDOPT5
Not used for a PC link request.

Bits in the EID should be modified in place. You should not modify the pointer to the EID. (Any attempt to do so is ignored by CICS.)

The EID is reset to its original value before return to the application program. That is, changes made to the EID are retained for the duration of the program control request only.

Your user exit program is prevented from making major changes to the EID.

Using the program control request token, UEPPCTOK

UEPPCTOK provides the address of a 4-byte area that you can use to pass information between the XPCREQ and XPCREQC user exits for the same program control request. For example, the address of a piece of storage obtained by the XPCREQ user exit, which has to be freed by the XPCREQC user exit, can be passed in the UEPPCTOK field.

Using the task token UEPTSTOK

UEPTSTOK provides the address of a 4-byte area that you can use to pass information between successive program control requests in the same task. (By contrast, UEPPCTOK is usable only for the duration of a single program control request, because its contents may be destroyed at the end of the request.) For example, if you need to pass information between successive invocations of the XPCREQ exit, UEPTSTOK provides a means of doing this.

The EIB

Copies of EIBRCODE, EIBRESP, and EIBRESP2 are passed to the exit, so that you can:

- Modify or set completion information in XPCREQ and XPCREQC.
- Examine completion information in XPCREQC.

You can update the copies of EIBRCODE, EIBRESP and EIBRESP2 that you are given in the parameter list. Program Control copies your values into the real EIB after the completion of XPCREQC; or if you specify a return code of ‘bypass’ in XPCREQ.

You must set valid program control responses. You must set all three of EIBRCODE, EIBRESP, and EIBRESP2 to a consistent set of values, such as would be set by Program Control to describe a valid completion. **Program Control does not police the consistency of EIBRCODE, EIBRESP, and EIBRESP2**. To aid you in setting the values of EIBRCODE, EIBRESP, and EIBRESP2, the values used by Program Control are specified in DFHPCEDS.

Example of how XPCREQ and XPCREQC can be used

XPCREQ and XPCREQC can be used for a variety of purposes. One example of a possible use is given below.

In this example, XPCREQ and XPCREQC are used to route LINK requests to a number of different CICS regions to provide a simple load balancing mechanism. The example shows only the capabilities of the exits; it is not intended to indicate an ideal way of achieving the load balancing function. For the purpose of this example, it is assumed that a global work area (GWA) already exists, and that it contains a list of available SYSIDs together with a count of the number of LINK requests currently being processed by each SYSID.

In XPCREQ:

1. Scan the global work area (GWA) to locate a suitable CICS region—for example, the region currently processing the least number of LINK requests.
2. Having decided which system to route the request to, increment the use count for this system.
3. Obtain a 4-byte area in which to store the SYSID for this request (this can be allocated from the GWA to avoid issuing a GETMAIN). If the area is obtained by issuing a GETMAIN, set UEPPCTOK to the address of the storage obtained.
4. Set PC_ADDR7 to the address of the 4-byte area.
5. If setting PC_ADDR7 now makes it the last address, set the high-order bit in the address, and unset the high-order bit in what was previously the last address.
6. Set the `X'02'` existence bit on in PC_BITS1 to indicate that a SYSID is specified.
7. Return to CICS.

In XPCREQC:

1. Scan the global work area (GWA) and locate the entry for the CICS region specified in the SYSID parameter.
2. Decrement the use count for this system.
3. If a GETMAIN was issued in XPCREQ to obtain an area to hold the SYSID, issue a FREEMAIN for the address held in UEPPCTOK.
4. Return to CICS.

XPCFTCH

XPCFTCH is invoked before a PPT-defined program (including internal CICS modules) receives control, which could be because it is the first program in a transaction, or as a result of a LINK, XCTL, or HANDLE ABEND PROGRAM request. You can use this exit to modify the entry address used when linking to the program. If the exit sets a return code of zero, or a modified address of zero, the entry address of the original application program is used.

The exit is intended to allow you to pass control to an application program or routine *before the original program is invoked*. This first program, after it has finished its processing, should pass control back to the entry point of the original program. You should not use the exit to cause a program to be invoked *instead of* the original program. If you do so, the results are unpredictable.

If a modified entry address is supplied, the program that is invoked receives control in the execution key that the original application program would have received control in—that is, as specified on the EXECKEY option of the original program's resource definition.

Table 46 (Page 1 of 2). Exit XPCFTCH

When invoked	Before an application program receives control.	
Exit-specific parameters	**UEPPCDS**	Address of a storage area that contains program- and terminal-related information, and that can be mapped using the DSECT DFHPCUE. When XPCFTCH is invoked, the following DFHPCUE fields are significant: **PCUE_CONTROL_BITS** 1-byte flag field. A setting of PCUECBTE (X'80') indicates that the transaction is linked to a terminal. A setting of PCUENOTX (X'40') indicates that the program is not command level. **PCUE_TASK_NUMBER** 3-character packed decimal field containing the task number. **PCUE_TRANSACTION_ID** 4-character field containing the transaction ID. **PCUE_TERMINAL_ID** 4-character field containing the terminal ID (if any).

Table 46 (Page 2 of 2). Exit XPCFTCH

		PCUE_PROGRAM_NAME 8-character field containing the name of the program that is to receive control. **PCUE_PROGRAM_LANGUAGE** 3-character field containing the language of the program that is to receive control. **PCUE_LOAD_POINT** The program's load point. **PCUE_ENTRY_POINT** The program's entry point. **PCUE_PROGRAM_SIZE** Fullword containing the size of the program, in bytes. **PCUE_COMMAREA_ADDRESS** Address of the program's communication area. **PCUE_COMMAREA_SIZE** Fullword containing the length of the program's communication area. **PCUE_LOGICAL_LEVEL** Fullword containing the logical link level. **PCUE_BRANCH_ADDRESS** Fullword. Use this field to supply an alternative entry address. To specify that the alternative program is to run AMODE (31), set the top bit (use the equated value PCUE_BRANCH_AMODE).
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
	UERCMEA	Entry address has been modified.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

The sample XPCFTCH global user exit program, DFH$PCEX

Note that there is a CICS-supplied sample exit program, DFH$PCEX, that is designed to be driven by the XPCFTCH exit. For more information about DFH$PCEX, see "Sample global user exit programs" on page 14.

XPCHAIR

XPCHAIR is invoked before a HANDLE ABEND LABEL routine is given control. Note that this occurs only when a program abend causes a branch to an internal abend routine. (When the HANDLE ABEND request specifies PROGRAM, exit XPCFTCH is invoked, as described above.) You can use this exit to supply an alternative handle-abend address. If the exit sets a return code of zero, or an alternative address of zero, CICS passes control to the application program's specified internal routine.

If a modified entry address is supplied, the code that is invoked receives control in the execution key that the internal abend routine would have received control in—that is, the key in force when the EXEC CICS HANDLE ABEND LABEL command was issued.

Table 47 (Page 1 of 2). Exit XPCHAIR

When invoked	Before a HANDLE ABEND routine is given control.	
Exit-specific parameters	**UEPPCDS**	Address of a storage area that contains program- and terminal-related information, and that can be mapped using the DSECT DFHPCUE. When XPCHAIR is invoked, the following DFHPCUE fields are significant: **PCUE_CONTROL_BITS** 1-byte flag field. A setting of PCUECBTE indicates that the transaction is linked to a terminal. **PCUE_TASK_NUMBER** 3-character packed decimal field containing the task number. **PCUE_TRANSACTION_ID** 4-character field containing the transaction ID. **PCUE_TERMINAL_ID** 4-character field containing the terminal ID (if any). **PCUE_PROGRAM_NAME** 8-character field containing the name of the program that issued the HANDLE ABEND LABEL command. **PCUE_LOGICAL_LEVEL** Fullword containing the logical link level. **PCUE_BRANCH_ADDRESS** Fullword. Use this field to supply the address of an alternate abend routine. To specify that the alternative program is to run AMODE (31), set the top bit (use the equated value PCUE_BRANCH_AMODE).
	UEPTACB	Address of the transaction abend control block (TACB) for the abend. If the abend occurred because of a program check, the information in the TACB includes: • The program status word (PSW) • The registers at the time of the abend • Details of the access registers current at the time of the abend You can map the TACB using the DFHTACB TYPE=DSECT macro.

Table 47 (Page 2 of 2). Exit XPCHAIR		
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
	UERCMEA	The address of an alternate abend routine has been supplied.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

XPCTA

XPCTA is invoked immediately after a transaction abend, and before any processing that might modify the existing environment so that the task could not be resumed. You can use it to set a resume address, instead of letting CICS process the abend. If a resume address is passed back, registers 0 through 13 and 15 are restored to their values at the time of the abend. Register 14 is used to branch to the resume address. If the exit sets a return code of zero, or a resume address of zero, CICS processes the abend.

Note: If the transaction abend occurs as a result of a program check or an operating system abend, it is possible that the XDUREQ dump domain exit may be invoked before XPCTA. (For details of XDUREQ, see page 30.)

Table 48 (Page 1 of 2). Exit XPCTA

When invoked	After an abend and before the environment is modified.	
Exit-specific parameters	**UEPPCDS**	Address of a storage area that contains program- and terminal-related information, and that can be mapped using the DSECT DFHPCUE. When XPCTA is invoked, the following DFHPCUE fields are significant: **PCUE_CONTROL_BITS** 1-byte flag field. A setting of PCUECBTE indicates that the transaction is linked to a terminal. **PCUE_TASK_NUMBER** 3-character packed decimal field containing the task number. **PCUE_TRANSACTION_ID** 4-character field containing the transaction ID. **PCUE_TERMINAL_ID** 4-character field containing the terminal ID (if any). **PCUE_PROGRAM_NAME** 8-character field containing the name of the failing program. **PCUE_LOGICAL_LEVEL** Fullword containing the logical link level. **PCUE_BRANCH_ADDRESS** Fullword. You can use this field to supply a resume address. To specify that the alternative program is to run AMODE (31), set the top bit (use the equated value PCUE_BRANCH_AMODE).

Table 48 (Page 2 of 2). Exit XPCTA		
		PCUE_BRANCH_EXECKEY If storage protection is active, you can use this 1-byte field to specify the execution key of the resumed task. The possible values are: **PCUE_BRANCH_USER** User key. **PCUE_BRANCH_CICS** CICS key. If storage protection is active, and you do not specify a value, the resumed task executes in User key. If storage protection is not active, the resumed task executes in CICS key.
	UEPTACB	Address of the transaction abend control block (TACB) for the abend. If the abend occurred because of a program check, the information in the TACB includes: • The program status word (PSW) • The registers at the time of the abend • The execution key at the time of the abend • Details of the access registers current at the time of the abend. You can map the TACB using the DFHTACB TYPE=DSECT macro.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
	UERCMEA	A resume address has been supplied.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

The sample XPCTA global user exit program, DFH$PCTA

The sample program tests whether the abend was caused by the application program trying to overwrite CICS-key storage in the CDSA or ECDSA, while running in user key. If this was the case, the sample changes the execution key to CICS, and retries the failing instruction.

You can use the sample program to identify, without abending, those programs that need to be defined with EXECKEY(CICS), because they intentionally modify a CICS-key DSA. For details of how to do this, see the prolog of DFH$PCTA.

XPCABND

XPCABND is invoked before a transaction dump call: you can use it to suppress the dump.

Table 49. Exit XPCABND

When invoked	Before a transaction dump call is made.	
Exit-specific parameters	**UEPPCDS**	Address of a storage area that contains program-related and terminal-related information. The storage area is mapped by the DSECT DFHPCUE. When XPCABND is invoked, the following DFHPCUE fields are significant: **PCUE_CONTROL_BITS** A 1-byte flag field. A setting of PCUECBTE indicates that the transaction is linked to a terminal. **PCUE_TASK_NUMBER** A 3-character packed decimal field containing the task number. **PCUE_TRANSACTION_ID** A 4-character field containing the transaction ID. **PCUE_TERMINAL_ID** A 4-character field containing the terminal ID (if any). **PCUE_PROGRAM_NAME** An 8-character field containing the name of the program that is abending. **PCUE_LOGICAL_LEVEL** A fullword containing the logical link level.
	UEPTACB	Address of the transaction abend control block (TACB) for the abend. If the abend occurred because of a program check, the information in the TACB includes: • The program status word (PSW) • The registers at the time of the abend. • Details of the subspace and access registers current at the time of the abend. You can map the TACB using the DFHTACB TYPE=DSECT macro.
Return codes	**UERCNORM**	Continue processing – make the dump call.
	UERCBYP	Suppress the dump call.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Resource manager interface program exits XRMIIN and XRMIOUT

XRMIIN

Table 50. Exit XRMIIN

When invoked	Before a task-related user exit program is invoked due to an application program issuing an RMI API request.	
Exit-specific parameters	**UEPTRUEN**	Address of the name of the task-related user exit program.
	UEPTRUEP	Address of the parameter list to be passed to the task-related user exit program. See note.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
	Note:	The task-related user exit program's parameter list is mapped by a DFHUEPAR DSECT that shares common field names with the global user exit program's DFHUEPAR parameter list. To include both DSECT definitions in your exit program, you must code: `DFHUEXIT TYPE=EP,ID=XRMIIN` `DFHUEXIT TYPE,TYPE=RM` The statements must be coded in this order. The two DFHUEPAR parameter lists, the global user exit's and the task-related user exit's, occupy separate areas of storage. The task-related user exit's parameter list is provided for information only; you should not amend it in any way.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Most can be used. However, CALLDLI, EXEC DLI, or EXEC SQL commands must **not** be used.	

XRMIOUT

Table 51. Exit XRMIOUT

When invoked	After a task-related user exit program has returned from handling an RMI API request.

Exit-specific parameters	**UEPTRUEN** Address of the name of the task-related user exit program.
	UEPTRUEP Address of the parameter list passed to the task-related user exit program. See note.
	UEPRECUR Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
	Note: The task-related user exit program's parameter list is mapped by a DFHUEPAR DSECT that shares common field names with the global user exit program's DFHUEPAR parameter list. To include both DSECT definitions in your exit program, you must code:
	`DFHUEXIT TYPE=EP,ID=XRMIOUT`
	`DFHUEXIT TYPE,TYPE=RM`
	The statements must be coded in this order.
	The two DFHUEPAR parameter lists, the global user exit's and the task-related user exit's, occupy separate areas of storage. The task-related user exit's parameter list is provided for information only; you should not amend it in any way.

Return codes	**UERCNORM** Continue processing. **UERCPURG** Task purged during XPI call.
XPI calls	All can be used.
API and SPI commands	Most can be used. However, CALLDLI, EXEC DLI, or EXEC SQL commands must **not** be used.

Warning: It is not recommended that your exit program make calls to other external resource managers that use the RMI, because this causes recursion, and may result in a loop. It is your exit program's responsibility to avoid entering a loop. It could use the recursion counter field UEPRECUR to guard against this.

Resource management install and discard exit XRSINDI

The XRSINDI global user exit is driven, if it is enabled, immediately after CICS successfully installs or discards a resource definition.

The install and discard activities that drive the exit are as follows:

- The install function of the group list on a cold start of CICS
- A CEDA INSTALL command
- An EXEC CICS CREATE command
- All autoinstall operations, as follows:
  - The autoinstall of a terminal, connection, program, mapset, or partitionset
  - The automatic discard of an unused terminal, controlled by the AILDELAY system initialization parameter and the SIGNOFF parameter on the TYPETERM resource definition
- A CEMT DISCARD or EXEC CICS DISCARD command
- The front-end programming interface (FEPI) install and discard operations: the EXEC CICS FEPI INSTALL command and EXEC CICS FEPI DISCARD command

The parameter list is designed to pass the names of more than one resource installed or discarded, in field UEPIDNAM. When designing your global user exit program, do not assume that the number of resource names passed is always one. You are recommended to analyze the resources within a loop based on the value referenced by UEPIDNUM.

Note that the names of modegroups are prefixed with the corresponding connection name. There is no separator between the two names: the first four characters form the connection name, followed by eight characters for the modegroup. The parts of the concatenated name are fixed length—if connection names are defined with less than four characters, they are padded with blanks in the concatenated names. Similarly, the connection names for a front-end programming interface (FEPI) connection is a concatenation of a FEPI node name and a FEPI target name, each of which is 8 characters long (fixed length) with no separator.

The exit is driven once for each individual resource in a group list installed during a CICS cold start. If you are concerned about the performance overhead on a cold start, you should not enable the exit until after the group list is installed. To obtain the information about resources installed prior to enabling the exit, you can write a program to scan the tables of installed resources, using the EXEC CICS INQUIRE *resource_name* browse function.

Table 52. Exit XRSINDI

When invoked	Whenever CICS installs or discards a resource definition.	
Exit-specific parameters	**UEPTRANID**	Address of the 4-byte transaction ID.
	UEPUSER	Address of the 8-byte user ID.
	UEPTERM	Address of the 4-byte terminal ID.
	UEPPROG	Address of the 8-byte application program name.
	UEPIDREQ	Address of the 1-byte install or discard identifier. The values are: **UEIDINS** This request is for an install. **UEIDDIS** This request is for a discard.
	UEPIDNAM	Address of a variable-length list containing the names of the individual resources reported by this call.
	UEPIDLEN	Address of the length of an individual resource name, as a full-word binary value.
	UEPIDNUM	Address of the number of resources reported by this call, as a full-word binary value.
	UEPIDTYP	Address of the 1-byte type of resource. The values are: **UEIDTRAN** A transaction. **UEIDPROF** A profile. **UEIDPROG** A program. **UEIDMAP** A mapset. **UEIDPSET** A partitionset. **UEIDTERM** A terminal. **UEIDCONN** A connection. **UEIDMODE** A modegroup. **UEIDSESS** A session. **UEIDFILE** A file. **UEIDPART** A partner. **UEIDTCLS** A transaction class. **UEIDAITM** An autoinstall terminal model. **UEIDFECO** A FEPI connection. **UEIDFENO** A FEPI node. **UEIDFEPO** A FEPI pool. **UEIDFEPS** A FEPI propertyset. **UEIDFETA** A FEPI target.
	UEPIDREC	Address of a 1-byte identifier indicating whether resources are recovered at a warm or emergency restart. The values are: **UEIDKEEP** The resources are recoverable at a warm or emergency restart. **UEIDLOSE** The resources are not recoverable. **Note:** The exit is not driven during a CICS restart.
Return codes	**UERCNORM**	Continue processing. This is the default.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Important

Abends in a program enabled at the XRSINDI exit point may cause CICS to terminate, because for some resources the exit is driven during syncpoint. If the exit returns code UERCPURG during syncpoint for these resources, abend code AUEP is produced and CICS terminates.

Shared data tables management program exits XDTRD, XDTAD, and XDTLC

XDTRD and XDTAD allow you to control the selection of records for inclusion in a data table, XDTRD being used to make such selections during loading, and XDTAD being invoked when records are subsequently added. XDTRD also allows the contents of records that are included in a user-maintained table to be modified before they are added. XDTLC enables you to take action based on the fact that a data table has completed loading, which might be to end some restrictions that you have decided to place on access to the data table during loading, or to cater for an unsuccessful completion of the loading.

Note that a program invoked from any of these exit points must declare a DSECT defining the data tables user exit parameter list pointed to by field UEPDTPL. (Although UEPDTPL is defined by a DFHUEXIT call, the parameter list that it addresses is not.) To do this, your program can include the copybook DFHXDTDS, which defines the DT_UE_PLIST DSECT.

If the RDO FILE definitions for any tables specify OPENTIME(STARTUP)[6] or any tables are opened implicitly, you should provide a program list table post-initialization (PLTPI) program to activate the user exits. Otherwise, the data tables may start loading before the exits can be enabled. For more details about PLTPI programs, see Chapter 4, “Writing initialization and shutdown programs” on page 339.

XDTRD

The XDTRD user exit is invoked just before CICS attempts to add to the data table a record that has been retrieved from the source data set.

This normally occurs when the loading process retrieves a record during the sequential copying of the source data set. However, it can also occur when an application retrieves a record that is not in the data table and:

- For a user-maintained data table, loading is still in progress, or
- For a CICS-maintained data table, loading terminated before the end of the source data set was reached (because, for example, the data table was full).

The record retrieved from the source data set is passed as a parameter to the user exit program—see fields UEPDTRA and UEPDTRL. Your exit program can choose (depending, for example, on the key value—see fields UEPDTKA and UEPDTKL) whether to include the record in the data table or not.

Alternatively, if you are using CICS shared data tables support, the exit program can request that all subsequent records up to a specified key are skipped—see field UEPDTSKA; these records are not passed to the exit program. This facility is available only during loading. You can specify the key as a complete key, or you can specify just the leading characters by padding the skip-key area with binary zeros.

For a user-maintained data table, the program can also modify the data in the record to reduce the storage needed for the data table. Application programs that

6 Equivalent to FILSTAT=OPENED on a DFHFCT macro.

use the data table must be aware of any changes made to the record format by the exit program. If the record length is changed, the exit program must set the new length in the parameter list—see field UEPDTRL. The new length must not exceed the data buffer length—see field UEPDTRBL.

Table 53 (Page 1 of 2). Exit XDTRD

When invoked	Just before CICS tries to add to the data table a record that has been retrieved from the source data set.		
Exit-specific parameters	**UEPDTPL**	Address of the data table user exit parameter list, which contains:	
		UEPDTNAM	An 8-byte field containing the 7-character data table name. CICS pads the name with blanks.
		UEPDTFLG	A 1-byte flag field. The possible bit settings are: **UEPDTSDT (X'80')** The exit has been invoked by CICS shared data table support. **UEPDTCMT (X'40')** This is a CICS-maintained table. **UEPDTOPT (X'20')** The exit has been invoked for table loading. This means that optimization by skipping can be requested.
		UEPDTRA	The address of the data record.
		UEPDTRBL	The fullword length of the data table buffer.
		UEPDTRL	The fullword length of the data record. For user-maintained tables, the exit program can set a new length in this field, if it amends the record.
		UEPDTKA	The address of the data table key.
		UEPDTKL	The fullword length of the data table key.
		UEPDTDSL	The fullword length of the name of the source data set.
		UEPDTDSN	A 44-character field containing the name of the source data set.

Table 53 (Page 2 of 2). Exit XDTRD			
		UEPDTSKA	The address of a skip-key area. When invoked for table loading, your exit program can return a key of length UEPDTKL in this area, and request load optimization by setting a return code of UERCDTOP.
	Note: The data table user exit parameter list is mapped by DSECT DT_UE_PLIST in copybook DFHXDTDS.		
Return codes	**UERCDTAC**	Add the record to the data table.	
	UERCDTRJ	Reject the record: that is, do not add it to the table.	
	UERCDTOP	Skip this and the following records until a key is found that is equal to or greater than the key specified in the skip-key area.	
XPI calls	All can be used.		
API and SPI commands	Must not be used.		

XDTAD

The XDTAD user exit is invoked when a write request is issued to a data table.

- For a user-maintained data table, the user exit is invoked once—before the record is added to the data table.
- For a CICS-maintained data table, the user exit is invoked twice—before the record is added to the source data set and then again before the record is added to the data table.

The record written by the application is passed as a parameter to the user exit program—see fields UEPDTRA and UEPDTRL. Your exit program can choose (depending on the key value, for example—see fields UEPDTKA and UEPDTKL) whether to include the record in the data table or not. This decision is indicated by setting the return code.

The XDTAD exit must not modify the data in the record. If you used XDTRD to truncate the data records when the user-maintained data table was loaded, you must code your application so that it only tries to write records of the correct format for the data table.

Table 54. Exit XDTAD

When invoked	One or more times during the processing of a write request to a data table.		
Exit-specific parameters	**UEPDTPL**	Address of the data table user exit parameter list, which contains:	
		UEPDTNAM	An 8-byte field containing the 7-character data table name. CICS pads the name with blanks.
		UEPDTFLG	A 1-byte flag field. The possible bit settings are: **UEPDTSDT (X'80')** The exit has been invoked by CICS shared data table support. **UEPDTCMT (X'40')** This is a CICS-maintained table.
		UEPDTRA	The address of the data record.
		UEPDTRBL	The fullword length of the data table buffer.
		UEPDTRL	The fullword length of the data record.
		UEPDTKA	The address of the data table key.
		UEPDTKL	The fullword length of the data table key.
		UEPDTDSL	The fullword length of the name of the source data set.
		UEPDTDSN	A 44-character field containing the name of the source data set.
	Note: The data table user exit parameter list is mapped by DSECT DT_UE_PLIST in copybook DFHXDTDS.		
Return codes	**UERCDTAC**	Add the record to the data table.	
	UERCDTRJ	Reject the record: that is, do not add it to the table.	
XPI calls	All can be used.		
API and SPI commands	Must not be used.		

XDTLC

The XDTLC user exit is invoked at the completion of data table loading—whether successful or not. **The user exit is not invoked if the data table is closed for any reason before loading is complete.**

The exit program is informed if the loading did not complete successfully—see field UEPDTORC. This could occur, for example, if the maximum number of records was reached or there was insufficient virtual storage. In this case, the exit program can request that the file is closed immediately, by setting the return code.

Table 55. Exit XDTLC

When invoked	At the completion of table loading. It is not invoked if the loading process was terminated because the data table had been closed.		
Exit-specific parameters	**UEPDTPL**	Address of the data table user exit parameter list, which contains:	
		UEPDTNAM	An 8-byte field containing the 7-character data table name. CICS pads the name with blanks.
		UEPDTFLG	A 1-byte flag field. The possible bit settings are: **UEPDTSDT (X'80')** The exit has been invoked by CICS shared data table support. **UEPDTCMT (X'40')** This is a CICS-maintained table.
		UEPDTORC	Data table open result code. The possible values are: **X'00'** Load successful **X'80'** Load unsuccessful.
		UEPDTDSL	The fullword length of the name of the source data set.
		UEPDTDSN	A 44-character field containing the name of the source data set.
Return codes	**UERCDTOK**	Accept the data table in its present state	
	UERCDTCL	Close the data table.	
XPI calls	All can be used.		
API and SPI commands	Must not be used.		

Signon and signoff exits XSNON and XSNOFF

Exit XSNON is invoked after a terminal user signs on, and exit XSNOFF is invoked after a terminal user signs off (whether the signon or sign-off is successful or not). XSNON and XSNOFF do not make any security decisions; they are merely a means of tracking users logging on and off a CICS system.

The activities which drive the exits are:

- Invocation of an EXEC CICS SIGNON command for a terminal (when, for example, the terminal user enters the CICS-supplied CESN, or an equivalent, user-written, signon transaction)
- Invocation of an EXEC CICS SIGNON command for a surrogate terminal (that is, a terminal attached by the CRTE routing transaction, or by dynamic transaction routing)
- Invocation of an EXEC CICS SIGNOFF command for a terminal
- When a `'CANCEL'` command is entered to terminate a CRTE routing session
- A timeout sign-off

XSNON

Table 56. Exit XSNON

When invoked	When a user signs on.	
Exit-specific parameters	**UEPUSRID**	Address of the terminal userid.
	UEPUSRLN	Address of the terminal userid length.
	UEPGRPID	Address of the group ID. If the signon was successful, the group ID is that which the user is associated with in this signon session. If the signon was unsuccessful, it is that specified by the user when he or she tried to sign on.
	UEPGRPLN	Address of the group ID length.
	UEPNETN	Address of the terminal's netname.
	UEPTRMID	Address of the terminal id.
	UEPTCTUA	Address of the TCT user area.
	UEPTCTUL	Address of the TCT user area length.
	UEPTRMTY	Address of the terminal-type byte.
	UEPSNFLG	Address of a 2-byte field containing flags: **UEPSNOK** Signon was successful. **UEPSNFL** Signon failed.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

XSNOFF

Table 57. Exit XSNOFF

When invoked	When a user signs off.	
Exit-specific parameters	**UEPUSRID**	Address of the terminal userid.
	UEPUSRLN	Address of the terminal userid length.
	UEPGRPID	Address of the group ID.
	UEPGRPLN	Address of the group ID length.
	UEPNETN	Address of the terminal's netname.
	UEPTRMID	Address of the terminal id.
	UEPTCTUA	Address of the TCT user area.
	UEPTCTUL	Address of the TCT user area length.
	UEPTRMTY	Address of the terminal-type byte.
	UEPSNFLG	Address of a 2-byte field containing flags: **UEPSNOK** Sign-off was successful. **UEPSNFL** Sign-off failed. **UEPSNNML** Normal sign-off. **UEPSNTIM** Timeout sign-off.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Statistics domain exit XSTOUT

On invocation, XSTOUT is passed the address of a buffer containing one or more statistics records. The buffer can contain records for various resource types (for example, connections and modenames), and both specific and global information (for example, loader statistics for individual programs, and loader statistics for all programs).

Your exit program can identify the types of records in the buffer by their STID values. (STID values are described in “CICS statistics data section” on page 576.)

You can use XSTOUT to prevent the contents of the statistics data buffer being written to DMF. Note that you cannot use it to selectively suppress individual records within the buffer. Your exit program should not modify the values of any of the exit-specific parameters.

Table 58 (Page 1 of 2). Exit XSTOUT

When invoked	Before a statistics record is written to DMF.
Exit-specific parameters	Fields UEPTRANID, UEPUSER, UEPTERM, and UEPPROG have meaning **only** for requested statistics (when using CEMT PERFORM STATISTICS RECORD or the EXEC CICS PERFORM STATISTICS RECORD command). **UEPTRANID** Address of the 4-byte transaction ID. **UEPUSER** Address of the 8-byte user ID. **UEPTERM** Address of the 4-byte terminal ID. **UEPPROG** Address of the 8-byte application program name. **UEPSTATS** Address of a buffer containing one or more statistics records. For unsolicited statistics, the buffer always contains one record; for other types of statistics, it may contain several records. The length of the buffer is addressed by the UEPSRLEN parameter. **UEPSRLEN** Address of the 4-byte hexadecimal length of the statistics record. **UEPSTYPE** Address of the 3-byte character field statistics type. The values of the types are: **INT** Interval statistics. **EOD** End-of-day statistics. **REQ** Requested statistics. **RRT** Requested reset statistics. **USS** Unsolicited statistics.

Table 58 (Page 2 of 2). Exit XSTOUT

	UEPSDATE	Address of a 6-byte character field containing the collection date (MMDDYY).
	UEPSTIME	Address of a 6-byte character field containing the collection time (HHMMSS).
	UEPSIVAL	Address of a 6-byte character field containing the interval time (HHMMSS). This field has meaning only for interval statistics.
	UEPSIVN	Address of the 4-byte interval number. This field has meaning only for interval statistics.
	UEPSCLD	Address of an 8-character field containing the collection date (MMDDYYYY).
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Suppress output of statistics data buffer to DMF.
XPI calls	WAIT_EXTERNAL can be used. **Note, however, that the wait cannot be purged using CEMT or SPI**. **Do not use any other calls**.	
API and SPI commands	Must not be used.	

System recovery program exit XSRAB

Table 59 (Page 1 of 3). Exit XSRAB

When invoked	When the system recovery program (DFHSRP) finds a match in the SRT for a VSE/ESA abend or cancel code. For information about defining entries in the SRT, refer to the *CICS Resource Definition Guide*.	
Exit-specific parameters	**UEPERROR**	Address of the error data structure, SRP_ERROR_DATA, which contains the following fields: **SRP_ERROR_TYPE** The 4-character error type—always ‘ASRB’. **SRP_SYS_ABCODE** 2 bytes containing the system abend code XXX in binary format (for example, 0C4). See note 5 on page 139. **SRP_USER_ABCODE** 2 bytes containing the user abend code NNNN in binary format (for example, 0999). **SRP_ERROR_TRANID** 4-character field containing the ID of the abending transaction. **SRP_ERROR_STACK_NAME** 8-character field containing the name of the current kernel stack entry for the transaction at the time of the abend. **SRP_ERROR_PPT_NAME** 8-character field containing the name of the current PPT entry for the transaction, if one exists. This field contains a value only if flag SRP_PPT_ENTRY is set. **SRP_ERROR_OFFSET** Fullword containing the offset into the program that abended, as follows: • If flag SRP_PPT_ENTRY is set, gives the offset in SRP_ERROR_PPT_NAME • Otherwise, gives the offset in SRP_ERROR_STACK_NAME. This field contains a value only if flag SRP_VALID_OFFSET is set. **SRP_ERROR_FLAGS** 1 byte containing flags: **SRP_CICS_CODE** The abend occurred while running CICS code. **SRP_USER_CODE** The abend occurred while running user application code.

Table 59 (Page 2 of 3). Exit XSRAB

		SRP_PPT_ENTRY The abend occurred while running SRP_ERROR_PPT_NAME. If this flag is not set, the abend occurred while running SRP_ERROR_STACK_NAME. **SRP_VALID_OFFSET** A meaningful offset could be determined. **SRP_VALID_REASON** VSE/ESA has supplied a reason code for the abend.
		SRP_CICS_ERROR_REASON 4-character field containing the VSE/ESA abend reason code. It contains a value only if flag SRP_VALID_REASON is set. See note 5 on page 139.
		SRP_CICS_ERROR_DATA An area describing the last thing that CICS did, prior to the abend. It contains the following: **SRP_CICS_EC_PSW** 8-character field containing the extended control (EC) mode program status word (PSW). **SRP_CICS_EC_INT** 8-character field containing the interrupt code and ILC. **SRP_CICS_REGST** 64-character field containing the contents of the general-purpose (GP) registers. **SRP_CICS_EXEC_KEY** 1 byte containing the PSW key, in the form `X'0n'`.
		SRP_ERROR_FP_REGS An area describing the contents of the floating point registers at the time of the abend. It contains: **SRP_FP_REG_0** FP register 0. **SRP_FP_REG_2** FP register 2. **SRP_FP_REG_4** FP register 4. **SRP_FP_REG_6** FP register 6.
	Note: The format of SRP_ERROR_DATA is shown in the *CICS Data Areas* manual.	
Return codes	**UERCNOCA**	Abnormally terminate the task with abend code ‘ASRB’. Do not cancel any program-level abend exits that are associated with this task.
	UERCCANC	Abnormally terminate the task with abend code ‘ASRB’. Cancel any program-level abend exits that are associated with this task.
	UERCCICS	Abnormally terminate CICS.

Table 59 (Page 3 of 3). Exit XSRAB

XPI calls	Because CICS invokes the exit XSRAB in an error environment, you can only use a subset of the XPI calls. Only TRACE_PUT is available for general use. You can use WAIT_EXTERNAL, but only after the exit program has determined (from the SRP_CICS_CODE and SRP_USER_CODE fields) that the abend has occurred in user application code, and not in CICS code.
API and SPI commands	Must not be used.

Important

Notes:

1. Take care when coding a program to run at the XSRAB exit point. If your exit program causes the system recovery program to be reentered (if, for example, a program check occurs) then CICS terminates abnormally, with a DFHSR06xx message.
2. The default return code is 'UERCNOCA'. This ensures that the task abends if the exit is in error.
3. There is no 'UERCNORM' return code at this exit point, because the exit is invoked after a failure.
4. The exit should **not** set the return code 'UERCPURG'.
5. A value of X'2C5' in field SRP_SYS_ABCODE is a special case; it means that a native VSE/ESA cancel condition has occurred (rather than a system abend condition generated by the VSE/ESA OS/390® API support). In this case, field SRP_CICS_ERROR_REASON contains further information. The first byte of SRP_CICS_ERROR_REASON is the VSE/ESA cancel code. The remaining three bytes may contain further information. For example, a value of X'2C5' in SRP_SYS_ABCODE and X'210000ss' in SRP_CICS_ERROR_REASON indicates that an invalid SVC has occurred. ss is the SVC number.

System termination program exit XSTERM

The XSTERM exit could be used to output final statistics to your statistics DMF data sets. (Note that CICS VSAM and DAM data sets have already been closed by CICS file control before the exit is invoked.)

Table 60. Exit XSTERM

When invoked	During the second quiesce stage of a normal system shutdown, immediately before the transient data and temporary storage buffers are cleared. The exit is not invoked during an IMMEDIATE shutdown.
Exit-specific parameters	**None**.
Return codes	**UERCNORM** Continue processing.
XPI calls	All XPI calls except WRITE_JOURNAL_DATA can be used. However, their use is not recommended, because they could cause the task to lose control, thus allowing another task to write more monitoring data.
API and SPI commands	Must not be used.

Takeover request-processing program exit XXRSTAT

XXRSTAT enables you to decide whether to terminate CICS when either of the following occurs:

- CICS is notified of a VTAM failure by the TPEND exit.
- A persistent sessions **predatory takeover**. A “predatory takeover” can occur if a VTAM application with the same APPLID as that of the executing CICS system assumes control of all the sessions of the executing CICS system.

  XXRSTAT gives you the choice of allowing the system which has suffered the takeover to continue or to terminate.

  To avoid potential integrity exposures, CICS default action after a predatory takeover is to terminate without a dump. If you want CICS to terminate with a dump, your exit program should return UERCABDU. CICS terminates with the abend code specified by your exit program.

  If you want CICS to continue after a predatory takeover, your exit program must return UERCCOIG. Message DFHZC0101 is issued and CICS continues processing without VTAM support. The predatory application assumes control of all VTAM sessions.

  Warning: Allowing CICS to continue after a predatory takeover could cause integrity problems and is not recommended. You are also recommended to use an external security manager to protect your CICS APPLIDs.

For more information about this exit and the circumstances in which you can use it, refer to the *CICS XRF Guide*.

Table 61 (Page 1 of 2). Exit XXRSTAT

When invoked	After either of the following: • CICS is notified of a VTAM failure by the TPEND exit. • A VTAM persistent sessions predatory takeover.		
Exit-specific parameters	**UEPERRA**	Address of parameter list containing:	
		UEPGAPLD	Address of the 8-byte generic applid.
		UEPSAPLD	Address of the 8-byte specific applid.
		UEPDOMID	Address of the 4-byte domain ID.
		UEPERRID	Address of the 4-byte error ID.
	Notes: 1. No DSECT is provided for the above parameter list. You need to code your own DSECT to access the named fields. 2. When VTAM has failed, the domain ID is ‘ZC ’ (uppercase Z, uppercase C, and two blanks), and the error ID is the character string ‘3443’.		

Table 61 (Page 2 of 2). Exit XXRSTAT

Return codes	**UERCNORM**	Take the system action. The system action depends on the reason why the exit was invoked: • For XRF, in the event of a VTAM failure: CICS continues processing as if the exit program had not been invoked. • For VTAM persistent sessions, in the event of a predatory takeover: CICS abends without a dump.
	UERCCOIG	Ignore.
	UERCABNO	Abend CICS without a dump.
	UERCABDU	Abend CICS with a dump.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Task control program exit XKCREQ

Table 62. Exit XKCREQ

When invoked	Before ENQUEUE and DEQUEUE requests are actioned.	
Exit-specific parameters	**UEPENQFN**	A 1-byte field indicating the type of function—either ENQUEUE or DEQUEUE—which caused the exit program to be invoked. The equated values are: **UEPENQ** ENQUEUE. **UEPDEQ** DEQUEUE.
	UEPENQA	The address of the resource name that is the object of the ENQUEUE or DEQUEUE request.
	UEPENQL	The length of the resource name.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Note: Some requests that caused this exit to be driven in previous releases of CICS are passed directly to the dispatcher domain in CICS Transaction Server for VSE/ESA Release 1, and therefore do not cause the exit to be driven.

Temporary storage control program exits XTSREQ, XTSIN, and XTSOUT

XTSREQ

Table 63. Exit XTSREQ

When invoked	Before analysis of a temporary storage request.	
Exit-specific parameters	**UEPTSIOA**	Address of the TSIOAVRL field in the temporary storage input/output area (TSIOA). The TSIOA can be mapped using the DSECT DFHTSIOA. Note that UEPTSIOA does not point to the start of the DFHTSIOA DSECT.
	UEPTSDI	Name of the temporary storage queue ID.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

XTSIN

Table 64. Exit XTSIN

When invoked	After an input event.	
Exit-specific parameters	**UEPTSIOA**	Address of the TSIOAVRL field in the temporary storage input/output area (TSIOA). The TSIOA can be mapped using the DSECT DFHTSIOA. Note that UEPTSIOA does not point to the start of the DFHTSIOA DSECT.
	UEPTSGID	Address of the first temporary storage group identification control block (TSGID). The TSGID is mapped by the DSECT DFHTSGID. However, field TSGIDSA is **not** a programming interface.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

XTSOUT

Table 65. Exit XTSOUT

When invoked	Before an output event.	
Exit-specific parameters	**UEPTSIOA**	Address of the TSIOAVRL field in the temporary storage input/output area (TSIOA). The TSIOA can be mapped using the DSECT DFHTSIOA. Note that UEPTSIOA does not point to the start of the DFHTSIOA DSECT.
	UEPTSGID	Address of the first temporary storage group identification control block (TSGID). The TSGID is mapped by the DSECT DFHTSGID. However, field TSGIDSA is **not** a programming interface.
	UEPTSREC	Address of the record prefix. The record prefix is mapped by the DSECT DFHTSCI. However, field TSCISA is **not** a programming interface.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Temporary storage EXEC interface program exits XTSEREQ and XTSEREQC

The XTSEREQ exit allows you to intercept temporary storage API requests before any action has been taken on the request. The XTSEREQC exit allows you to intercept the response after a temporary storage API request has completed.

The API requests affected are:

- EXEC CICS WRITEQ TS
- EXEC CICS READQ TS
- EXEC CICS DELETEQ TS

Using **XTSEREQ**, you can:

- Analyze the API parameter list (function, keywords, argument values, and responses).
- Modify any input parameter value prior to execution of a request.
- Prevent execution of a request.

Using **XTSEREQC**, you can:

- Analyze the API parameter list.
- Modify any output parameter value after request completion.

You can also:

- Pass data between your XTSEREQ and XTSEREQC exit programs when they are invoked for the same request.
- Pass data between your temporary storage exit programs when they are invoked within the same task.

It is possible that programs invoked from the exits in the temporary storage control program (XTSOUT, XTSIN, and XTSREQ) could modify situations set up by XTSEREQ; therefore you must consider the order in which the exits are invoked.

If all five exits are enabled, the order of invocation is as follows:

- For the WRITEQ temporary storage command:
  1. XTSEREQ
  2. XTSREQ
  3. XTSOUT
  4. XTSEREQC
- For the READQ temporary storage command:
  1. XTSEREQ
  2. XTSREQ
  3. XTSIN
  4. XTSEREQC
- For the DELETEQ temporary storage command:
  1. XTSEREQ
  2. XTSREQ
  3. XTSEREQC

XTSEREQ

Table 66. Exit XTSEREQ

When invoked	Before CICS processes a temporary storage API request.	
Exit-specific parameters	**UEPCLPS**	Address of a copy of the command parameter list. See “The command-level parameter structure” on page 149.
	UEPTQTOK	Address of a 4-byte area which can be used to pass information between XTSEREQ and XTSEREQC for a single temporary storage request.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code EIBRCODE. For details of EIB return codes, see the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code EIBRESP.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code EIBRESP2.
	UEPTSTOK	Address of a 4-byte token which can be used to pass information between successive temporary storage requests within the same task (for example, between successive invocations of the XTSEREQ exit).
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCBYP**	Bypass this request
	UERCNORM	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands. For example, you must avoid entering a loop when issuing a temporary storage request from the XTSEREQ exit. Use of the recursion counter UEPRECUR is recommended.

XTSEREQC

Table 67. Exit XTSEREQC

When invoked	After a temporary storage API request has completed, before return from the temporary storage EXEC interface program.	
Exit-specific parameters	**UEPCLPS**	Address of a copy of the command parameter list. See “The command-level parameter structure” on page 149.
	UEPTQTOK	Address of a 4-byte area which can be used to pass information between XTSEREQ and XTSEREQC for a single temporary storage request.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code EIBRCODE. For details of EIB return codes, see the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code EIBRESP.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code EIBRESP2.
	UEPTSTOK	Address of a 4-byte token which can be used to pass information between successive temporary storage requests within the same task (for example, between successive invocations of the XTSEREQC exit).
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when issuing a temporary storage request from the XTSEREQC exit. Use of the recursion counter UEPRECUR is recommended.

You can update the copies of EIBRCODE, EIBRESP, and EIBRESP2 that you are given in the parameter list. If you update the values, temporary storage copies the new values into the application program’s EIB after the completion of XTSEREQC or if you specify a return code of UERCBYP in XTSEREQ.

You must set valid temporary storage responses. You must set all three of EIBRCODE, EIBRESP, and EIBRESP2 to a consistent set of values, such as would be set by temporary storage to describe a valid completion. CICS does not check the consistency of EIBRCODE, EIBRESP, and EIBRESP2. If EIBRCODE is set to a non-zero value and EIBRESP is set to zero, CICS will override EIBRESP with a non-zero value. To help you set values for EIBRCODE, EIBRESP, and EIBRESP2, the values used by temporary storage are specified in DSECT DFHTSUED.

The command-level parameter structure

The command-level parameter structure consists of a series of addresses. The first address points to the EXEC interface descriptor (EID), which consists of a bit string that describes the type of request and identifies each keyword specified with the request. The remaining addresses point to pieces of data associated with the request.

You can examine the EID to determine the type of request and the keywords specified. You can examine the other parameters in the list to determine the values of the keywords. You can also modify values of keywords specified on the request.

End of parameter list indicator

The high-order bit is set on in the last address set in the parameter list to indicate that it is the last one in the list. On return from your user exit program, CICS scans the parameter list for the high-order bit to find the last parameter. Therefore, if you modify the length of the parameter list, you must also reset the high-order bit to indicate which is the new last address.

For example, if the parameter list specifies only the first four addresses (TS_ADDR0, the address of the EID, to TS_ADDR3, the address of the halfword LENGTH), the high-order bit is set on in TS_ADDR3. If you extend the parameter list by setting the address of a SYSID in TS_ADDR7, you must unset the high-order bit in TS_ADDR3 and set it on in TS_ADDR7 instead.

The UEPCLPS exit-specific parameter: The UEPCLPS exit-specific parameter is included in both exit XTSEREQ and exit XTSEREQC. It is the address of the command-level parameter structure. The command-level parameter structure contains 8 addresses, TS_ADDR0 through TS_ADDR7. It is defined in the DSECT TS_ADDR_LIST, which you should copy into your exit program by including the statement COPY DFHTSUED.

The command-level parameter list is made up as follows.

Note: The relationship between arguments, keywords, data types, and input/output types is summarized for the temporary storage commands in the following tables:

Command	See
WRITEQ TS	Table 68 on page 153.
READQ TS	Table 69 on page 153.
DELETEQ TS	Table 70 on page 154.

TS_ADDR0
is the address of an 8-byte area called the EID, which is made up as follows:

TS_GROUP
TS_FUNCT
TS_BITS1
TS_BITS2
TS_EIDOPT5
TS_EIDOPT6
TS_EIDOPT7

TS_GROUP	Always X'0A', indicating that this is a temporary storage request.
TS_FUNCT	One byte that defines the type of request:

X'02'	WRITEQ.
X'04'	READQ.
X'06'	DELETEQ.

TS_BITS1 Existence bits that define which arguments were specified. To obtain the argument associated with a keyword, you need to use the appropriate address from the command-level parameter structure. Before using this address, you must check the associated existence bit. If the existence bit is set off, the argument was not specified in the request and the address should not be used.

X'80'	Set if the request contains an argument for the QUEUE keyword. If set, **TS_ADDR1** is meaningful.
X'40'	Set if the request contains an argument for any of the FROM, INTO, or SET keywords. If set, **TS_ADDR2** is meaningful.
X'20'	Set if the request contains an argument for the LENGTH keyword. If set, **TS_ADDR3** is meaningful.
X'10'	Set if the request contains an argument for the NUMITEMS keyword. If set, **TS_ADDR4** is meaningful.
X'08'	Set if the request contains an argument for the NUMITEMS or ITEM keyword. If set, **TS_ADDR5** is meaningful.
X'02'	Set if the request contains an argument for the SYSID keyword. If set, **TS_ADDR7** is meaningful.

TS_BITS2 Two bytes not used by temporary storage.

TS_EIDOPT5 Indicates whether certain keywords were specified on the request.

X'01'	Set if SET was specified (not set if INTO specified). You cannot modify this bit from your user exit.

TS_EIDOPT6 One byte not used by temporary storage.

TS_EIDOPT7 Indicates whether certain functions and/or keywords were specified on the request.

X'10'	WRITEQ NOSUSPEND specified.
X'80'	WRITEQ MAIN or READQ ITEM specified.
X'04'	WRITEQ REWRITE or READQ NUMITEMS specified.

TS_EIDOPT8 Indicates whether certain keywords were specified on the request.

`X'80'`	Set if ITEM was specified (not set if NUMITEMS specified).

TS_ADDR1
is the address of an 8-byte area containing the name from QUEUE.

TS_ADDR2
is the address of one of the following:

- A 4-byte address from SET (if the request is READQ and **TS_EIDOPT5** indicates that this is SET).
- Data from INTO (if the request is READQ and **TS_EIDOPT5** indicates that this is not SET).
- Data from FROM (if the request is WRITEQ).

TS_ADDR3
is the address of the halfword value of LENGTH (if the request is READQ or WRITEQ).

Warning: For requests that specify INTO, do not change the value of LENGTH to a value greater than that specified by the application. To do so causes a storage overlay in the application.

TS_ADDR4
is the address of the halfword value of NUMITEMS (if the request is READQ).

TS_ADDR5
is the address of one of the following:

- The halfword value of NUMITEMS (if the request is WRITEQ).
- The halfword value of ITEM (if the request is READQ or WRITEQ).

TS_ADDR6
is the address of a value intended for CICS internal use only. It must not be used.

TS_ADDR7
is the address of an area containing the value of SYSID.

Modifying fields in the command-level parameter structure: Some fields that are passed to temporary storage are used as input to the request, some are used as output fields, and some are used for both input and output. The method your user exit program uses to modify a field depends on the usage of the field.

The following are always input fields:

QUEUE
FROM
SYSID

The following are always output fields:

INTO
NUMITEMS
SET

LENGTH is an input field on a WRITEQ request, and an output field on a READQ request that specifies SET. It is both an input and an output field on a READQ request that specifies INTO.

ITEM is an input field on a READQ request, and on a WRITEQ request that specifies REWRITE. It is both an input and an output field on a WRITEQ request that does not specify REWRITE.

Modifying input fields: The correct method of modifying an input field is to create a new copy of it, and to change the address in the command-level parameter list to point to your new data.

Warning: You must never modify an input field by altering the data that is pointed to by the command-level parameter list. To do so would corrupt storage belonging to the application program and would cause a failure when the program attempted to reuse the field.

Modifying output fields: The technique described in “Modifying input fields” is not suitable for modifying output fields. (The results would be returned to the new area instead of the application’s area, and would be invisible to the application.)

An output field is modified by altering the data that is pointed to by the command-level parameter list. In the case of an output field, you can modify the application’s data in place, because the application is expecting the field to be modified anyway.

Modifying fields used for both input and output: An example of a field that is used for both input and output is LENGTH on a READQ request that specifies INTO. You can treat such fields in the same way as output fields, and they are considered to be the same.

Modifying the EID: It is not possible to modify the EID to make major changes to requests. It is not possible, for example, to change a READQ request to a WRITEQ request.

However, you can make minor changes to requests, such as to turn on the existence bit for SYSID so that the request can be changed into one that is shipped to a remote system.

The list that follows shows the bits in the EID that can be modified. Any attempt to modify any other part of the EID is ignored.

TS_BITS1

`X'02'`	The existence bit for SYSID.

TS_EIDOPT7

A user exit program at XTSEREQ can set the following on or off for all WRITEQ TS commands:

`X'10'`	The existence bit for NOSUSPEND.
`X'08'`	The existence bit for MAIN.

The EID is reset to its original value before return to the application program. That is, changes made to the EID are retained for the duration of the temporary storage request only.

Warning: Your user exit program is prevented from making major changes to the EID. However, you must take great care when making the minor modifications that **are** permitted.

Use of the task token UEPTSTOK: UEPTSTOK provides the address of a 4-byte area that you can use to pass information between successive temporary storage requests in the same task. (By contrast, UEPTQTOK is usable only for the duration of a single temporary storage request, because its contents may be destroyed at the end of the request.) For example, if you need to pass information between successive invocations of the XTSEREQ exit, UEPTSTOK provides a means of doing this.

Table 68. WRITEQ TS: User arguments and associated keywords, data types, and input/output types

Argument	Keyword	Data type	Input/output type
Arg1	QUEUE	CHAR(8)	input
Arg2	FROM	DATA-AREA	input
Arg3	LENGTH	BIN(15)	input
Arg4	*	*	*
Arg5	ITEM	BIN(15)	input/output
Arg5	NUMITEMS	BIN(15)	output
Arg6	*	*	*
Arg7	SYSID	CHAR(4)	input

Note: The different uses of Arg5 are shown, because Arg5 is used by the ITEM and NUMITEMS keywords which are alternatives and the argument to the ITEM keyword is an input field when REWRITE is specified.

Table 69. READQ TS: User arguments and associated keywords, data types, and input/output types

Argument	Keyword	Data type	Input/output type
Arg1	QUEUE	CHAR(8)	input
Arg2	SET	DATA-AREA, PTR	output
Arg2	INTO	DATA-AREA	output
Arg3	LENGTH	BIN(15)	input/output
Arg4	NUMITEMS	BIN(15)	output
Arg5	ITEM	BIN(15)	input
Arg6	*	*	
Arg7	SYSID	CHAR(4)	input

Table 70. DELETEQ TS: User arguments and associated keywords, data types, and input/output types

Argument	Keyword	Data type	Input/output type
Arg1	QUEUE	CHAR(8)	input
Arg2	*	*	*
Arg3	*	*	*
Arg4	*	*	*
Arg5	*	*	*
Arg6	*	*	*
Arg7	SYSID	CHAR(4)	input

Modifying user arguments: User exit programs can modify user arguments, as follows:

For input arguments, the user exit program should obtain sufficient storage to hold the modified argument, set up that storage to the required value, and set the associated pointer in the parameter list to the address of the newly acquired area.

For output arguments, and for input/output arguments, the user exit program can update the argument in place, because the area of storage is represented by a variable in the application which is expected to receive a value from CICS.

Notes:

1. CICS does not check changes to argument values, so any changes must be verified by the user exit program making the changes.
2. It is not advisable for XTSEREQ to modify output arguments or for XTSEREQC to modify input arguments.

Adding user arguments: Global user exit programs can add arguments associated with the SYSID keyword. You must ensure that the arguments you specify or modify in your exit programs are valid.

Assuming that the argument to be added does not already exist, the user exit program must:

1. Obtain storage for the argument to be added.
2. Initialize the storage to the required value.
3. Select and set up the appropriate pointer from the parameter list.
4. Select and set up the appropriate argument existence bit in the EID.
5. Modify the parameter list to reflect the new end of list indicator.

Removing user arguments: User exit programs can remove arguments (for which the program is totally responsible) associated with the SYSID keyword:

Assuming that the argument to be removed exists, the user exit program must:

1. Switch the corresponding argument existence bit to `'0'b` in the EID
2. Modify the parameter list to reflect the new end of list indicator.

Example program

CICS supplies—in hardcopy only—an example program, DFH$XTSE, that shows how temporary storage requests can be modified. See Appendix E, “The example program for the XTSEREQ global user exit, DFH$XTSE” on page 673.

Terminal allocation program exit XALCAID

XALCAID is driven when an AID with data is canceled in one of the following ways:

- By means of the CEMT transaction
- During execution of a SET TERMINAL or SET CONNECTION command
- During reinstallation of a terminal or connection

XALCAID is invoked only if there is data associated with the AID.

Table 71 (Page 1 of 2). Exit XALCAID

When invoked	Whenever an AID with data is canceled. **Note:** It is not possible for the exit to prevent the request from being canceled.	
Exit-specific parameters	**UEPALTSD**	Address of a 4-byte field containing the symbolic identifier of the transaction which was to be started by this request.
	UEPALTRM	Address of a 4-byte field containing the identifier of the terminal or connection to which this request was directed.
	UEPALDAT	Address of an area of storage containing the data specified in the FROM option; or hexadecimal zeros, if the AID was created by a START request without a FROM option.
	UEPALLEN	Address of a fullword binary field containing the length of the FROM data; or hexadecimal zeros, if the FROM option was not specified.
	UEPALRQD	Address of an 8-byte field containing the value of the REQID associated with the FROM data. The data was stored in a temporary storage queue with this name. This value was either specified explicitly using the REQID option on the START command, or created internally by CICS.
	UEPALQUE	Address of an 8-byte field containing the value specified in the QUEUE option on the START command, or hexadecimal zeros if QUEUE was not specified.
	UEPALRTE	Address of a 4-byte field containing the value specified in the RTERMID option on the START command, or hexadecimal zeros if RTERMID was not specified.
	UEPALRTA	Address of a 4-byte field containing the value specified in the RTRANSID option on the START command, or hexadecimal zeros if RTRANSID was not specified.
	UEPALFMH	Address of a 1-byte field containing the value `X'FF'` if the data contains FMHs, as specified by the FMH option on the associated START command; or hexadecimal zeros otherwise.
	UEPALSTC	Address of a 2-byte field containing the start code. This is `'SZ'` for FEPI starts; otherwise it is `'SD'`.
Return codes	**UERCNORM**	No other return codes are supplied. The value of the return code is not inspected.

Table 71 (Page 2 of 2). Exit XALCAID

XPI calls	You can use: INQ_APPLICATION_DATA INQUIRE_SYSTEM No other XPI calls should be used.
API and SPI commands	No EXEC CICS commands can be used.

Note: The XALTENF exit, used to handle the “terminal not known” condition, is also invoked from the terminal allocation program. XALTENF is described on page 160.

Terminal control program exits XTCIN, XTCOUT, and XTCATT

XTCIN

Table 72. Exit XTCIN

When invoked	After an input event for a sequential device.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). Your exit program should not change the address. The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces.
	UEPTCTLE	Address of the terminal control table line entry (TCTLE). The TCTLE can be mapped using the DSECT DFHTCTLE.
Return codes	**UERCNORM**	Continue processing.
XPI calls	All can be used. However, note that you cannot use a GETMAIN call to obtain terminal-class storage for use as a replacement TIOA.	
API and SPI commands	Must not be used.	

XTCOUT

Table 73. Exit XTCOUT

When invoked	Before an output event for a sequential device.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). Your exit program should not change the address. The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces.
	UEPTCTLE	Address of the terminal control table line entry (TCTLE). The TCTLE can be mapped using the DSECT DFHTCTLE.
Return codes	**UERCNORM**	Continue processing.
XPI calls	All can be used. However, note that you cannot use a GETMAIN call to obtain terminal-class storage for use as a replacement TIOA.	
API and SPI commands	Must not be used.	

XTCATT

Table 74. Exit XTCATT

When invoked	Before task attach.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces.
	UEPTCTLE	Address of the terminal control table line entry (TCTLE). The TCTLE can be mapped using the DSECT DFHTCTLE.
	UEPTRAN	Address of the 4-byte transaction id.
Return codes	**UERCNORM**	Continue processing.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

‘Terminal not known’ condition exits XALTENF and XICTENF

The ‘terminal not known’ condition can occur when intercommunicating CICS regions use both SHIPPABLE terminal definitions and automatic transaction initiation (ATI). The condition is especially likely to arise if autoinstall is used.

SHIPPABLE attribute
Terminals defined with the SHIPPABLE attribute in a terminal-owning region (TOR) do not need a definition in a connected application-owning region (AOR). If necessary to support transaction routing, CICS ships a copy of the definition from the TOR to the AOR. For further information, refer to the *CICS Resource Definition Guide*.

Automatic transaction initiation (ATI)
ATI occurs when an internally generated request leads to the initiation of a transaction. For example, when:

- An application issues an EXEC CICS START command, or
- The transient data trigger level is reached.

Two CICS modules handle ATI requests:

The **interval control program** processes a START command, checks that the terminal is known in the local system, and (when any START time interval elapses) calls the terminal allocation program.

The **terminal allocation program** is called by the interval control program or by the transient data triggering mechanism, and checks that the terminal is known in the local system. If the requested terminal is remote, the terminal allocation program ships an ATI request to the remote system, which initiates transaction routing back to the local system.

For guidance information about ATI, refer to the *CICS Intercommunication Guide*.

‘Terminal not known’ condition
The ‘terminal not known’ condition arises when an ATI request is made for a terminal not known in the region. An ATI request can occur in the AOR for a SHIPPABLE terminal before any transaction routing has taken place for the terminal, and so before the definition of the terminal can have been shipped from the TOR to the AOR.

If the ‘terminal not known’ condition occurs, both the interval control program and the terminal allocation program reject the transaction-initiation request as ‘TERMIDERR’.

The exits: To deal with the ‘terminal not known’ condition, CICS provides global user exits in the interval control and terminal allocation programs:

XICTENF	In the interval control program.
XALTENF	In the terminal allocation program.

CICS drives the XICTENF exit when the ‘terminal not known’ condition occurs after the interval control program has been invoked by an EXEC CICS START command. CICS drives the XALTENF exit when the ‘terminal not known’ condition occurs after the terminal allocation program has been invoked by the transient data trigger level or the interval control program. Note that an EXEC CICS START command could result in both exits being invoked.

The exit program must indicate whether the terminal exists on another system and, if so, on which one. CICS passes data to the exit program to help establish this information. You can use the same exit program at both exit points. CICS supplies a sample exit program, DFHXTENF (see Figure 2 on page 166), that can be used at both exits and that can deal unchanged with some typical situations.

The exits are designed to deal with ‘terminal not known’ conditions that occur in CICS regions other than the TOR. For a TOR/AOR pair, enable the exit program in the AOR. The exits cannot deal with a ‘terminal not known’ condition in the TOR and the exit program should not normally be enabled there. However, if more than one TOR exists, you may need to enable the exit program in each TOR to deal with requests for terminals owned by other TORs. In this case, the exit program must recognize terminals that should be owned by this system and reject the requests (‘UERCTEUN’). Although the exit provides as much data as possible, the logic of your program depends entirely on your system design. A simple solution to the most complex case would be to make the name of each terminal reflect the netname or sysid of its owning region.

Data returned by exit: The exit program must set a return code in register 15 as follows:

UERCTEUN	Terminal does not exist.
UERCNETN	Netname returned.
UERCSYSI	Sysid returned.

For return codes 4 and 8, the program must place the netname or sysid in fields UEPxxNTO or UEPxxSYO (where xx is AL or IC).

XALTENF

Table 75 (Page 1 of 2). Exit XALTENF

When invoked	By the terminal allocation program when the terminal that an ATI request from transient data or interval control requires is unknown in this system. The exit program is expected to give a return code indicating whether the terminal exists on another connected CICS system and, if so, on which one.		
Exit-specific parameters	**UEPALEVT**	Address of 2 bytes containing the type of request. The equated values of the types are:	
		UEPALESD	START command with data.
		UEPALES	START command without data.
		UEPALETD	Transient data trigger level reached.
	UEPALTR	Address of 1 byte containing an indication of whether the task issuing the START command was started by transaction routing. The equated values are:	
		UEPALTY	A START command was being processed and the task issuing the command was transaction routed to.
		UEPALTN	A START command was not being processed **or** a START command was being processed but the task issuing the command was not transaction routed to.
	UEPALFS	Address of 1 byte containing an indication of whether the START command was function shipped. The equated values are:	
		UEPALFY	A START command was being processed and the START was function shipped.
		UEPALFN	A START command was not being processed **or** a START was being processed but it was not function shipped.
	UEPALTRN	Address of 4 bytes containing the name of the transaction to be run.	
	UEPALRTR	Address of 4 bytes containing the name of the terminal on which the transaction should run. (If a transient data trigger level was reached and the DCT entry specified DESTFAC=(SYSTEM,sysidnt), then this would contain a sysid).	

Table 75 (Page 2 of 2). Exit XALTENF

	UEPALCTR	Address of 4 bytes containing, for START commands, the name of the current terminal if the command was transaction routed, or the name of the session if the command was function shipped. For other START commands and for transient data trigger events, the field pointed to contains blanks.
	UEPALNTI	Address of 8 bytes containing, for function-shipped START commands, the netname of the last system from which the request came. For START commands issued in this system by transaction routing to a task, the netname of the last system from which the task was routed. For other START command situations and for transient data trigger level events, the field pointed to contains blanks.
	UEPALSYI	Address of 4 bytes containing, if UEPALNTI contains a netname, the corresponding sysid. If UEPALNTI does not contain a netname, the field pointed to is blank.
	UEPALNTO	Address of 8 bytes containing the contents of UEPALNTI. **If it sets a return code of ‘UERCNETN’, your exit program must place in this field the netname of the system to which the ATI request should be sent**.
	UEPALSYO	Address of 4 bytes containing the contents of UEPALSYI. **If it sets a return code of ‘UERCSYSI’, your exit program must place in this field the sysid of the system to which the ATI request should be sent**.
Return codes	**UERCTEUN**	Terminal unknown, reject request.
	UERCNETN	Terminal known, netname returned in UEPALNTO.
	UERCSYSI	Terminal known, sysid returned in UEPALSYO.
XPI calls	You can use: INQ_APPLICATION_DATA INQUIRE_SYSTEM No other XPI calls should be used.	
API and SPI commands	Must not be used.	

XICTENF

Table 76 (Page 1 of 2). Exit XICTENF

When invoked	By the interval control program when the terminal that an EXEC CICS START command requires is unknown in this system. The exit program is expected to give a return code indicating whether the terminal exists on another connected CICS system and, if so, on which one.		
Exit-specific parameters	**UEPICEVT**	Address of 2 bytes containing the type of request. The equated values of the types are:	
		UEPICESD	START command with data.
		UEPICES	START command without data.
	UEPICTR	Address of 1 byte containing an indication of whether the task issuing the START command was started by transaction routing. The equated values are:	
		UEPICTY	A START command was being processed and the task issuing the command was transaction routed to.
		UEPICTN	A START command was not being processed **or** a START command was being processed but the task issuing the command was not transaction routed to.
	UEPICFS	Address of 1 byte containing an indication of whether the START command was function shipped. The equated values are:	
		UEPICFY	A START command was being processed and the START was function shipped.
		UEPICFN	A START command was not being processed **or** a START was being processed but it was not function shipped.
	UEPICTRN	Address of 4 bytes containing the name of the transaction to be run.	
	UEPICRTR	Address of 4 bytes containing the name of the terminal on which the transaction should run.	
	UEPICCTR	Address of 4 bytes containing, for START commands, the name of the current terminal if the command was transaction routed, or the name of the session if the command was function shipped. For other START commands, the field pointed to contains blanks.	

Table 76 (Page 2 of 2). Exit XICTENF

	UEPICNTI	Address of 8 bytes containing, for function-shipped START commands, the netname of the last system from which the request came. For START commands issued in this system by transaction routing to a task, the netname of the last system from which the task was routed. For other START command situations, the field pointed to contains blanks.
	UEPICSYI	Address of 4 bytes containing, if UEPICNTI contains a netname, the corresponding SYSID. If UEPICNTI does not contain a netname, the field pointed to is blank.
	UEPICNTO	Address of 8 bytes containing the contents of UEPICNTI. **If it sets a return code of ‘UERCNETN’, your exit program must place in this field the netname of the system to which the ATI request should be sent**.
	UEPICSYO	Address of 4 bytes containing the contents of UEPICSYI. **If it sets a return code of ‘UERCSYSI’, your exit program must place in this field the sysid of the system to which the ATI request should be sent**.
Return codes	**UERCTEUN**	Terminal unknown, reject request.
	UERCNETN	Terminal known, netname returned in UEPICNTO.
	UERCSYSI	Terminal known, sysid returned in UEPICSYO.
	UERCPURG	Task purged during XPI call.
XPI calls	The following must not be used: ADD_SUSPEND DELETE_SUSPEND RESUME SUSPEND WAIT_EXTERNAL.	
API and SPI commands	Must not be used.	

The sample program for the XALTENF and XICTENF exits, DFHXTENF

One program can be used for both exits, or a separate program can be written for each. Figure 2 shows the executable code from the supplied sample program DFHXTENF, which can be used for both exits. DFHXTENF rejects transient data requests, because the action in this case is very much installation-dependent.

Important

The example is intended purely as a demonstration of some of the possibilities available, and would be impractical in a production environment.

```
DFHXTENF CSECT
         DFHVM XTENF
         ENTRY DFHXTENA
DFHXTENA DS    0H
         STM   R14,R12,12(R13)     save registers
         BALR  R11,0               set up base register
         USING *,R11
*
         USING DFHUEPAR,R1         DFHUEH parameter list
*
*        Could check the terminal ID at this point. In this
*        program we assume it is valid. We also choose to accept
*        START requests and reject Transient Data trigger level
*        events.
*
         L     R2,UEPICEVT         access type of request
         CLC   0(2,R2),START       START command?
         BE    STARTCMD            yes
*
         CLC   0(2,R2),STARTDAT    START command with data?
         BNE   NOTSTART            no, must be Transient Data
*
STARTCMD DS    0H
*
*        Accept the default netname if we are Function Shipping.
*        Otherwise build a netname.
*
         L     R2,UEPICFS          access FS information
         CLI   0(R2),UEPICFY       Function Shipping?
         BNE   BLDNETNM            no, build a netname
*
         LH    R15,NETNAME         accept the default netname
         B     EXIT
*
```

Figure 2 (Part 1 of 2). Sample program for XALTENF and XICTENF exits

```
BLDNETNM DS    0H
*
*        Build a netname by taking the first character of the
*        terminal ID and appending it to the characters 'CICS'.
*
         L     R2,UEPICNTO         access the output netname field
         L     R3,UEPICRTR         access ID of requested terminal
         MVC   0(8,R2),=C'CICS    '
         MVC   4(1,R2),0(R3)       first character of terminal ID
         LH    R15,NETNAME         netname returned
         B     EXIT
*
NOTSTART DS    0H
         LH    R15,UNKNOWN         reject Transient Data trigger       *
                                   level events
*
EXIT     DS    0H
         L     R14,12(R13)         restore registers except 15
         LM    R0,R12,20(R13)      which contains the return code
         BR    R14
*
***********************************************************************
*        Local constants
***********************************************************************
START    DC    AL2(UEPICES)
STARTDAT DC    AL2(UEPICESD)
NETNAME  DC    AL2(UERCNETN)
UNKNOWN  DC    AL2(UERCTEUN)
*
         DFHEND DFHXTENF
```

Figure 2 (Part 2 of 2). Sample program for XALTENF and XICTENF exits

Transaction backout programs exits XRCDBER, XRCINIT, XRCINPT, XRCOPER, and XRCFCER

At emergency restart, updates made to recoverable CICS resources that were not committed when the system failed must be backed out. Six programs are involved in the backout process, and they run in parallel under their own CICS tasks. There are global user exit points in four of the backout programs. These backout programs are:

- The DL/I backout program
- The file control backout program
- The message and ISC state recovery program
- The user backout program, for backing out user-written system log entries.

Five global user exits can be invoked from these backout programs. These are XRCDBER, XRCINIT, XRCINPT, XRCOPER, and XRCFCER. XRCDBER is invoked from the DL/I backout program only. XRCINIT is invoked at both initialization and termination of each of the four recovery programs. XRCINPT is invoked from the file control backout program, the user backout program, and the message and ISC state recovery program. XRCOPER and XRCFCER are invoked from the file control backout program only.

For further guidance information about exits in the transaction backout programs, refer to the *CICS Recovery and Restart Guide*.

Coding the exit programs

CICS services can be used in exit programs invoked from these exits using the XPI or EXEC CICS commands. However, you need to consider the following:

- There is a restriction on using the XPI early during initialization: do not invoke exit programs that use the XPI functions TRANSACTION_DUMP, WRITE_JOURNAL_DATA, MONITOR and INQUIRE_MONITOR_DATA until the second phase of PLTPI processing.
- There are also restrictions on the use of EXEC CICS commands in these exits:
  - You cannot use EXEC CICS commands to access terminal control services.
  - You are strongly advised not to use temporary storage, transient data, file control, journal control, or DL/I services, because the resources that you try to access may also be in a state of recovery and therefore “not open for business”. Attempting to access resources in these circumstances causes, at best, serialization of the recovery tasks and, at worst, a deadlock.

    If you do issue file control requests in programs invoked from these exits, note that:

    - If an exit program acquires an area as a result of a file control request, it is the responsibility of the program to release that area.
    - An exit program must not attempt to make any file control requests to a file referring to a VSAM data set with a string number of 1, unless no action is specified for that file during the initialization exit.
    - An XRCFCER exit program must not disable or close files, because this could cause further error conditions.
  - Your exit program must not issue EXEC CICS commands if the recovery is as the result of an EXEC CICS SYNCPOINT ROLLBACK request.

  - Exit programs that issue EXEC CICS commands must first address the EIB. See “Using CICS services” on page 5.
  - Exit programs that issue EXEC CICS commands, and that use the DFHEIENT macro, should use the DFHEIRET macro to set a return code and return to CICS. See “Returning values to CICS” on page 10.
  - Exit programs invoked from these exits must be translated with the NOEDF option, if they issue EXEC CICS commands. See “Using EDF with global user exits” on page 6.
- Task-chained storage acquired in an exit program is released at the completion of emergency restart processing. However, the exit program should attempt to release the storage as soon as its contents are no longer needed.
- No exit program should reset either the absent or no-action indicators set by the file control backout program.

Warning: Care should be taken when issuing recursive commands not to cause a loop. For example, it is your responsibility to avoid entering a loop when an RC request is issued from any of the transaction backout program exits. Use of the recursion counter UEPRECUR is recommended.

Enabling the exit programs

To enable these exits, you must either specify the system initialization parameter TBEXITS=(name1,name2,name3,name4), where name1, name2, name3, and name4 are the names of your user exit programs for XRCINIT, XRCINPT, XRCFCER, and XRCOPER, or enable them during the first stage of initialization using a PLTPI program. If you use the TBEXITS parameter to enable these exits, a global work area of 4 bytes is provided. If you use a PLTPI program, you can select the size of the global work area. You can also enable more than one exit program for use at each exit point; the TBEXITS parameter allows only one exit program at each exit point. PLTPI processing is described in Chapter 4, “Writing initialization and shutdown programs” on page 339.

XRCDBER from the DL/I backout program

Table 77. Exit XRCDBER invoked from the DL/I backout program

When invoked	When an error condition has been returned from the DL/I program.	
Exit-specific parameters	**UEPDBOTE**	Address of the DL/1 backout (DBO) table. The DBO table can be mapped using the DSECT DFHDBODS.
	UEPTREQ	Address of a 1-byte flag indicating the reason for the call.
	UEPLOGRC	Address of the entire log record.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
	When UEPTREQ has a value of UEDBUNSC, the exit has been invoked because of a PSB scheduling error; when UEPTREQ has a value of UEDBUNBO, the exit has been invoked because of a failure during the backout of a data base update; when UEPTREQ has a value of UEDBUNTR, the exit has been invoked because of a PSB termination (unschedule) error.	
Return codes	**UERCNORM**	Accept error and continue processing.
	UERCBYP	Ignore error and continue processing.
XPI calls	All can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCINIT from the DL/I backout program

Table 78. Exit XRCINIT invoked from the DL/I backout program

When invoked	At the beginning and at the end of the DL/I backout program.	
Exit-specific parameters	**UEPDBOTE**	Address of the DL/1 backout (DBO) table. The DBO table can be mapped using the DSECT DFHDBODS.
	UEPTREQ	Address of a 1-byte flag indicating the reason for the call.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
	When UEPTREQ has a value of UEDLINIT, the exit has been invoked at the start of recovery, and when UEPTREQ has a value of UEDLTERM, the exit has been invoked at the end of recovery.	
Return codes	**UERCNORM**	Continue processing. No other return codes are supported.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCINIT from the file control backout program

Table 79. Exit XRCINIT invoked from the file control backout program

When invoked	At the beginning and at the end of the file control backout program.	
Exit-specific parameters	**UEPFBOTE**	Address of the start of the file backout (FBO) table. The FBO table can be mapped using DSECT DFHFBODS. All of the fields in DSECT DFHFBODS are product-sensitive programming interfaces, except for bit TBFBFAIL of byte TBFBFLG1, which is not a programming interface.
	UEPTREQ	Address of a 1-byte flag indicating the reason for the call. When UEPTREQ has a value of UEFCINIT, the exit has been invoked at the start of file recovery, and when UEPTREQ has a value of UEFCTERM, the exit has been invoked at the end of file recovery.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing. No other return codes are supported.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCINIT from the message and ISC SRP

Table 80. Exit XRCINIT invoked from the message and ISC SRP

When invoked	At the beginning and at the end of the message and ISC state recovery program.	
Exit-specific parameters	**UEPMBOTE**	Address of the message backout (MBO) table. The MBO table can be mapped using the DSECT DFHMBODS.
	UEPTREQ	Address of a 1-byte flag indicating the reason for the call. When UEPTREQ has a value of UEMEINIT, the exit has been invoked at the start of message recovery, and when UEPTREQ has a value of UEMETERM, the exit has been invoked at the end of message recovery.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing. No other return codes are supported.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCINIT from the user backout program

Table 81. Exit XRCINIT invoked from the user backout program

When invoked	At the beginning and at the end of the user backout program.	
Exit-specific parameters	**UEPTBOTE**	Address of the transaction backout (TBO) table. The TBO table can be mapped using the DSECT DFHTBODS.
	UEPTREQ	Address of a 1-byte flag indicating the reason for the call. When UEPTREQ has a value of UEUSINIT, the exit has been invoked at the start of user recovery, and when UEPTREQ has a value of UEUSTERM, the exit has been invoked at the end of user recovery.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing. No other return codes are supported.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCINPT from the file control backout program

Table 82. Exit XRCINPT invoked from the file control backout program

When invoked	From the file control backout program whenever a file control record has been read from the restart data set.	
Exit-specific parameters	**UEPFBOTE**	Address of the entry in the file backout (FBO) table corresponding to the CICS file involved. The FBO table can be mapped using the DSECT DFHFBODS. All of the fields in DSECT DFHFBODS are product-sensitive programming interfaces, except for bit TBFBFAIL of byte TBFBFLG1, which is not a programming interface.
	UEPLGREC	Address of the log record just read. The journal control record can be mapped using the DSECT DFHJCRDS, which is described in Chapter 17, “CICS journaling” on page 513. The type of file control record read from the restart data set can be determined by testing field JCRSTRID (defined in DFHJCRDS) with values provided by copy book DFHFMIDS. Copy book DFHJFCDS defines the file control layout of the variable part of the system prefix section of the log record.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Bypass this record.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCINPT from the message and ISC SRP

Table 83. Exit XRCINPT invoked from the message and ISC SRP

When invoked	From the message and ISC state recovery program whenever a terminal control record has been read from the restart data set.	
Exit-specific parameters	**UEPMBOTE**	Address of the message backout (MBO) table. The MBO table can be mapped using the DSECT DFHMBODS.
	UEPLGREC	Address of the log record just read. The journal control record can be mapped using the information supplied in Chapter 17, “CICS journaling” on page 513.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Bypass this record.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCINPT from the user backout program

Table 84. Exit XRCINPT invoked from the user backout program

When invoked	From the user backout program whenever a user-journaled record has been read from the restart data set.	
Exit-specific parameters	This parameter is preceded by a 4-byte reserved field in the parameter list.	
	UEPLGREC	Address of the log record just read. The journal control record can be mapped using the information supplied in Chapter 17, “CICS journaling” on page 513.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	Bypass this record.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCOPER from the file control backout program

Table 85. Exit XRCOPER invoked from the file control backout program

When invoked	From the file control backout program if an error occurs while opening a file control data set.	
Exit-specific parameters	**UEPFBOTE**	Address of the entry in the file backout (FBO) table corresponding to the CICS file involved. The FBO table can be mapped using the DSECT DFHFBODS. All of the fields in DSECT DFHFBODS are product-sensitive programming interfaces, except for bit TBFBFAIL of byte TBFBFLG1, which is not a programming interface.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

XRCFCER from the file control backout program

Table 86 (Page 1 of 2). Exit XRCFCER invoked from the file control backout program

When invoked	From the file control backout program when the file control program returns an error during backout processing, or when the file control backout program itself detects an error.	
Exit-specific parameters	**UEPFBOTE**	Address of the entry in the file backout (FBO) table corresponding to the CICS file involved. The FBO table can be mapped using the DSECT DFHFBODS. All of the fields in DSECT DFHFBODS are product-sensitive programming interfaces, except for bit TBFBFAIL of byte TBFBFLG1, which is not a programming interface.
	UEPLGREC	Address of the log record just read. The journal control record can be mapped using the information supplied in Chapter 17, “CICS journaling” on page 513.
	UEPFCTE	Address of the entry in the file control table (FCT), if any (see note below). The FCT entry can be mapped using the DSECT DFHFCTDS.

Table 86 (Page 2 of 2). Exit XRCFCER invoked from the file control backout program

	UEPFCRSP	The address of the file control response byte. This can have one of the following values: **UENORESP** Normal response. **UEFILERR** File not found. **UEINVREQ** Invalid request. **UEILOGIC** VSAM illogical error. **UENOTOPN** Not open. **UEDISAB** Disabled. **UEENDFIL** End of file. **UEIOEROR** I/O error. **UENOTFND** Record not found. **UEDUPREC** Duplicate record. **UENOSPAC** No space available. **UELENGER** Length error. **UEDUPKEY** Duplicate key in alternate index (AIX). **UEPURGED** Transaction canceled. **UEDISAST** Disastrous error detected. **Note:** A value of UEPFCRSP other than one of those listed above indicates that File Control detected an invalid request.
	UEPERR	Address of a one-byte field containing the error type. The system log record can be mapped using the information supplied in Chapter 17, "CICS journaling" on page 513. The values of the error byte and their meanings are described in "Values of the error byte pointed to by UEPERR" on page 176, and are defined in the DSECT DFHFBODS. All of the fields in DFHFBODS are product-sensitive programming interfaces, except for bit TBFBFAIL of byte TBFBFLG1, which is not a programming interface.
	UEPFDATA	Address of a variable-length field containing the data in the file control request.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
	UEPFLEN	Address of a fullword containing the length of the data in the file control request.
	Note: UEPFCTE, UEPFDATA, and UEPFLEN contain valid values, depending on the type of error reported by UEPFCRSP. For example, if the byte addressed by UEPFCRSP contains 'UEFILERR' (file not found), then UEPFCTE and UEPFDATA are zero.	
Return codes	**UERCNORM**	Continue processing and invoke CICS backout failure control.
	UERCBYP	Ignore the error (do not invoke CICS backout failure control) and continue.
	UERCRTRY	Retry the request, or reapply the record if the error is 'TBFEWA'.
XPI calls	Most can be used. See page 168 for details of restrictions.	
API and SPI commands	Most can be used. See page 168 for details of restrictions.	

Values of the error byte pointed to by UEPERR

Field UEPERR in the XRCFCER parameter list points to an error byte which contains one of the following values:

TBFEGU
An error response has been returned from the file control program (DFHFCVS) while servicing a GET UPDATE request. DFHFCBP has attempted to retrieve the existing copy of the record before backing it out. Use parameter UEPFCRSP in combination with the type of record pointed to by parameter UEPLGREC (before copy of a “read for update” record or new copy of a “write add” to be deleted) to determine the specific problem.

TBFELE
The area acquired in DFHFCVS is not large enough to receive the before-copy data picked up from the restart data set to perform the backout. Parameter UEPFDATA points to the data. UEPFLEN points to a field containing the length. Parameter UEPFCRSP does not apply to this error.

TBFEPU
An error response has been returned from DFHFCVS while servicing a PUT UPDATE request. DFHFCBP has attempted to replace the existing copy of the record on the file with the “before-copy” held in the log record pointed to by UEPLGREC. Use parameter UEPFCRSP to determine which error occurred.

TBFEPN
An error response has been returned from DFHFCVS while servicing a PUT NEW request. DFHFCBP has attempted to add the “before-copy” of a deleted VSAM KSDS record. Use parameter UEPFCRSP to determine which error occurred.

TBFEWA
If the record read from the restart data set is a WRITE ADD, the record is also read in from the file through a GET UPDATE. For DAM and VSAM–ESDS data sets, no delete function exists. Because DFHFCBP does not attempt to delete the record that has been added, you are given the opportunity in your exit program to “mark” the existing record on the file as deleted according to application-dependent logic. Mark the record at the address pointed to by UEPFDATA. If you want this version to be reapplied, specify return code ‘UERCRTRY’.

Parameter UEPFCRSP does not apply to this sort of error, and will contain a normal response from the READ UPDATE. Parameter UEPFDATA points to the unmatched record. UEPFLEN points to the length of this record.

TBFEVD
An error response has been returned from DFHFCVS while servicing a VSAM DELETE request. DFHFCBP has attempted to delete a new record added to a VSAM key-sequenced data set. Use parameter UEPFCRSP to determine which error occurred.

Transaction manager domain exit XXMATT

Table 87. Exit XXMATT

When invoked	**During** transaction attach. This exit is able to change some of the attributes of the transaction that is being attached.	
Exit-specific parameters	**UEPTRANID**	The address of transaction id (see Notes).
	UEPUSER	The address of the userid associated with the transaction if the current task is a user task (see Notes).
	UEPTERM	The address of the terminal id associated with the transaction, if any (see Notes).
	UEPPROG	The address of the application program name for this transaction, if any (see Notes).
	UEPATPTI	The address of a 4-byte field containing the primary transaction id. You can change the primary transaction id by modifying the addressed field.
	UEPATOTI	The address of the 4-byte attach transaction id. A transid of `X'00000000'` indicates that a transid was not supplied on the attach.
	UEPATTPL	The address of an area containing the length of the attach TPName. A length of zero indicates that a TPName was not supplied on the attach.
	UEPATTPA	The address of a fullword containing the address of the attach TPName. The attach TPName can be 1 through 64 bytes long, as defined by UEPTTPL.
	UEPATLOC	The address of a 1-byte field indicating whether the transaction was found. Equated values are: **UEATFND** The transaction was found. **UEATNFND** The transaction was not found.
	UEPATTST	The address of a one-byte transaction definition state. Equated values for the definition state are: **UEATENAB** Transaction is enabled. **UEATDISA** Transaction is disabled.
	UEPATTTK	The address of a doubleword containing a transaction token. Note that some of the transaction manager XPI calls require this token to identify the transaction that is being attached.
Return codes	**UERCNORM**	Continue attach processing.
XPI calls	The user exit can inquire on the transaction being attached using the UEPATTTK transaction token as input to the XMIQ INQUIRE_TRANSACTION XPI call. The exit can also set the total priority and TCLASS using the XMIQ SET_TRANSACTION XPI call. Most of the XPI calls can be used, but with caution since typically this exit is invoked under the TCP task. Thus it is advisable not to issue any XPI calls that might cause the TCP task to wait.	
API and SPI commands	Must not be used.	

Notes:

1. The following XPI calls can be useful for obtaining information that could be used to modify the attach of a transaction:

   INQUIRE_TRANSACTION
   INQUIRE_MXT
   INQUIRE_TCLASS
   INQUIRE_TRANDEF
   INQUIRE_SYSTEM

2. The fields UEPTRANID, UEPUSER, UEPTERM, and UEPPROG are common to many of the domain global user exit points, and normally return values associated with the current user task. In the case of XXMATT, however, the user task that is being attached is **not** the current task when the exit is invoked. Until task attach is complete, the current task is the CICS task that is performing the attach.

   When the task being attached is for a task started by an immediate START command; that is, a START without an interval, the current task is the task that issues the START command, and the fields contain values associated with that task.

Transient data program exits XTDREQ, XTDIN, and XTDOUT

XTDREQ

Table 88. Exit XTDREQ

When invoked	Before request analysis.	
Exit-specific parameters	**UEPTDQUE**	Address of 4-byte TD queue name.
	UEPTDTYP	Address of 1-byte TD request type. Values are: **UEPTDPUT** PUT request. **UEPTDGET** GET request. **UEPTDPUR** PURGE request.
Return codes	**UERCNORM**	Continue TD processing.
	UERCTDOK	Quit TD processing – returning 'NORMAL' to the caller.
	UERCTDNA	Quit TD processing – returning 'NOTAUTH' to the caller.
	UERCPURG	Task purged during XPI call.
XPI calls	You can use: INQ_APPLICATION_DATA, INQUIRE_SYSTEM, WAIT_EXTERNAL. **Do not use any other calls**.	
API and SPI commands	Must not be used.	

XTDIN

Table 89. Exit XTDIN

When invoked	After receiving data from SAM (for extrapartition) or VSAM (for intrapartition).	
Exit-specific parameters	**UEPTDQUE**	Address of the 4-byte TD queue name.
	UEPTDAUD	Address of the unmodified TD data.
	UEPTDLUD	Address of the fullword length of the unmodified TD data.
	UEPTDAMD	Address of the TD data modified by the exit program.
	UEPTDLMD	Address of the fullword length of the TD data modified by the exit program.
Return codes	**UERCNORM**	Continue TD processing.
	UERCPURG	Task purged during XPI call.
XPI calls	You can use: INQ_APPLICATION_DATA, INQUIRE_SYSTEM, WAIT_EXTERNAL. **Do not use any other calls**.	
API and SPI commands	Must not be used.	

XTDOUT

Table 90. Exit XTDOUT

When invoked	Before passing the data to a SAM (for extrapartition) or VSAM (for intrapartition) user-defined transient data queue.	
Exit-specific parameters	**UEPTDQUE**	Address of the 4-byte TD queue name.
	UEPTDAUD	Address of the unmodified TD data.
	UEPTDLUD	Address of the fullword length of the unmodified TD data.
	UEPTDAMD	Address of the TD data modified by the exit program.
	UEPTDLMD	Address of the fullword length of TD data modified by the exit program.
	UEPTDNUM	Address of the fullword containing the number of items in the list.
	UEPTDCUR	Address of the fullword containing the number of the current item.
Return codes	**UERCNORM**	Continue TD processing.
	UERCTDOK	Quit TD processing – returning ‘NORMAL’ to the caller.
	UERCPURG	Task purged during XPI call.
XPI calls	You can use: INQ_APPLICATION_DATA INQUIRE_SYSTEM WAIT_EXTERNAL **Do not use any other calls**.	
API and SPI commands	Must not be used.	

Transient data EXEC interface program exits XTDEREQ and XTDEREQC

The XTDEREQ exit allows you to intercept a transient data request before any action has been taken on it by transient data. The XTDEREQC exit allows you to intercept a transient data request after transient data has completed its processing.

Using XTDEREQ, you can:

- Analyze the request to determine its type, the keywords specified, and their values.
- Modify any value specified by the request before the command is executed.
- Set return codes to specify that either:
  - CICS should continue with the (possibly modified) request.
  - CICS should bypass the request. (Note that if you set this return code, you must also set up return codes for the EXEC interface block (EIB), as if you had processed the request yourself.)

Using XTDEREQC, you can:

- Analyze the request, to determine its type, the keywords specified, and their values.
- Set return codes for the EIB.

Both exits are passed seven parameters as follows:

- The address of the command-level parameter structure
- The address of a token (UEPTDTOK) used to pass 4 bytes of data from XTDEREQ to XTDEREQC
- The addresses of copies of three pieces of return code information from the EIB
- The address of a token (UEPTSTOK) that is valid throughout the life of a task
- The address of an exit recursion count (UEPRECUR)

Example program

CICS supplies—in hardcopy only—an example program, DFH$XTSE, that shows how to modify fields in the command-level parameter structure passed to EXEC interface exits. DFH$XTSE is listed on page 673.

XTDEREQ

Table 91. Exit XTDEREQ

When invoked	Before CICS processes a transient data API request.	
Exit-specific parameters	**UEPCLPS**	Address of the command-level parameter structure. See "The UEPCLPS exit-specific parameter" on page 185.
	UEPTDTOK	Address of the 4-byte token to be passed to XTDEREQC. This allows you, for example, to pass a work area to exit XTDEREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code 'EIBRCODE'. For details of EIB return codes, refer to the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code 'EIBRESP'.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code 'EIBRESP2'.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See "Use of the task token UEPTSTOK" on page 188.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCBYP	The transient data EXEC interface program should ignore this request.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, we recommend that you use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands. For example, you must avoid entering a loop when issuing a transient data request from the XTDEREQ exit. Use of the recursion counter UEPRECUR is recommended.

XTDEREQC

Table 92. Exit XTDEREQC

When invoked	After a transient data API request has completed, and before return from the transient data EXEC interface program.	
Exit-specific parameters	**UEPCLPS**	Address of the command-level parameter structure. See "The UEPCLPS exit-specific parameter" on page 185.
	UEPTDTOK	Address of the 4-byte token to be passed to XTDEREQC. This allows you, for example, to pass a work area to exit XTDEREQC.
	UEPRCODE	Address of a 6-byte hexadecimal copy of the EIB return code 'EIBRCODE'. For details of EIB return codes, refer to the *CICS Application Programming Reference* manual.
	UEPRESP	Address of a 4-byte binary copy of the EIB response code 'EIBRESP'.
	UEPRESP2	Address of a 4-byte binary copy of the EIB response code 'EIBRESP2'.
	UEPTSTOK	Address of a 4-byte token that is valid throughout the life of a task. See "Use of the task token UEPTSTOK" on page 188.
	UEPRECUR	Address of a halfword recursion counter. The counter is set to 0 when the exit is first invoked, and is incremented for each recursive call.
Return codes	**UERCNORM**	Continue processing.
	UERCPURG	Task purged during XPI call.
XPI calls	All can be used. Although the exit permits the use of XPI GETMAIN and FREEMAIN calls, we recommend that you use the EXEC CICS GETMAIN and FREEMAIN commands instead.	
API and SPI commands	All can be used.	

Warning: Care should be taken when issuing recursive commands. For example, you must avoid entering a loop when issuing a transient data request from the XTDEREQC exit. Use of the recursion counter UEPRECUR is recommended.

The command-level parameter structure

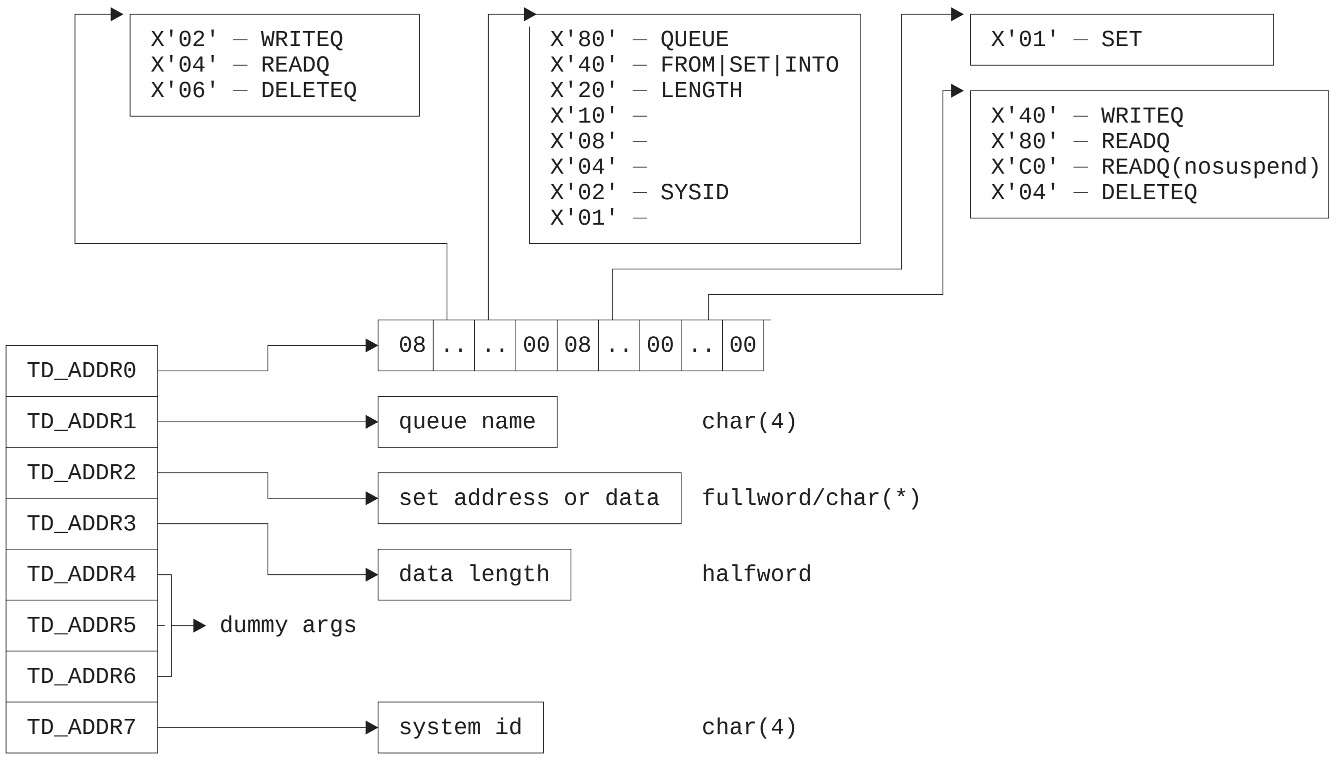


Figure 3. The command-level parameter structure for transient data

The command-level parameter structure consists of a series of addresses. The first address points to the EXEC interface descriptor (EID), which consists of an 8-byte area that describes the type of request and identifies each keyword specified with the request. The remaining addresses point to pieces of data associated with the request. (For example, the second address points to the queue name.)

You can examine the EID to determine the type of request and the keywords specified. You can examine the other parameters in the list to determine the values of the keywords. You can also modify values of keywords specified on the request. (For example, you could change the sysid specified in the request.)

End of parameter list indicator

The high-order bit is set on in the last address set in the parameter list to indicate that it is the last one in the list. On return from your user exit program, CICS scans the parameter list for the high-order bit to find the last parameter. Therefore, if you modify the length of the parameter list, you must also reset the high-order bit to indicate which is the new last address.

For example, if the parameter list specifies only the first two addresses (TD_ADDR0, the address of the EID, and TD_ADDR1, the address of the name of the queue named in a DELETEQ request), the high-order bit is set on in TD_ADDR1. If you extend the parameter list by setting the address of a SYSID in TD_ADDR7, you must reset the high-order bit in TD_ADDR1 and set it on in TD_ADDR7 instead.

The maximum size of parameter list is supplied to the exit, thus allowing your exit program to add any parameters not already specified without needing to first obtain more storage.

The original parameter list, as it was before XTDEREQ was invoked, is restored after the completion of XTDEREQC. It follows that the execution diagnostic facility (EDF) displays the original command before **and** after execution. **EDF does not display any changes made by the exit**.

The UEPCLPS exit-specific parameter: The UEPCLPS exit-specific parameter is included in both exit XTDEREQ and exit XTDEREQC. It is the address of the command-level parameter structure. The command-level parameter structure contains 8 addresses, TD_ADDR0 through TD_ADDR7. It is defined in the DSECT TD_ADDR_LIST, which you should copy into your exit program by including the statement COPY DFHTDUED.

The command-level parameter list is made up as follows:

TD_ADDR0
is the address of an 8-byte area called the EID, which is made up as follows:

TD_GROUP
TD_FUNCT
TD_BITS1
TD_BITS2
TD_EIDOPT5
TD_EIDOPT6
TD_EIDOPT7

TD_GROUP Always X'08', indicating that this is a transient data request.

TD_FUNCT One byte that defines the type of request:

X'02'	WRITEQ.
X'04'	READQ.
X'06'	DELETEQ.

TD_BITS1 Existence bits that define which arguments were specified. To obtain the argument associated with a keyword, you need to use the appropriate address from the command-level parameter structure. Before using this address, you must check the associated existence bit. If the existence bit is set off, the argument was not specified in the request and the address should not be used.

X'80'	Set if the request contains an argument for the QUEUE keyword. If set, **TD_ADDR1** is meaningful.
X'40'	Set if the request contains an argument for any of the INTO, SET, or FROM keywords. If set, **TD_ADDR2** is meaningful.
X'20'	Set if the request contains an argument for the LENGTH keyword. If set, **TD_ADDR3** is meaningful.

	X'02'	Set if the request contains an argument for the SYSID keyword. If set, **TD_ADDR7** is meaningful.
TD_BITS2	Two bytes not used by transient data.	
TD_EIDOPT5	Indicates whether certain keywords were specified on the request.	
	X'01'	SET (and not INTO) was specified.
TD_EIDOPT6	One byte not used by transient data.	
TD_EIDOPT7	Indicates whether certain functions and/or keywords were specified on the request:	
	X'40'	WRITEQ specified.
	X'80'	READQ specified.
	X'C0'	READQ(nosuspend) specified.
	X'04'	DELETEQ specified.

TD_ADDR1
is the address of a 4-byte area containing the name from QUEUE.

TD_ADDR2
is the address of one of the following:

- A 4-byte address from SET (if the request is READQ and **TD_EIDOPT5** indicates that this is SET).
- Data from INTO (if the request is READQ and **TD_EIDOPT5** indicates that this is not SET). You cannot modify this bit in your user exit.
- Data from FROM (if the request is WRITEQ).

TD_ADDR3
is the address of one of the following:

- The halfword value of LENGTH (if the request is READQ or WRITEQ). **Warning:** For requests that specify INTO, do not change the value of LENGTH to a value greater than that specified by the application. To do so causes a storage overlay in the application.

TD_ADDR4
is the address of a value intended for CICS internal use only. It must not be used.

TD_ADDR5
is the address of a value intended for CICS internal use only. It must not be used.

TD_ADDR6
is the address of a value intended for CICS internal use only. It must not be used.

TD_ADDR7
is the address of an area containing the value of SYSID.

TD_ADDR8
is the address of a value intended for CICS internal use only. It must not be used.

Modifying fields in the command-level parameter structure: Some fields that are passed to transient data are used as input to the request, some are used as output fields, and some are used for both input and output. The method your user exit program uses to modify a field depends on the usage of the field.

The following are always input fields:

QUEUE
FROM
SYSID

The following are always output fields:

INTO
SET

LENGTH is an input field on a WRITEQ request, and an output field on a READQ request that specifies SET. It is both an input and an output field on a READQ request that specifies INTO.

Modifying input fields: The correct method of modifying an input field is to create a new copy of it, and to change the address in the command-level parameter list to point to your new data.

Warning: You must never modify an input field by altering the data that is pointed to by the command-level parameter list. To do so would corrupt storage belonging to the application program and would cause a failure when the program attempted to reuse the field.

Modifying output fields: The technique described in “Modifying input fields” is not suitable for modifying output fields. (The results would be returned to the new area instead of the application’s area, and would be invisible to the application.)

An output field is modified by altering the data that is pointed to by the command-level parameter list. In the case of an output field, you can modify the application’s data in place, because the application is expecting the field to be modified.

Modifying fields used for both input and output: An example of a field that is used for both input and output is LENGTH on a READQ request that specifies INTO. You can treat such fields in the same way as output fields, and they are considered to be the same.

Modifying the EID: It is not possible to modify the EID to make major changes to requests, such as changing a READQ request to a WRITEQ request.

However, you can make minor changes to requests, such as turning on the existence bit for SYSID so that the request can be changed into one that is shipped to a remote system.

The list that follows shows the bits in the EID that **can** be modified. Any attempt to modify any other part of the EID is ignored.

TD_BITS1

X'20'	The existence bit for LENGTH.

X'02' The existence bit for SYSID.

TD_EIDOPT5

X'01' Existence bit for SET keyword. You cannot modify this bit from your user exit.

TD_EIDOPT7

Changes to TD_EIDOPT7 are limited to READQ requests. X'80'–READQ is interchangeable with X'C0'–READQ(nosuspend). No other changes may be made to this byte.

The EID is reset to its original value before return to the application program. That is, changes made to the EID are retained for the duration of the transient data request only.

Warning: Your user exit program is prevented from making major changes to the EID. However, you must take great care when making the minor modifications that **are** permitted.

Use of the task token UEPTSTOK: UEPTSTOK provides the address of a 4-byte area that you can use to pass information between successive transient data requests in the same task. (By contrast, UEPTDTOK is usable only for the duration of a single transient data request, because its contents may be destroyed at the end of the request.) For example, if you need to pass information between successive invocations of the XTDEREQ exit, UEPTSTOK provides a means of doing this.

The EIB: Copies of EIBRCODE, EIBRESP, and EIBRESP2 are passed to the exit, so that you can:

- Modify or set completion information in XTDEREQ and XTDEREQC
- Examine completion information in XTDEREQC.

You can update the copies of EIBRCODE, EIBRESP, and EIBRESP2 that you are given in the parameter list. Transient data copies your values into the real EIB after the completion of XTDEREQC; or if you specify a return code of ‘ bypass’ in XTDEREQ.

You must set valid transient data responses. You must set all three of EIBRCODE, EIBRESP, and EIBRESP2 to a consistent set of values, such as would be set by CICS transient data to describe a valid completion. **CICS does not police the consistency of EIBRCODE, EIBRESP, and EIBRESP2**. However, if EIBRCODE is set to a non–zero value and EIBRESP is set to zero then CICS will override EIBRESP with a non–zero value. To aid you in setting the values of EIBRCODE, EIBRESP, and EIBRESP2, the values used by transient data are specified in DFHTDUED.

VTAM terminal management program exit XZCATT

Table 93. Exit XZCATT

When invoked	Before task attach for terminal tasks.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces.
	UEPTPN	Address of the APPC transaction process name (TPN), or the LU6.1 process name (DPN), whose length is addressed by the parameter UEPTPNL.
	UEPTPNL	Address of a 1-byte field containing the length of the TPN or DPN.
	UEPTRAN	Address of the 4-byte transaction ID. **Note:** The exit program must not change the TRANSID of tasks started by automatic transaction initiation (ATI). (This is because CICS needs to match the TRANSID in its program control table with the TRANSID in the automatic initiate descriptor (AID) that was created in the AOR.)
Return codes	**UERCNORM**	Continue processing.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

VTAM working-set module exits XZCIN, XZCOUT, XZCOUT1, and XZIQUE

Note: None of the exits in the VTAM working-set module is available for advanced program-to-program communication (APPC, or LUTYPE6.2) links.

XZCIN

Table 94. Exit XZCIN

When invoked	After an input event.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). Your exit program should not change the address. The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces.
Return codes	**UERCNORM**	Continue processing.
XPI calls	All can be used. However, we do not recommend that you use a GETMAIN call to obtain terminal-class storage for use as a replacement TIOA. This is because there are several internal pointers to the TIOA, and if any one of these is not updated the application may experience problems.	
API and SPI commands	Must not be used.	

XZCOUT

Table 95. Exit XZCOUT

When invoked	Before an output event.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). Your exit program should not change the address. The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces. **Note:** In certain circumstances—for example, when XZCOUT is invoked before the send of a NULL RU—UEPTIOA contains zeroes.
Return codes	**UERCNORM**	Continue processing.
XPI calls	All can be used. However, we do not recommend that you use a GETMAIN call to obtain terminal-class storage for use as a replacement TIOA. This is because there are several internal pointers to the TIOA, and if any one of these is not updated the application may experience problems.	
API and SPI commands	Must not be used.	

XZCOUT1

Table 96. Exit XZCOUT1

When invoked	Before a message is broken into RUs.	
Exit-specific parameters	**UEPTCTTE**	Address of the terminal control table terminal entry (TCTTE). The TCTTE can be mapped using the DSECT DFHTCTTE.
	UEPTIOA	Address of the terminal input/output area (TIOA). Your exit program should not change the address. The TIOA can be mapped using the DSECT DFHTIOA. However, fields TIOASAL and TIOASCA are **not** programming interfaces.
Return codes	**UERCNORM**	Continue processing.
XPI calls	All can be used. However, we do not recommend that you use a GETMAIN call to obtain terminal-class storage for use as a replacement TIOA. This is because there are several internal pointers to the TIOA, and if any one of these is not updated the application may experience problems.	
API and SPI commands	Must not be used.	

XZIQUE exit for managing intersystem queues

You can use the XZIQUE exit to control the number of queued requests for sessions on intersystem links (allocate queues).

Note: There are several methods that you can use to control the length of intersystem queues. For a description of the various methods, see the *CICS Intercommunication Guide*.

The XZIQUE exit enables you to detect queuing problems (bottlenecks) early. It provides more function than the XISCONA global user exit (described on page 80), which is invoked only for function shipping requests. XZIQUE is invoked for transaction routing, DPL, asynchronous processing, and distributed transaction processing requests, as well as for function shipping. Compared with XISCONA, it receives more detailed information on which to base its decisions.

XZIQUE enables allocate requests to be queued or rejected, depending on the length of the queue. It also allows a connection on which there is a bottleneck to be terminated and then re-established.

Interaction with the XISCONA exit

There is no interaction between the XZIQUE and XISCONA global user exits. If you enable both exits, XISCONA and XZIQUE could both be invoked for function shipping requests, which is not recommended. You should ensure that only one of these exits is enabled. Because it provides more function and greater flexibility, it is recommended that you use XZIQUE rather than XISCONA.

When the XZIQUE exit is invoked

The XZIQUE global user exit is invoked, if it is enabled, at the following times:

- Whenever CICS tries to acquire a session with a remote system and there is no free session available. It is invoked whether or not you have specified the QUEUELIMIT option on the CONNECTION definition, and whether or not the limit has been exceeded. It is not invoked if the allocate request specifies NOQUEUE or NOSUSPEND.

  Requests for sessions can arise in a number of ways, such as explicit EXEC CICS ALLOCATE commands issued by DTP programs, or by transaction routing or function shipping requests.

- Whenever an allocate request succeeds in finding a free session, after the queue on the connection has been purged by a previous invocation of the exit program. In this case, your exit program can indicate that CICS is to continue processing normally, resuming queuing when necessary.

Using an XZIQUE global user exit program

When the exit is enabled, your XZIQUE global user exit program is able to check on the state of the allocate queue for a particular connection in the local system. Information is passed to the exit program in a parameter list, that is structured to provide data about non-specific allocate requests, or requests for specific modegroups, depending on the session request. Non-specific allocate requests are for MRO, LU6.1, and APPC sessions that do not specify a modegroup.

Using the information passed in the parameter list, your global user exit program can decide (based on queue length, for example) whether CICS is to queue the allocate request. Your program communicates its decision to CICS by means of one of the return codes CICS provides. These are:

UERCAQUE
This return code indicates that CICS is to queue the allocate request.

The total number of allocate requests queued against the connection is provided in field A14ESTAQ of the system entry statistics (for all non-specific allocates) or A20ESTAQ of the mode entry statistics (for specific modegroup allocates). See DSECTs DFHA14DS or DFHA20DS for details. CICS passes to the exit program, in the exit specific parameter UEPQUELIM, the QUEUELIMIT parameter from the connection definition.

If the limit has not been reached, you can return control to CICS with return code UERCAQUE.

UERCAPUR
This return code indicates that CICS is to reject the allocate request and return SYSIDERR to the application program, but leave the existing queue unchanged.

If the number of queued allocate requests has reached the limit set on the QUEUELIMIT parameter for the connection, you can request that CICS rejects the request. However, you should first check whether the state of the link is satisfactory. This means checking that the rate of allocation of sessions is acceptable. Use the time the queue was started, the current time, and the total number of allocates processed since the queue began, to determine the rate at which CICS is processing requests. The relevant fields are:

- UEPSAQTS and UEPSACNT, for non-specific allocate requests
- UEPMAQTS and UEPMACNT, for specific modegroup requests.

You can compare the calculated time with either:

1. The parameter from the connection definition, MAXQTIME, which is passed in the exit specific parameter UEPEMXQT, or
2. Some other preset time value

to determine whether CICS is allocating requests for sessions on this connection at an acceptable rate. If the processing time using this kind of formula is acceptable, return control to CICS with return code UERCAPUR to purge only this request.

UERCAKLL or UERCAKLM
These return codes indicate that you want CICS to deal with the request as follows:

- UERCAKLL—reject this request, purge all other queued allocate requests on this connection, and send an information message to the operator console.
- UERCAKLM—reject this request, purge all other queued modegroup allocate requests on this connection, and send an information message to the operator console.

If the queue limit has been reached but the performance of allocate processing against the queue is below the acceptable limits defined in your user exit program, you can return control to CICS as follows:

- For non-specific allocate requests, use return code UERCAKLL. UERCAKLL also returns SYSIDERR to all application programs waiting on the purged allocate requests. CICS sets the UEPFLAG parameter to UEPRC8 on subsequent calls to your XZIQUE exit program to indicate that UERCAKLL was returned previously to purge the queue.
- For specific modegroup allocate requests, use return code UERCAKLM. UERCAKLM also returns SYSIDERR to all application programs waiting on the purged allocate requests. CICS sets the UEPFLAG parameter to UEPRC12 on subsequent calls to your XZIQUE exit program to indicate that UERCAKLM was returned previously to purge the queue.

Purging a queue that is causing congestion in the flow of tasks frees task slots that are needed to prevent the system becoming clogged. The more you allow a session queue to grow, the more likely you are to reach the task ceiling set by the MXT system initialization parameter, and then cause a queue of incoming tasks in the local region that cannot be attached. Note that some internal CICS requests (such as those for the LU services model transactions CLS1, CLS2, and CLS3) are not purged by return codes UERCAKLL and UERCAKLM.

If a queue has been purged previously (with UERCAKLL or UERCAKLM) but there are no queued requests currently, check the number of successful allocates since the queue was last purged. For non-specific allocate requests, this number is in UEPSARC8, and for specific modegroup requests, this number is in UEPMAR12. If no requests of this type have been allocated on this connection since the queue was last purged, the problem that caused the purge previously has not been resolved, and this request should be rejected with UERCAPUR.

If the UEPSARC8 or UEPMAR12 parameters show that allocates are being processed, you should use UERCAQUE to resume queuing of requests. If you return with UERCAQUE in this case, CICS issues an information message to the console to signal that queuing has been resumed.

Note: The address of the system entry statistics record, UEPCONST, is supplied for both non-specific and specific modegroup allocate requests.

The address of the modegroup statistics record, UEPMODST, is set to zeros for non-specific allocate requests. This address is supplied only if the request is for a specific modegroup.

If the exit is invoked after a successful allocate following the suppression of queuing, you can use the following return code:

UERCNORM
This return code indicates that CICS is to resume normal processing on the link, including queuing of requests.

Statistics fields in DFHA14DS and DFHA20DS

There are some statistics fields that your XZIQUE global user exit program can use to control queues.

A14EALRJ: Each time an XZIQUE global user exit program returns with a request to reject a request, CICS increments a field in the system entry connection statistics. This is A14EALRJ (allocate rejected) in DSECT DFHA14DS. This field is provided to help you to tune the queue limit. Normally, if the number of sessions and the queue limit defined for a link are correctly balanced, and there has been no abnormal congestion on the link, the A14EALRJ should be zero. If the rejected allocates field is non-zero it probably indicates that some action is needed.

A14EQPCT and A20EQPCT: Each time an XZIQUE global user exit program returns with a request to purge a queue, CICS increments a field in either the system entry or mode entry connection statistics. These fields are:

A14EQPCT The count of the number of times the queue has been purged for the connection as a whole.

A20EQPCT The count of the number of times the mode group queue has been purged.

For detailed information about statistics fields, what they contain and how they are updated, see the *CICS Performance Guide*.

Table 97 (Page 1 of 3). Exit XZIQUE

When invoked	Whenever: 1. An allocate request for a session is about to be queued 2. An allocate request succeeds following previous suppression of queuing.	
Exit-specific parameters	**UEPZDATA**	Address of the 70-byte area containing the information listed below. This area is mapped by the DSECT in copybook DFHXZIDS.
Area addressed by UEPZDATA	**UEPSYSID**	The 4-byte SYSID of the connection.
	UEPREQ	A 2-byte origin-of-request code, which can have the following values: **TR** Transaction routing. **FS** Function shipping (includes distributed program link). **AL** Other kinds of intercommunication (for example, distributed transaction processing (DTP) or CPI Communications).
	UEPREQTR	The 4-byte identifier of the requesting transaction (applicable only when the origin-of-request code is FS or AL).
	UEPTRANR	The 4-byte identifier of the transaction being routed (applicable only when origin of request is TR).
	UEPFLAG	A 1-byte flag indicating whether a return code 8 or return code 12 was issued last time the exit was invoked. **UEPRC8** The exit program returned control to CICS on the previous invocation with return code 8. **UEPRC12** The exit program returned control to CICS on the previous invocation with return code 12.
	UEPPAD	A 1-byte padding field.
	UEPFSPL	Address of the 10-byte function shipping parameter list.
	UEPCONST	Address of the 98-byte system entry statistics record (this can be mapped using DSECT DFHA14DS).
	UEPMODST	Address of the 70-byte modegroup statistics record for the modegroup specified in the relevant CICS profile. This field applies only to APPC connections for a specific allocate. For LU61, IRC, or non-specific APPC allocates, it contains zero. The statistics record can be mapped using DSECT DFHA20DS. The modegroup name field (A20MODE) may contain blanks. The record is followed by a fullword of `X'FFFFFFFF'`.

Table 97 (Page 2 of 3). Exit XZIQUE		
Area addressed by UEPZDATA (continued)	**UEPSTEX**	A 6-byte area containing additional current statistics for APPC that are not already in the modegroup statistics record (DFHA20DS). For specific allocates, the numbers refer to the specified modegroup only. For non-specific allocates, they refer to the whole connection—that is, they are the totals of each modegroup. The 6-byte area contains: **UEPEBND** A halfword binary field containing the number of bound sessions. **UEPEWWT** A halfword binary field containing the number of contention winners with tasks. **UEPELWT** A halfword binary field containing the number of contention losers with tasks.
	UEPEMXQT	A halfword binary field containing the maximum queuing time specified for the connection (MAXQTIME on the CONNECTION resource definition).
	UEPMDGST	Address of a set of 70-byte modegroup statistics records—one for each user modegroup for the connection. This field applies only to APPC connections for a non-specific allocate. For LU61, IRC, and APPC specific allocates, it contains zero. Each statistics record can be mapped using DSECT DFHA20DS. The modegroup name field (A20MODE) may contain blanks. The end of the set of records is indicated by a fullword of `X'FFFFFFFF'`.
	Non-specific allocates data: The following three fields contain data relating to MRO, LU6.1, and non-specific APPC allocates:	
	UEPSAQTS	A double-word binary field containing the time stamp from the TCT system entry indicating the time the queue of non-specific requests was started.
	UEPSACNT	A half-word binary field containing the number of all non-specific allocates processed since the queue was started (see UEPSAQTS for the start time).
	UEPSARC8	A half-word binary field containing the number of sessions freed since the queue was last purged as a result of a UEPCAKLL return code to CICS.

Table 97 (Page 3 of 3). Exit XZIQUE

	Specific allocates data: The following three fields contain data relating to specific modegroup allocates. They are applicable only when UEPMODST is non-zero (that is, it contains the address of the relevant modegroup statistics).	
	UEPMAQTS	A double-word binary field containing the time stamp from the TCT mode entry indicating the time that the modegroup queue was started for this specific modegroup.
	UEPMACNT	A half-word binary field containing the number of all specific allocates for this modegroup processed since the queue was started (see UEPMAQTS for the start time).
	UEPMAR12	A half-word binary field containing the number of modegroup sessions freed since the queue was last purged as a result of a UEPCAKLL return code to CICS.
	UEPQUELM	A half-word binary field containing the queue limit specified for this connection (QUEUELIMIT on the CONNECTION definition).
Return codes	In the case of an allocate that is about to be queued, use one of the following:	
	UERCAQUE	Queue the allocate request.
	UERCAPUR	Reject the allocate request with SYSIDERR.
	UERCAKLL	Reject this allocate request with SYSIDERR. Purge all other queued allocate requests and send an information message to the operator console. CICS also returns SYSIDERR to all application programs waiting on the purged allocate requests.
	UERCAKLM	Reject this allocate request for the modegroup and return SYSIDERR. Purge all other queued allocate requests for the modegroup specified on this allocate request and send an information message to the operator console. Retry the modegroup after an interval.
	UERCPURG	Task purged during XPI call.
	In the case of a successful allocate following the use of UERCAKLL or UERCAKLM, on a previous invocation of the exit, use one of the following:	
	UERCNORM	Resume normal operation of the link or modegroup.
	UERCAPUR	Reject the allocate request with SYSIDERR.
XPI calls	All can be used.	
API and SPI commands	Must not be used.	

Designing an XZIQUE global user exit program

The functions of your XZIQUE exit should be designed:

1. To control of the number of tasks (and the amount of associated resource) that are waiting in a queue for a free intersystem session. Waiting tasks can degrade the performance of the local system.
2. To detect poor response from the receiving (remote) system and to notify the operator (or automatic operations program).
3. To cause CICS to issue a message when the link resumes normal operation.

The XZIQUE global user exit parameter list is designed to support these objectives.

Design considerations

The information passed at XZIQUE is designed to enable your XZIQUE global user exit program to:

- Avoid false diagnosis of problems on the connection by distinguishing poor response times from a complete bottleneck
- Ensure that a link resumes normal operation quickly and without operator intervention once any problem in a remote system is resolved.

Some guidance on the use of IRC/ISC statistics

CICS adds an entry for unsatisfied allocate requests to the following queues:

Non-specific (generic) allocate queue
All non-specific allocate requests are queued in this single queue. CICS makes the total number of entries in this queue available in the system entry statistics field A14ESTAQ, to which your global user exit program has access by means of the address of the system entry statistics, which is passed in UEPCONST.

Specific modegroup allocate queues
Specific allocate requests are queued in the appropriate modegroup queue—one queue for each specific modegroup name. CICS makes the total number of entries in all these queues available, as a single total, in the mode entry statistics field A20ESTAQ, to which your global user exit program has access by means of the address of the mode entry statistics, which is passed in UEPMODST.

Sample exit program design

A sample XZIQUE exit program is provided with CICS Transaction Server for VSE/ESA Release 1 as a base for you to design your own global user exit program. It is called DFH$XZIQ, and is supplied in the VSE/ESA sublibrary PRD1.BASE. The DSECT used by the sample program to map the area addressed by UEPZDATA is called DFHXZIDS, and this too is supplied in the PRD1.BASE sublibrary.

As supplied, the sample exit program implements the same basic function as described for the QUEUELIMIT and MAXQTIME parameters on the RDO CONNECTION resource definition. If the XZIQUE exit is not enabled, CICS uses these parameters to control the existence and length of the queue of allocate requests. If you enable the exit, the parameters from the connection definition are passed to your XZIQUE global user exit program, which can change the way in which these parameters are used.

The exit program also demonstrates how to control allocate requests for a particular modegroup, based on the same QUEUELIMIT and MAXQTIME parameters.

For information about creating RDO CONNECTION definitions, see the *CICS Resource Definition Guide*.

Overview of the sample exit program: The program uses the exit-specific parameters passed by CICS to determine the state of the connection, and to request the appropriate action, as follows:

1. The connection is operating normally; a queue may exist, but is of short length.

   In this case, the exit program returns with UERCAQUE to indicate that CICS is to **queue the request**.

2. The response from the partner system is slower than the rate of requests demands, and the queue length has grown to the limit specified on the QUEUELIMIT parameter. The partner system is still operating normally, but is overloaded.

   In this case, the exit program returns with UERCAPUR to indicate that CICS is to **purge the request**.

3. The queue has reached the limit specified by the QUEUELIMIT parameter, **and** requests that join the queue are expected to take longer to be satisfied than the time defined by the MAXQTIME parameter. (The estimated time for a request to complete is calculated by dividing the number of successful requests since the queue first formed by the time elapsed since it formed. These statistics are passed to the exit in the parameter list.)

   These criteria are used to determine that the connection is not operating correctly, and that continued queuing of tasks is not helpful. In this case:

   - The exit returns with UERCAKLL requesting CICS to **purge all queued** user requests from the connection. The SYSIDERR condition is returned to the application program.
   - CICS issues message DFHZC2300 to warn that a connection is not performing as expected.

4. The queue has been purged as a result of a previous invocation of the global user exit program, there are still no free sessions, and the request is about to be queued.

   In this case, the exit program returns with UERCAPUR to indicate that CICS is to **purge the request**. This also leaves the UEPRC8 flag set.

5. The queue has been purged as a result of a previous invocation of the global user exit program. A new allocate request has been received and is about to be allocated because a session has become free.

   CICS invokes the exit program to enable it to indicate that normal processing can continue.

   In this case, the exit program returns with UERCNORM to indicate that CICS is to **continue processing normally**. This also causes the UEPRC8 flag to be unset following this invocation, and CICS to issue message DFHZC2301.

The sample program also monitors the length of queues for modegroup-specific allocate requests and controls these—in the same way as the queue for the whole connection—using the QUEUELIMIT parameter and MAXQTIME parameters.

If both UEPRC8 and UEPRC12 are set, UERCNORM is required twice to resume normal operation. The UEPRC8 condition is reset first in this case.

Extensions to the sample program: The sample exit program does not attempt to control the queue length, or detect poor response for a particular modegroup differently from the whole connection. This kind of enhancement is something you might want to add to your own exit program if your applications request specific modegroups via the allocate command (or via a transaction profile) and you think it would be useful to control the modegroups individually.

You can also use more complex decisions (such as adding time delays to lessen the risk of false diagnosis) to decide when to issue the return codes that purge the queue, and allow queuing to restart.

Chapter 2. Task-related user exit programs

General-use programming interface

This chapter describes a special kind of user exit called a **task-related user exit**. A task-related user exit allows you to write your own program to access a resource, such as a database, that would not otherwise be available to your CICS system. Such a resource is known as a non-CICS resource. The exit is said to be task-related because it becomes part of the task that invoked it and because, unlike a global user exit, it is not associated with an exit point. You do not have to use any of the task-related user exits, but you can use them to extend and customize the function of your CICS system according to your own requirements.

The most common use of a task-related user exit is to communicate with a resource manager external to CICS, for example, a file or database manager. The CICS interface modules that handle the communication between the task-related user exit and the resource manager are usually referred to as the resource manager interface (RMI) or the task-related user exit interface.

The chapter is divided into the following sections:

1. **“Introduction to the task-related user exit mechanism (the adapter)”**
2. **“The stub program”** on page 204
3. **“The task-related user exit program”** on page 206
4. **“Adapter administration”** on page 232

Introduction to the task-related user exit mechanism (the adapter)

The task-related user exit mechanism is known as an **adapter** because it provides the connection between an application program that needs to access a non-CICS resource and the manager of that resource. Figure 4 on page 204 illustrates the adapter concept.

The adapter is made up of three or more locally-written programs. These are a “stub” program, a task-related user exit program, and one or more administration routines or programs.

The **stub program** intercepts a request (for example, to access data held on an external database manager) issued by the calling application program. The stub can be used to resolve a locally-defined high-level language command into a task-related user exit macro call, DFHRMCAL, which then causes CICS to pass control to the task-related user exit program.

The **task-related user exit program** translates commands for accessing a non-CICS resource into a form acceptable to the resource manager. The program must be written in assembler language, and can reside above or below the 16MB line. For more guidance information about addressing and residency modes, refer to “Addressing-mode implications” on page 219. The program must not alter the contents of any access registers. It is executed in response to a specific application program request, for example, to read data from an external database. In this instance, it may be passed application data, such as a search argument for a required record. Responses from the resource manager are passed back to the calling program by the task-related user exit program.

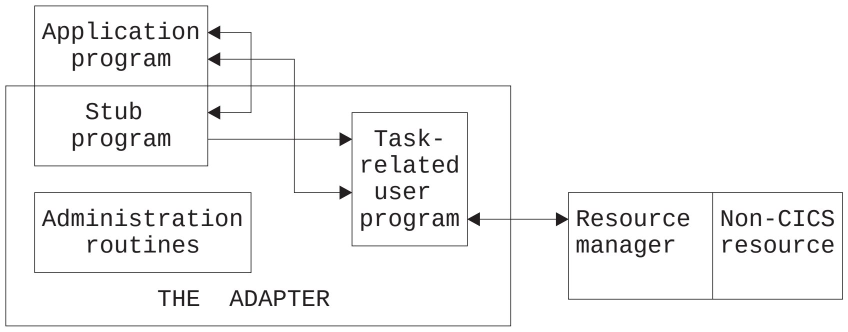


Figure 4. The adapter concept

The task-related user exit program is provided with a parameter list (DFHUEPAR) by the CICS management module that handles task-related user exits. This parameter list gives the task-related user exit access to information such as the addresses and sizes of its own work areas.

The task-related user exit program may be invoked by the CICS task manager and the CICS syncpoint manager, as well as by an application program. It may also be invoked at CICS termination or by the Execution Diagnostic Facility (EDF). The parameter list serves to distinguish between these various callers, and gives access to a register save area containing the caller's registers.

The **administration routines** contain the EXEC CICS ENABLE and DISABLE commands that you use to install and withdraw the task-related user exit program. The administration routines may also contain commands to retrieve information about one of the exit program's work areas (the EXEC CICS EXTRACT EXIT command), and to resolve any inconsistency between CICS and a non-CICS resource manager after a system failure (the EXEC CICS RESYNC command). For programming information about the EXEC CICS RESYNC command, refer to the *CICS System Programming Reference* manual.

The remainder of this chapter discusses each of these parts of the adapter in turn.

The stub program

The purpose of the stub program is to shield your application programmers from the mechanics of non-CICS resource managers. It is written in assembler language. After assembly, the stub is link-edited to each application program that wants to use it. See Figure 5 on page 205.

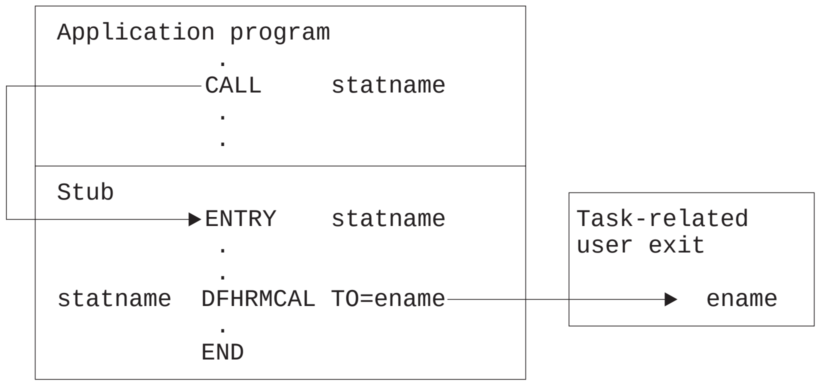


Figure 5. The stub concept

statname is a label that can be referenced externally. It should conform to the requirements of an assembler-language ENTRY statement, and typically resolves a V-type address constant, or the target of a high-level language CALL. A single stub may contain several such labels.

ename is the entry name (specified on the EXEC CICS ENABLE command) of the task-related user exit program that you want to handle resource manager requests.

You can define high-level language commands for your programmers to use when they want to access a non-CICS resource. If you do this, you must use a translator to convert a locally-defined high-level language command into a conventional CALL to the required entry point of the stub program. Alternatively, the application program can issue a CALL naming the stub entry point, as shown in Figure 5. For example, to read a record from a non-CICS resource, an application program can use the COBOL statement:

```
CALL 'XYZ' USING PARM1 PARM2...
```

XYZ is an entry point (the statname) in your stub program. The stub converts the command into a macro call (DFHRMCAL) to the task-related user exit program, specified in the TO= operand. Return from the task-related user exit program is to the calling application program, not to the stub program.

The application can use a parameter to determine whether the resource manager was called. For example, if the application sets a parameter to zero and the resource manager sets it to nonzero, the parameter value on return indicates whether the resource manager was invoked.

Returning control to the application program: If you specify RTNABND=YES in the DFHRMCAL macro, control returns to the application program when the task-related user exit is not available, for example, because it is not enabled or started. Note that for assembler-language application programs, a negative value in register 15 signals to the application program that control has returned because the exit is not available. The task-related user exit program can use positive values (including zero) in register 15 to pass resource manager response codes to the application program.

If you do not specify RTNABND=YES and the task-related user exit is not available, the application program terminates abnormally with the abend code ‘AEY9’.

Task-related user exits and EDF: When a task-related user exit (TRUE) is invoked for a call to a non-CICS resource manager from an application that is being monitored by EDF, EDF's default action is to display the parameters that are addressed by the parameter list passed by the DFHRMCAL macro. However, the parameter list can be transformed into a more meaningful display by the TRUE itself. This is done by specifying FORMATEDF on the EXEC CICS ENABLE command that enables the TRUE. The latter is then invoked several times, before and after the invocation to satisfy the call to the resource manager, to format the data to be displayed by EDF and to deal with any changes made by the user to the data on the EDF screen.

For more information about how to format screens for EDF, refer to "CICS EDF build parameters" on page 214 and "Using EDF with your task-related user exit program" on page 231.

If a task-related user exit program contains EXEC CICS commands, EDF may be useful in debugging the TRUE itself. If you want EDF to display commands from the TRUE, you must specify the EDF option when the TRUE program is translated. The standard EDF screens for the CICS commands are then displayed between the "About to Execute" and "Command Execution Complete" screens for the call to the resource manager. However, as EDF is primarily an application debugging tool and the CICS commands within the TRUE would not generally be of interest to the application programmer, the TRUE program is normally translated with the "NOEDF" option; in this case, screens for CICS commands within the TRUE are suppressed.

Note: If you specify SUPPEDF=YES on the DFHRMCAL macro, the "About to Execute" and "Command Execution Complete" screens relating to DFHRMCAL's invocation of the TRUE are suppressed; in other words, DFHRMCAL becomes "invisible" to EDF. (Specifying SUPPEDF=YES has no effect in determining whether EDF displays EXEC CICS commands within the TRUE—the factors governing this are as described above—but it **does** suppress the display of parameters passed to the TRUE.)

The task-related user exit program

The main function of the task-related user exit program is to translate the calling program's parameters into a form acceptable to your non-CICS resource manager, and then to pass control to the resource manager. You therefore need to be familiar with your resource manager's syntax requirements. The calling program's parameters are described on page 210.

This section describes the user exit parameter lists, the schedule flag word, which is used by the exit program to register its need to be invoked by CICS management services, and register-handling in the task-related user exit program. This section also discusses the use of the CICS syncpoint manager and the CICS task manager.

User exit parameter lists

When a task-related user exit is invoked, the CICS management module that handles task-related user exits provides the exit with a parameter list. The address of this parameter list is passed in register 1. The list contains the following information:

- The identity of the caller
- Addresses and sizes of any work areas that are available to the task-related user exit program
- The address of the register save area of the caller
- The address of an EXEC interface block (EIB) that is for use by the task-related user exit program during this invocation
- The address of the identifier of the current unit of recovery
- The address of the schedule flag word
- The address of the kernel stack entry
- The address of the APPC unit of work (UOW) identifier
- The address of the user security block flag
- The address of the user security block
- The address of the resource manager qualifier name
- The address of the resource manager's "single-update" and "read-only" indicator byte
- The address of the caller's AMODE indicator byte
- The address of the application's DATALOC and TASKDATAKEY indicator byte

To enable your exit program to access this parameter list, you must include in it the macro:

```
DFHUEXIT TYPE=RM
```

The DFHUEXIT TYPE=RM macro causes the assembler to create the storage definitions (DSECTs) DFHUEPAR and DFHUERTR. If you want your task-related user exit to be able to format screens for EDF, you must include in it the macro:

```
DFHUEXIT TYPE=RM,DSECT=EDF
```

This causes the assembler to create the UEPEDFRM DSECT, which is described in "CICS EDF build parameters" on page 214. All of the user exit parameter lists are summarized in Figure 7 on page 216.

The format and the purpose of these definitions are described below.

DFHUEPAR

DFHUEPAR gives you the following symbolic names for address parameters:

UEPEXN	Address of the function definition, which tells the task-related user exit program why it is being called. See "DFHUERTR (the function definition)" on page 210 for more details.

UEPGAA	Address of the global work area requested in the EXEC CICS ENABLE command. The global work area is described on page 222. CICS initializes this work area to X'00' when the task-related user exit program is enabled.
UEPGAL	Address of a halfword containing the length (binary value) of the global work area.
UEPTCA	This field is retained for historical reasons. It should **not** be referenced by your exit program.
UEPCSA	This field is retained for historical reasons. It should **not** be referenced by your exit program.
UEPHMSA	Address of the register save area (RSA) of the caller. It is an 18-word save area, with the contents of registers 14 through 12 stored in the fourth and subsequent words. Its fifth word, representing the calling program's register 15, is cleared by CICS before the task-related user exit program is invoked, so that it can be used to convey response codes from the resource manager to the calling program. For this reason you cannot use register 15 to send data to the task-related user exit program. The seventh word of the save area contains the caller's register 1. Register 1 addresses the caller's parameter list if the exit program is being invoked by the CICS task manager or the CICS syncpoint manager, by EDF, or at CICS termination. When the caller is an application program, the contents of register 1 are determined by the linkage conventions of the adapter's language interface.
UEPTAA	Address of the local work area requested in the EXEC CICS ENABLE command. The local work area is described on page 222. CICS initializes the work area to X'00' throughout on first acquiring the area; that is, when the task first invokes the task-related user exit program.
UEPTAL	Address of a halfword containing the binary length of the local work area.
UEPEIB	Address of the EXEC interface block (EIB) created by CICS for the task-related user exit program. The EIB exists only for the duration of the call and it allows the task-related user exit program to request CICS services through the command-level interface. This is not the same EIB that is available to the calling program, so you cannot access the calling program's environment other than by UEPHMSA (see above), which provides the address of the calling program's register save area (RSA).
UEPURID	Address of CICS unit of recovery identifier. This field contains the 8-byte date and time value that is generated by an STCK instruction, and it identifies the current logical unit of work.
UEPFLAGS	Address of the schedule flag word. This is a fullword that the task-related user exit program uses to register its need for CICS management programs' services. For more information, see "The schedule flag word" on page 217.
UEPRMSTK	Address of the kernel stack entry.
UEPUOWDS	Address of the APPC unit of work (UOW) identifier.

UEPSECFLG Address of the user security flag. The user security flag is a 1-byte field that can take the following values:

UEPNOSEC (X'80')
Security is not active for this CICS system.

UEPSEC (X'20')
Security is active for this CICS system. Only in this case is the address of the “user security block” set.

UEPSECBLK Address of a fullword that addresses the “user security block”—that is, the ACEE.

UEPRMQUA Address of an 8-byte field into which the task-related user exit can move the qualifier name of the resource manager on each API request. Where different resource manager qualifiers are returned on the responses to various API requests within an LUW, it is the resource manager qualifier returned on the final API request immediately before a prepare or backout invocation that is used when recording any in-doubt information. For programming information about the purpose of the qualifier name, refer to the *CICS System Programming Reference* manual.

UEPCALAM Address of caller’s AMODE indication byte.

X'80' Indicates that the original caller was in AMODE 31. If the bit is not set, then the caller was in AMODE 24.

UEPSYNCA Address of the single-update and read-only indication byte. This field contains flags that your exit program can set to indicate that the resource manager “understands” the single-update protocol, and to record the status of the current logical unit of work (LUW). See “Increasing efficiency—single-update and read-only protocols” on page 222.

UEPSUPDR (X'80')
The resource manager understands the single-update protocol. That is, your exit program can instruct the resource manager to perform a single-phase commit, in appropriate circumstances.

UEPREADO (X'40')
The resource manager understands the read-only protocol, and has been in read-only mode for this LUW so far. (If this flag is not set, it means either that the LUW contains updates for this resource manager, or that the LUW may be read-only but the resource manager does not understand the read-only protocol.)

UEPTIND Address of a 1-byte field containing indicator bits. The indicators are represented by two symbolic values, UEPTANY and UEPTCICS, which you can test to determine whether data locations can be above or below the 16MB line, and whether the application’s storage is in CICS-key or user-key storage.

UEPTANY (X'80')
The application can accept addresses above the 16MB line. If the symbolic value is not UEPTANY, the application must be returned an address below the 16MB line.

UEPTCICS (X'40')
The application's working storage and task life-time storage are in CICS-key storage (that is, if TASKDATAKEY=CICS is specified on the RDO TRANSACTION definition). If the symbolic value is not UEPTCICS, the application's working storage and the task's life-time storage are in user-key storage (TASKDATAKEY=USER).

DFHUERTR (the function definition)

The function definition identifies the caller of the task-related user exit program. The DSECT contains two symbolic definitions (fields).

UERTFGP A single byte that is set to X'00'. The zero setting shows that this is a task-related user exit invocation and that the parameter list therefore includes the fields UEPTAA, UEPTAL, UEPEIB, UEPURID, and UEPFLAGS.

UERTFID A single-byte identifier that shows whether this call has been made by an application program, the CICS syncpoint manager, the CICS task manager, or EDF, or whether this is a CICS termination call. It can have one of the following five settings:

UERTAPPL (X'02')	The calling program is an application program.
UERTSYNC (X'04')	The calling program is the syncpoint manager.
UERTTASK (X'08')	The calling program is the CICS task manager.
UERTCTER (X'0A')	This is a CICS termination call.
UERTFEDF (X'0C')	The calling program is EDF.

It is important to know which type of program has made the call because it affects how the calling program's parameter list is interpreted by the task-related user exit program.

Caller parameter lists

In addition to the DSECTs DFHUEPAR and DFHUERTR, the inclusion of DFHUEXIT TYPE=RM in the task-related user exit program provides some field definitions that are specific to the caller of the task-related user exit. The calling program's parameter list is normally addressed by R1 in the calling program's RSA. This RSA is addressed by field UEPHMSA of DFHUEPAR. These parameters are described below.

Application program parameters: If the caller is an application program, the format and addressing of its parameter list are decided locally.

CICS syncpoint manager parameters: The CICS syncpoint manager's parameter list contains ten entries, although on most invocations only parameters 1 and 10 contain values. The operation bytes pointed to by parameters 1 and 10 contain flags which, when combined, form an operation code that tells the TRUE why it has been invoked.

Parameters 2 through 9 contain values only when the syncpoint manager makes a "Commit Unconditionally" or "Backout" call to the TRUE, for resynchronization purposes after a session or system failure. These extra parameters point to fields that identify the task, the transaction that started the task, the terminal from which it was initiated, the identity of the terminal operator, the date and time of the failing syncpoint, and (if there are no further units of recovery associated with the task) the next transaction code. Typically, you would use these values to create meaningful messages for resource recovery. They are presented explicitly because, after a system failure, the task driving the exit is not the task that originally scheduled the recoverable work. These additional parameters describe the **original** task's environment and are accessed directly.

The full parameter list is as follows:

Parameter 1
The address of operation byte 1, which contains the following flags:

UERTPREP
(X'80') Prepare to commit (that is, perform the first phase of a two-phase commit).

UERTCOMM
(X'40') Commit unconditionally (perform the second phase of a two-phase commit).

UERTBACK
(X'20') Backout.

UERTDGCS
(X'10') Unit of recovery is lost to CICS cold start.

UERTDGNK
(X'08') Resource manager should not be in doubt about this unit of recovery.

UERTRSYN
(X'02') This syncpoint request was generated as the result of an EXEC CICS RESYNC command.

UERTLAST
(X'01') There are no further units of recovery associated with this task. Note that when this bit is **not** set, there may or may not be further units of recovery. For this reason, it is not recommended that you rely on this bit to signal end-of-task. You should instead schedule the CICS task manager to drive you at end-of-task by setting the task manager bit in the schedule flag word. If you do use UERTLAST to signal end-of-task, and if at that stage you can complete your clean-up process, you can set the task manager bit off in the schedule flag word when the clean-up process is finished, to avoid an unnecessary invocation by the CICS task manager.

The only **valid bit combinations** are those produced by combining one of UERTPREP, UERTCOMM, UERTBACK, UERTDGCS, and UERTDGNK with either UERTLAST or UERTRSYN, or both.

Your exit program should examine the flags set both in this byte and in operation byte 2 (see parameter 10), to determine what action is expected of it.

Parameter 2
If not zero, the address of a 4-byte, packed-decimal field identifying the original task. But note that, on many invocations of the exit program, parameters 2 through 9 do not contain values. See note 1.

Parameter 3
Address of a 4-character field identifying the transaction that started the original task. See note 1.

Parameter 4
Address of a 4-character field identifying the terminal from which the original task was initiated. See note 1.

Parameter 5
Address of a 4-character field containing the identity of the terminal operator (OPID) who initiated the original task. See note 1.

Parameter 6
Address of a 4-byte, packed-decimal field containing the date of the failing syncpoint, in the format 0Cyyddd+. See note 1.

Parameter 7
Address of a 4-byte, packed-decimal field containing the time of the failing syncpoint, in the format 0hhmmss+. See note 1.

Parameter 8
Address of an 8-byte field containing the resource manager qualifier. See note 1.

Parameter 9
Address of a 4-character field containing the next transaction code. If the transaction ended with an EXEC CICS RETURN without specifying the next transaction code, the addressed field is set to nulls; otherwise, it is set to the value specified by the application. See note 2.

Parameter 10
The address of operation byte 2, which contains the following flags:

UERTONLY
(X'80') Perform a single-phase commit. (No recoverable resources other than those owned by the resource manager being invoked have been updated during the current LUW.)

UERTELUW
(X'40') Perform a single-phase commit. (The resource manager was in read-only mode throughout the current LUW.)

Your exit program should examine the flags set both in this byte and in operation byte 1 (see parameter 1), to determine what action is expected of it.

Notes:

1. Parameters 2 through 8 contain values only if the CICS syncpoint manager call is prompted by the issue of an EXEC CICS RESYNC command after a session or system failure, and operation byte 1 contains the bit settings UERTCOMM or UERTBACK. Otherwise, they are set to X'00' (hexadecimal zero). For programming information about the EXEC CICS RESYNC command and about the completion of the syncpointing procedure following a system failure, refer to the *CICS System Programming Reference* manual.

   Note that parameters 2 through 8 describe the environment of the **original** task (not of the task that is currently driving the TRUE).

2. Unless the UERTLAST bit is set in operation byte 1, parameter 9 is a zero address. Although for a call prompted by an EXEC CICS RESYNC call, the UERTLAST bit will be set on, in this case the next transaction code does not apply and so parameter 9 addresses a field set to nulls.

CICS task manager parameters: There are either one or two entries in the CICS task manager's parameter list, depending on the reason for the call to the TRUE: on start-of-task calls, the parameter list contains one entry, while on end-of-task calls, it contains two. Each entry consists of an address, and the end of the parameter list is indicated by the top bit of the address being set.

The significance of the parameters is as follows:

Parameter 1
The address of a single byte with bit definitions indicating the reason for the call:

UERTSOTR (X'40')	Start of CICS task
UERTEOTR (X'80')	End of CICS task

Parameter 2
This parameter is passed only on end-of-task calls. It is the address of a 4-character field which contains the next transaction code specified on the EXEC CICS RETURN command. If the transaction ends with an EXEC CICS RETURN without specifying a next transaction, this field is set to nulls.

The schedule flag word should be set during the start-of-task call if you want your task-related user exit program to be invoked unconditionally by the CICS syncpoint manager.

CICS termination manager parameters: All task-related user exit programs that have been enabled with the SHUTDOWN option of the EXEC CICS ENABLE command, and started, are invoked at CICS termination to allow them to do the clean-up processing that is appropriate to the type of termination. At CICS termination, the address of a one-byte termination code is passed to your exit program. The code may consist of any of the following bit settings:

UERTCORD (X'80')	CICS orderly shutdown.
UERTCIMM (X'40')	CICS immediate shutdown.
UERTCABY (X'20')	CICS abend, retry possible, TCBs dispatchable.
UERTCABN (X'10')	CICS abend, retry not possible, TCBs dispatchable.
UERTOPCA (X'01')	CICS abend, retry not possible, TCBs not dispatchable.

For further information about shutdown TRUEs, see "Coding a program to be invoked at CICS termination" on page 227.

CICS EDF build parameters: On EDF invocations, the address contained in register 1 of the calling program's RSA points to the UEPEDFRM DSECT. This contains the following fields:

UEPEDFR1 The address of the application's R1 parameter list.

UEPEDFFI The input flag byte. When a task-related user exit is invoked by EDF, UEPEDFFI can take the following bit settings:

UEPEDFRQ (X'80') “About to Execute” invocation.
UEPEDFRS (X'40') “Command Execution Complete” invocation.
UEPEDFRA (X'20') About to display command to EDF.
UEPEDFRC (X'10') Command has been displayed to EDF.
UEPEDFSC (X'08') EDF user has changed the screen.
UEPEDFWS (X'04') EDF user has changed working storage.
UEPEDFNO (X'01') EDF user has requested NOOP.

UEPEDFFO The output flag byte. If the task-related user exit requires, it can set the UEPEDFFO flag byte to indicate to EDF what action the task-related user exit wants EDF to take. It can take the following values:

UEPEDFDF (X'80') Take default CICS action. (EDF screen contains the uninterpreted caller's R1 parameter list.)
UEPEDFND (X'40') Do not display command to EDF.
UEPEDFRD (X'20') Redisplay command to EDF.

UEPEDFDL EDF screen attributes. These are for information only: the task-related user exit program cannot change these fields.

UEPEDFPS (halfword binary) Page size (number of lines).
UEPEDFLS (halfword binary) Line size.
UEPEDFMP (halfword binary) Maximum number of pages.

UEPEDFPA The address of the EDF display data parameter list, supplied by the task-related user exit. The display data parameter list is composed of alternating pairs of attribute-byte addresses and data-field addresses. Attribute bytes refer to the line of display data pointed to by the data-field addresses. The data field must be the same size as the value specified in UEPEDFLS. The display data is in the format shown in Figure 6 on page 215.

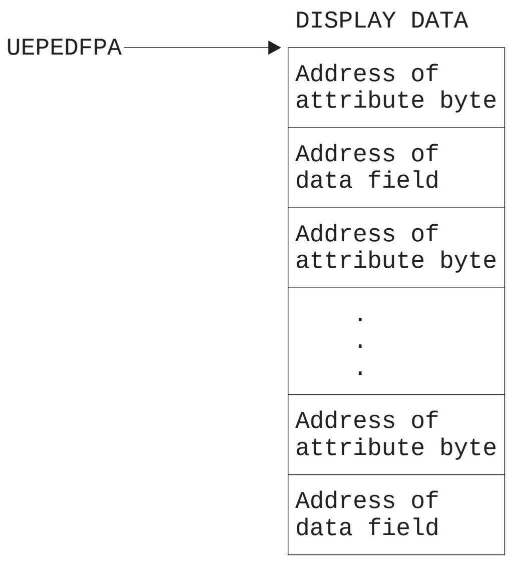

DISPLAY DATA
UEPEDFPA
Address of attribute byte
Address of data field
Address of attribute byte
.
.
.
Address of attribute byte
Address of data field

Figure 6. Display data parameter list

Notes:

1. CICS provides a list of named standard attribute bytes that you may want to use. These standard attribute bytes are contained within DFHBMSCA, which must be copied into your program. For programming information, including a list of the attribute bytes and their meanings, refer to the *CICS Application Programming Reference* manual.
2. The high-order bit must be set **on** in the last address, to indicate to EDF that this is the last address.

Summary of the task-related user exit parameter lists

Figure 7 on page 216 shows, in diagrammatic form, the relationships between the parameter lists that are discussed in the preceding sections.

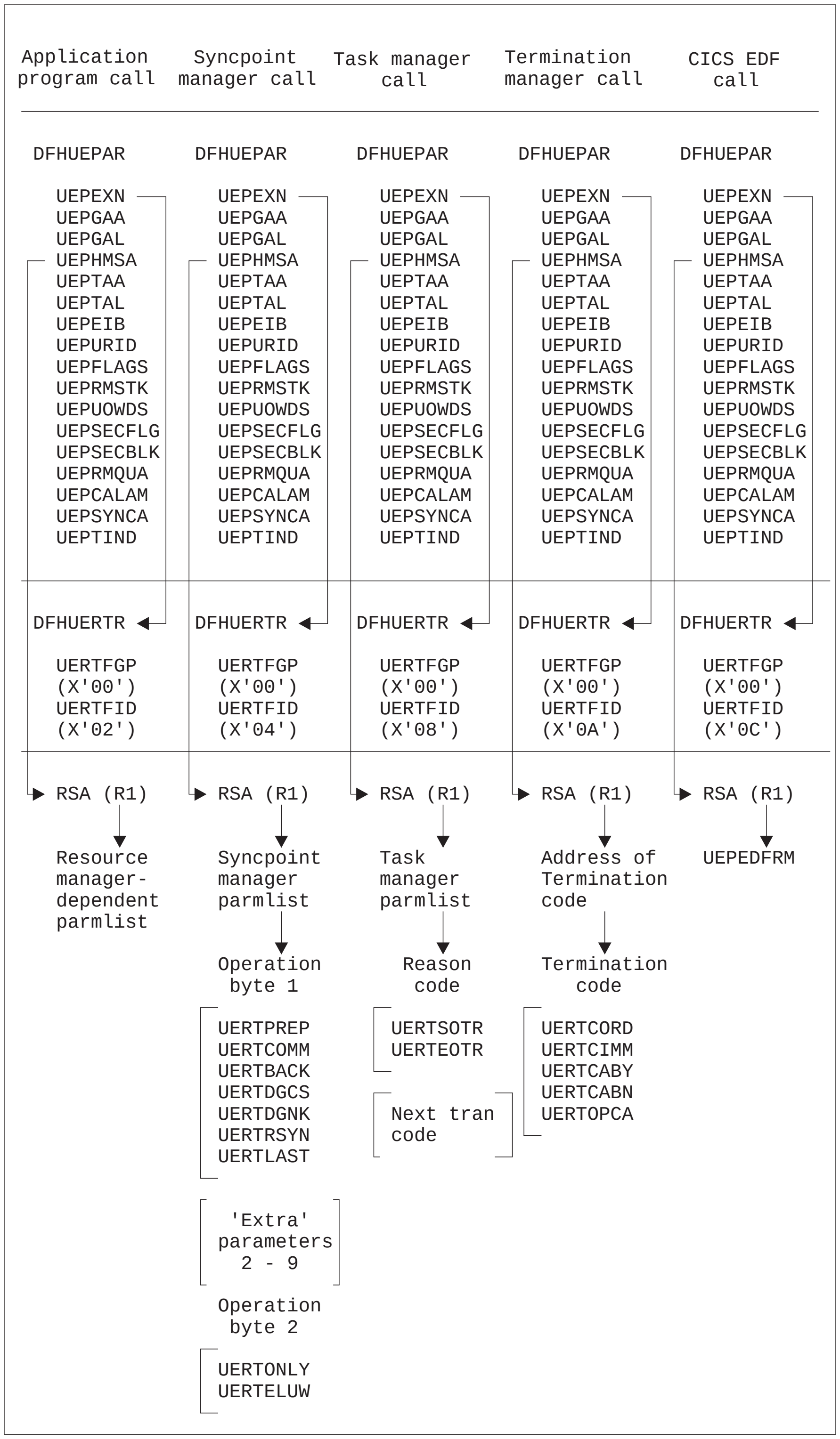


Figure 7. Task-related user exit parameter lists

The schedule flag word

The schedule flag word is a fullword indicator that the task-related user exit program uses to control its own invocation. It is also used by CICS to schedule the first invocation of a task-related user exit program. The schedule flag word is accessed by the address parameter UEPFLAGS of DFHUEPAR. There is a unique schedule flag word for each association between a CICS task and the ENTRYNAME specified when a task-related user exit program is enabled.

The default setting of the schedule flag word is for application program requests (that is, the last two bytes are set to X'0004').

The format of the schedule flag word is shown in Table 98.

Table 98. Format of the schedule flag word

Byte	Setting	Comments
0	—	Reserved.
1	—	Reserved.
2		
UEFDFEDF	UEFMFEDF (X'10')	Bit mask for EDF invocation.
UEFDTASK	UEFMTASK (X'01')	Bit mask for task manager exit.
3		
UEFDSYNC	UEFMSYNC (X'10')	Bit mask for syncpoint manager exit.
UEFDAPPL	UEFMAPPL (X'04')	Bit mask for application program exit.

The bit settings of the schedule flag word show which programs invoke your task-related user exit program. For example, if an exit program is to be invoked by the CICS task manager, the CICS syncpoint manager, **and** an application program, then the last two bytes of the schedule flag word are set to X'0114'. If an exit program is to be called by the CICS task manager and an application program only, the last two bytes of the flag word are set to X'0104'. Before the exit program is first called by a task, CICS sets the API flag bit on.

Before returning from any call, the task-related user exit can change the bit settings of the flag word to register its need to be invoked by a different CICS management service, or to register lack of interest in a service by setting the relevant flag bit to zero.

For example, a task-related user exit may be called by an application program that needs to access a non-CICS recoverable resource. When the exit program is first called, the API bit is set on by CICS. If the calling program then issues a request to update a record, the exit program sets the syncpoint manager bit on in the schedule flag word. When the calling application program subsequently issues a syncpoint command, or when end-of-task is reached, the CICS syncpoint manager calls the exit program.

Note: CICS sets the syncpoint manager bit off after every call to the syncpoint manager. This is to avoid the CICS syncpoint manager invoking the task-related user exit program for a unit of recovery during which the exit program did no recoverable work. The syncpoint manager bit must therefore be set on whenever the exit program performs any recoverable work.

If you set the task manager bit in the schedule flag word on, CICS invokes your task-related exit program at the end of this task. (Note that, if you want your exit program to be called at the **start** as well as at the end of a task, you must specify TASKSTART on the EXEC CICS ENABLE command for the TRUE. This causes the TRUE to be invoked at the start and end of **every** task.)

If the last two bytes of the schedule flag word are set to `X'1000'`, this indicates that the task-related user exit is interested in being invoked by EDF to format requests for display. This schedule flag bit UEFDFEDF is set **on** either by the EXEC CICS ENABLE FORMATEDF command, or by the task-related user exit. Unlike other schedule flag bits, there are restrictions on when the task-related user exit can register a lack of interest in EDF (that is, restrictions on when UEFEDFDF can be set off). Once a task-related user exit has formatted the initial screen for EDF to display on “About to Execute” or “Command Execution Complete”, CICS does not allow it to set the EDF bit UEFDFEDF off until the screen build cycle is complete.

Register handling in the task-related user exit program

In this section, two sets of registers are discussed:

1. The registers belonging to the CICS management module that handles task-related user exits. These are referred to as the **CICS registers**.
2. The registers belonging to the calling program and that are addressed by parameter UEPHMSA of DFHUEPAR. These are referred to as the **calling program’s registers**.

Saving CICS registers

Your task-related user exit program should begin by saving the contents of the CICS registers. Register 13 addresses an 18-word area into whose 4th and subsequent words your exit program should store registers 14 through 12. Three of the saved values have significance, as follows:

- The saved contents of register 14 contain the address within CICS to which the task-related user exit program returns control.
- The saved contents of register 15 contain the address at which the task-related user exit program has just been entered.
- The saved contents of register 1 address the parameter list (DFHUEPAR) that is provided by CICS for the task-related user exit program.

Note: As a general rule, if you fail to understand the origin or the purpose of a call, you should:

1. Restore any registers that you have used to the state they were in on entry to your code
2. Return to the address contained in CICS register 14.

The calling program’s registers

The calling program’s registers are stored at the address specified by UEPHMSA of DFHUEPAR. Where the calling program is a CICS management program, for example the syncpoint manager, the only caller registers that have significance are registers 1 and 15. Register 1 addresses the calling program’s parameter list. CICS sets the calling program’s register 15 to zero before the task-related user exit program is invoked. The calling program’s register 15 can sometimes be used to pass responses back to the calling program from the task-related user exit program, depending on the identity of the caller. If the calling program is a CICS management program, and the register is still zero on return, CICS assumes that its call was not understood. If the calling program is an application program, the significance of register settings on return are either described in your resource manager’s documentation, or defined locally.

Addressing-mode implications

The task-related user exit is invoked in the AMODE of the caller, unless the exit has been enabled with the LINKEDITMODE option of the EXEC CICS ENABLE command. This option enables the task-related user exit in its link-edit AMODE. Therefore, if the TRUE has been link-edited AMODE 31 and is enabled with the LINKEDITMODE option, it can be placed above the 16MB line. For programming information about the LINKEDITMODE option of the EXEC CICS ENABLE command, refer to the *CICS System Programming Reference* manual.

Important

You should avoid the use of the LINKEDITMODE option where the TRUE has been link-edited AMODE 24. This combination forces the TRUE *always* to run AMODE 24, which is unwise because:

- An AMODE 24 TRUE cannot be invoked from a transaction running with TASKDATALOC(ANY). This results in an ‘AEZB’ abend.
- Enabling an AMODE 24 TRUE for task start causes CICS to force all transactions to run with TASKDATALOC(BELOW).
- On a CICS termination call, CICS ignores LINKEDITMODE and invokes the TRUE in AMODE 31, if it detects that the TCA it is running under is above the 16MB line. (This is because, for some types of termination, such as a cancel, the TCA under which the TRUE will run is not predetermined.)

It is recommended that TRUEs are:

- Written so that they can always run AMODE 31
- Link-edited AMODE 31
- Enabled with the LINKEDITMODE option

If the task-related user exit has not been enabled with the LINKEDITMODE option of EXEC CICS ENABLE, it is invoked in the AMODE of the caller. For example, in the case of an application request, if the application is AMODE 24 at the time of the DFHRMCAL, the task-related user exit is invoked in AMODE 24. For this reason, task-related user exits which have been enabled without the LINKEDITMODE option must reside below the 16MB line.

Exit programs and the CICS storage protection facility

When you are running CICS with the storage protection facility, there are two points you need to consider for task-related user exits:

1. The execution key in which your task-related user exit programs run
2. The storage key of data storage obtained for your exit programs

Execution key for task-related user exit programs

When you are running with storage protection active, CICS always invokes task-related user exit programs in CICS key. Even if you specify EXECKEY(USER) on the program resource definition, CICS forces CICS key when it passes control to the TRUE. However, if a task-related user exit program itself passes control to another program (via a link or transfer-control command), the program thus invoked executes according to the execution key (EXECKEY) defined in its program resource definition.

Important

You are strongly recommended to specify EXECKEY(CICS) when defining both task-related user exit programs, and programs to which an exit program passes control.

Data storage key for task-related user exit programs

The storage key of storage used by task-related user exit programs depends on how the storage is obtained:

- Global or local work areas specified when an exit program is enabled, are always in CICS key.
- Any working storage obtained for the exit program is in the key set by the TASKDATAKEY of the transaction under which the exit program is invoked.
- Task-related user exit programs can use EXEC CICS commands to obtain storage by issuing:
  - Explicit EXEC CICS GETMAIN commands
  - Implicit storage requests as a result of EXEC CICS commands that use the SET option

  The default storage key for storage obtained by EXEC CICS commands is CICSDATAKEY. However, on an EXEC CICS GETMAIN command, the exit program can override the CICSDATAKEY by specifying USERDATAKEY.

Recursion within a task-related user exit program

The task-related user exit has the ability to invoke itself recursively. It can do this, for example, by issuing a DFHRMCAL call to its own entry name (as specified on the EXEC CICS ENABLE command). It can also be entered recursively if it performs an EXEC CICS SYNCPOINT when it is interested in SYNCPOINT invocations.

Using CICS services in your task-related user exit program

You might find some CICS services useful in your exit program. These can be invoked using EXEC CICS commands. However, you should take note of the following:

- If your program is invoked because of a CICS abend, it must not use any CICS services. See “Coding a program to be invoked at CICS termination” on page 227.
- DFHEIENT and DFHEIRET must be in your program. *But see the note about not using DFHEIENT in abend invocations, on page 228* . For further details of the DFHEIENT and DFHEIRET macros, see the *CICS Application Programming Reference* manual.
- If your exit program entry point is immediately followed by an occurrence of a DFHEIENT macro, inserted either implicitly by CICS or explicitly in the program, then the expansion of the DFHEIENT macro stores incorrect values at DFHEIBP and DFHEICAP. Your code can subsequently correct this by copying UEPEIB into DFHEIBP, reloading the EIB base register (DFHEIBR) from UEPEIB, and setting DFHEICAP to X'80000000'. For example,

  ```
  TESTPROG DFHEIENT CODEREG=2,EIBREG=11,DATAREG=10
           USING DFHUEPAR,1
           MVC   DFHEIBP,UEPEIB             Get correct EIB address
           L     DFHEIBR,UEPEIB             Reload EIB base register
           MVC   DFHEICAP,=X'80000000'
  ```

  Note that the entry point of a program does not have to be at the start of the program and can be positioned after the DFHEIENT macro.
- The DFHEIENT macro allocates dynamic storage to be mapped by the DFHEISTG DSECT. You must return to CICS by means of the DFHEIRET macro, which frees the dynamic storage.
- Command-level calls use registers 0, 1, 14, and 15.
- Do not issue a syncpoint in start-of-task, end-of-task, or syncpoint invocations.
- On each invocation of a task-related user exit program, a new EXEC environment is created, even when the program is being invoked from the same task. This means that CICS operations, such as browse of a resource definition table, cannot be continued from one invocation of the exit program to the next.

Work areas

When you use the EXEC CICS ENABLE command to identify a task-related user exit program to CICS, you may specify that the program must have access to one local and one global work area. The EXEC CICS ENABLE command allows you to specify the size, in bytes, of the work areas to be acquired for your task-related user exit program. CICS acquires storage for the areas and initializes pointers to them. The user exit parameter list, DFHUEPAR, gives you access to the pointers. For more information, see the description of DFHUEPAR under “User exit parameter lists” on page 207.

The global work area

A global work area is associated with an exit program. Whenever the exit program is invoked, it has access to the area through the parameter UEPGAA of DFHUEPAR. The global work area may be shared by a number of exit programs. You must have specified the size of the global work area using the GALENGTH parameter or the GAENTRYNAME parameter of the EXEC CICS ENABLE command.

The local work area

A local work area is associated with a single task and lasts only for the duration of the task. It is for the use of a single task-related user exit program. It can be thought of as a logical extension to the transaction work area (TWA, TWACOBA) that is exclusively for the exit program's use. It is specified using the TALENGTH option of the EXEC CICS ENABLE command and is accessed using the UEPTAA parameter of DFHUEPAR.

Coding a program to be invoked by the CICS syncpoint manager

All task-related user exit programs can be invoked by the CICS syncpoint manager. An exit program must "schedule" the syncpoint manager by setting the syncpoint manager bit-mask in the schedule flag word (addressed by the UEPFLAGS parameter). The format of the schedule flag word is described in Table 98 on page 217. The bit-mask must be set after every piece of recoverable work to ensure that the CICS syncpoint manager calls the exit program during syncpoint processing. (The identification of the current unit of recovery—or logical unit of work—is addressed by the 8-byte field UEPURID. This is available on all invocations of your exit program in which recoverable actions are possible, for example, application calls and subsequent syncpoint manager calls.)

Increasing efficiency—single-update and read-only protocols

If your resource manager is capable of performing a single-phase commit, you can increase the efficiency of your system by means of CICS single-update and read-only protocols.

Single-update protocol: Many CICS transactions use only one external resource manager. In this case, a single-phase commit is in order. The benefits of a single-phase commit are:

- The resource manager can reduce from two to one the number of log forces required for transactions.
- The number of transaction-related log records written by CICS is reduced.
- A path length reduction is achieved, because the TRUE is invoked only once at the syncpoint, rather than twice.

To take advantage of these benefits, your task-related user exit program must indicate to CICS that the resource manager understands the single-update protocol, and that it (the TRUE) can process a syncpoint call to perform a single-phase commit. It indicates this by setting the UEPSUPDR flag in the field pointed to by UEPSYNCA in the DFHUEPAR parameter list. It must do this every time it sets the syncpoint manager bit in the schedule flag word.

If the exit program has set the UEPSUPDR flag, then, when the syncpoint manager next invokes the TRUE, it informs it whether the resource manager is the only one to have updated resources in the current LUW. It does this by means of the

UERTONLY bit (in operation byte 2 of the syncpoint manager's parameter list); if this is set on, then the resource manager can be asked to perform a single-phase commit.

Read-only protocol: Similar gains in efficiency can be made if the resource manager is in read-only mode throughout the current LUW. Again, a single-phase commit is in order. To benefit, the resource manager must return to the TRUE a flag indicating whether the LUW is read-only or not. The flag may show either the "history" of the LUW so far (for example, so far it is read-only), or simply whether the current request is read-only. In turn, the TRUE must update the UEPREADO flag in the DFHUEPAR parameter list with the history of the LUW so far. That is, it must set UEPREADO initially, but unset it as soon as the LUW contains updates. (Once UEPREADO has been unset, CICS ignores any subsequent setting of the flag during the current LUW, and treats the LUW as containing updates.)

At the end of the LUW, if the UEPREADO flag is still set, the syncpoint manager invokes the TRUE with instructions to issue a single-phase commit to the resource manager (by setting the UERTELUW bit on).

Return codes

When a task-related user exit program is invoked by the CICS syncpoint manager, the return codes it is able to set depend on the reason for the invocation. Table 99 shows the relationship between the request flags in the syncpoint manager's parameter list and the TRUE return codes. (The CICS syncpoint manager parameters are described on page 210.)

Table 99. Valid return codes for a TRUE invoked by the CICS syncpoint manager

Request-type	Return codes	Meaning
UERTPREP	UERFPREP	Phase 1 of 2-phase commit successful
	UERFBACK	Phase 1 of 2-phase commit unsuccessful
UERTCOMM	UERFDONE	Phase 2 of 2-phase commit successful
	UERFHOLD	Phase 2 of 2-phase commit unsuccessful
UERTBACK	UERFDONE	Backout successful
	UERFHOLD	Backout unsuccessful
UERTONLY	UERFOK	Single-phase commit successful
	UERFBOUT	Single-phase commit failed and backed out
UERTELUW	None	Not applicable

What is expected of your resource manager

If every request from the syncpoint manager prompts a meaningful response from the resource manager, CICS ensures that changes to recoverable resources (such as databases) can be synchronized. That is, either all the changes take effect or all are backed out, even across system failures.

Limitations

Do not update a recoverable CICS resource during a syncpoint call because any changes will not be seen by the CICS syncpoint manager.

Sample code for a TRUE invoked by the CICS syncpoint manager

The pseudocode given in Figure 8 is only an example. It is not complete, and includes only some of the conditions that a task-related user exit invoked at a syncpoint might be required to check.

```
if UERTFID = UERTSYNC then       /* Caller is CICS syncpoint manager */
  select;                        /* Type of syncpoint manager request */
    when (UERTONLY)                          /* ONLY resource manager */
        invoke RM for single-phase commit    /* Single-phase commit */
        if RM single-phase commit succeeded then
          give CICS syncpoint manager 'YES' vote (UERFOK)
        else                         /* Single-phase commit failed */
                                     /* If RM completed backout */
          if RM single-phase commit failed and backed out
            give CICS syncpoint manager 'NO' vote (UERFBOUT)
          else                       /* Don't know what happened */
            put out message and issue transaction abend
          endif
        endif
    when (UERTELUW)                  /* RM read-only for current LUW */
        invoke RM for single-phase commit    /* Single-phase commit */
    when (UERTPREP)       /* Not ONLY resource manager, nor read-only */
        invoke RM for PREPARE  /* Prepare - phase 1 of 2-phase commit */
        select (resource manager vote)
          when (YES)                 /* Phase 1 completed */
            give CICS syncpoint manager 'YES' vote (UERFPREP)
          otherwise
            give CICS syncpoint manager 'NO' vote (UERFBACK)
        endselect
    when (UERTCOMM)             /* Commit - phase 2 of 2-phase commit */
        invoke RM for commit phase 2
        if RM commit succeeded then
          tell CICS sync manager OK (UERFDONE)
        else
          tell CICS sync manager remember could not commit (UERFHOLD)
        endif
    when (UERTBACK)                  /* Backout request */
        invoke RM for backout
        if RM backout succeeded then
          tell CICS sync manager OK (UERFDONE)
        else
          tell CICS sync manager remember could not backout (UERFHOLD)
        endif
  endselect
endif
```

Figure 8. Sample pseudocode for a task-related user exit program to be invoked by the CICS syncpoint manager

As described in “Increasing efficiency—single-update and read-only protocols” on page 222, if the UERTONLY bit is set (indicating that the resource manager is the only one to have updated resources) the exit program should cause the resource manager to perform a single-phase commit. If the commit is successful, the exit program should return ‘UERFOK’ in register 15; if not, it should return ‘UERFBOUT’, meaning that the commit was unsuccessful and the resources were backed out. If the exit program is unsure about the outcome of a single-phase commit, it must abend the task, having saved or displayed any diagnostic information that it considers necessary.

Note that “register 15” in this section refers to the syncpoint manager’s register 15, the fifth word of the area addressed by UEPHMSA.

Similarly, when the UERTELUW bit is set (indicating that the resource manager was in read-only mode throughout this LUW), the exit program should cause the resource manager to perform a single-phase commit. There are no return codes for a UERTELUW call. Because no updates were made, data integrity is not at risk, and therefore no action is taken if the commit fails.

On receiving a request to perform the first phase of a two-phase commit, the resource manager is expected to get into a state where recoverable changes made since the last syncpoint can be either committed or backed out on demand, even if there is an intervening system failure. For example, buffer contents must be moved to nonvolatile storage. If the resource manager is unable to get into this state, the exit program should return ‘UERFBACK’ in register 15, to request backout. Normally, it should return ‘UERFPREP’, to indicate a successful phase 1 of a 2-phase commit.

On receiving a request to perform the second phase of a two-phase commit, or a request to back out, your resource manager should take the corresponding irreversible step, and have the exit program send the syncpoint manager a return code: either ‘UERFDONE’, meaning that the commit or abend process is complete; or ‘UERFHOLD’, meaning that the commit or abend must be resolved later. These return code constants are available to you when you code the macro DFHUEXIT TYPE=RM in your exit program.

If a resource manager cannot understand a call, it should not change the contents of the caller’s register 15 before returning to the caller, because it cannot anticipate how the caller will interpret the change.

Resynchronization after failure

If a failure occurs between returning from the exit after performing phase 1 of a 2-phase commit and the subsequent phase 2 or back out call, the resource manager must be ready, on restart, to discover the state of the unit of recovery, and to act accordingly. For programming information about restart resynchronization using the EXEC CICS RESYNC command, see the *CICS System Programming Reference* manual.

Information about in-doubt units of work is retained across CICS warm starts. CICS initialization and keypoint management routines recover from the system log all information associating resource managers with outstanding units of recovery, which are resolved automatically when CICS reconnects to the resource managers concerned.

However, if for any reason CICS has to be cold started after a failure, information about in-doubt units of work is lost. In these circumstances, the outstanding units of recovery have to be resolved manually. You can use the CICS-supplied sample program, DFH$INDB, to help you do this. DFH$INDB produces a list of in-doubt external resource records, with the action needed to resolve each one. Each list relates to a single, specified resource manager, so you may need to execute DFH$INDB more than once. You can write your own version of DFH$INDB by modifying the source code supplied in the VSE/ESA sublibrary PRD1.BASE. For more information about DFH$INDB, see the *CICS Operations and Utilities Guide*.

Coding a program to be invoked by the CICS task manager

If your exit program sets the task manager bit in the schedule flag word, it is invoked at end-of-task. If you specify TASKSTART on the EXEC CICS ENABLE command for the TRUE, it is invoked at start-of-task, and (providing it does not unset the task manager bit), at end-of-task too. To determine whether a particular invocation is at start- or end-of-task, you can examine the CICS task manager parameters described in “CICS task manager parameters” on page 213. Typically, your program shows interest in task manager events if it needs to save task-related information, such as performance or accounting data, before the task ends.

Limitations

If your exit program is invoked at end-of-task, you must be alert to possible limitations on exit program activity at task-detach. For example:

- Do not update any CICS resources at all during a task-detach exit call, because the CICS syncpoint manager is not invoked again for that task. Note also that all resources (terminals, and so on) except task-storage have been released by end-of-task.

  Note: You should also be aware that transactions with resource security or command security defined may not run successfully after the terminal has been released. Failure to observe this limitation can result in an ABENDAEY7 - NOTAUTH condition arising.

- It is possible to schedule a new CICS task from your exit program using the EXEC CICS START command and to pass data to a new task. However, you should note that EXEC CICS START uses a temporary storage queue to pass data to the new transaction. If this queue is recoverable (DFHTST TYPE=RECOVERY), it is locked to the detaching task. It is never unlocked, because, when the task-detach exit call is made, the resources of the detaching task have **already** been freed. Use of the PROTECT option would cause a different problem: the new task could not be scheduled until the next syncpoint of the detaching task, but there will be no such syncpoint.

- It is recommended that you do not access remote resources using a task-related user exit program. However, if you do so, then you must understand fully the circumstances in which the function shipping conversation may be terminated.

Coding a program to be invoked at CICS termination

If you specify the SHUTDOWN option when enabling your task-related user exit program, it is invoked at system termination. The CICS system termination manager passes the exit program the address of a one-byte code that identifies the type of termination (see "CICS termination manager parameters" on page 213). You can use this invocation of your program to do processing appropriate to the type of termination. For example, at an orderly shutdown you could use it, rather than a PLT program, to shut down the adapter; at a CICS abend you could use it to take special actions, related to the seriousness of the abend.

Limitations

Note that, due to the nature of CICS abends and operator cancels, there is no guarantee that CICS will be able to invoke your exit program at system termination, even if you have specified SHUTDOWN; it may be too impaired to do so.

The limitations on what your program can do, if invoked, depend on the type of termination:

Orderly shutdown (UERTCORD)
Your exit program must follow the rules for programs that execute during the first quiesce stage of CICS shutdown—that is, all CICS services are available, but programs must not start any new tasks.

Immediate shutdown (UERTCIMM)
As for orderly shutdown, except that your exit program should do the minimum required and return control, so that shutdown can proceed.

CICS abend, retry possible, TCBs dispatchable (UERTCABY)
VSE/ESA has flagged the failure as being "eligible for retry".

Subtasks in the region (that is, task control blocks (TCBs) in addition to the CICS job-step TCB) are still dispatchable, and your exit program can execute code under them.

You must not use any CICS services.

CICS abend, retry not possible, TCBs dispatchable (UERTCABN)
VSE/ESA has flagged the failure as "not eligible for retry". Note that your exit program is invoked from code within the OS/390 extended subtask abend exit (ESTAEX). VSE/ESA imposes more restrictions on ESTAEX code than on non-ESTAEX code.

Subtasks in the region are still dispatchable, and your exit program can execute code under them.

You must not use any CICS services.

CICS abend, retry not possible, TCBs not dispatchable (UERTOPCA)
As for UERTCABN, except that subtasks in the region are **not** dispatchable; your exit program must not try to execute code under any TCBs that it may have attached.

Important

In the abend invocations (UERTCABY through UERTOPCA), your exit program must not use any CICS services. This includes the DFHEIENT call, which performs a CICS GETMAIN. To prevent a DFHEIENT call being issued automatically on each invocation of your program, specify the NOPROLOG translator option; but include in the program source your own DFHEIENT call to be issued on non-abend invocations only. An example of how to code a task-related user exit program to be invoked at CICS termination is given in Figure 9 on page 229. For further information about coding a DFHEIENT call, see the *CICS Application Programming Reference* manual.

Sample code for a TRUE invoked at CICS termination

Note that the sample in Figure 9 on page 229 is a multipurpose program—that is, it is coded to be invoked at many task-related user exit points. However, to avoid the need to test for CICS abends in all of your multipurpose TRUEs, it is recommended that you use a separate program for termination invocations.

```
JTRUE1A  CSECT                         TERMINATION TRUE ENTRYPOINT
         STM   14,12,12(13)            Save registers
         USING JTRUE1A,R3
         LR    R3,R15                  Use R3 as base register
         USING DFHUEPAR,R1             Address DFHUEPAR parameter list
         L     R2,UEPEXN
         USING DFHUERTR,R2
         CLI   UERTFID,UERTCTER        CICS Termination call?
         BNE   CONT                    No, so continue
         L     R10,UEPHMSA             Address Host register save area
         USING SA,R10
         L     R5,RSAR1                Get Caller's R1
         USING DFHCTERM,R5
         L     R5,CTERML               Get termination type
         USING CTERMLIST,R5
         TM    CTERMTYPE,UERTCORD      CICS orderly shutdown?
         BO    CONT                    Yes, so can use CICS services
         TM    CTERMTYPE,UERTCIMM      CICS immediate shutdown?
         BO    CONT                    Yes, so can use CICS services
*        ...
*        ...
*        Insert code here for any processing when CICS is abending
*        (No CICS services should be used)
*        ...
*        ...
         LM    14,12,12(13)            Restore caller's registers
         BSM   0,14                    Return to caller
CONT     DS    0H                      Continue in new CSECT
         LM    14,12,12(13)            Restore callers's registers
         DROP  R3
         USING JTRUE1A,R15             Use R15 as temporary base register
         L     R15,=V(JTRUE1B)         Get address of new CSECT
         BR    R15                     Branch to new CSECT
         DROP  R1,R2,R5,R10,R15
         LTORG
JTRUE1B  CSECT                         POST TEST CSECT
         DFHEIENT
         LR    R4,R1                   Use R4 to address parm list
         USING DFHUEPAR,R4             Address parm list
         L     R5,UEPEXN
         USING DFHUERTR,R5
```

Figure 9 (Part 1 of 2). Sample code for a task-related user exit program to be invoked at CICS termination

```
         MVC   DFHEIBP,UEPEIB
         MVC   DFHEICAP,=X'80000000'
*        .....
*        Insert code here for all types of call other than when CICS
*        is abending
*        (CICS services can be used)
*        .....
EXIT     DS    0H
         DFHEIRET
         DROP  R4,R5
*
         LTORG
*
DFHCTERM DSECT
CTERML   DS    A
*
CTERMLIST DSECT
CTERMTYPE DS   CL1
*
DFHEISTG DSECT
*
*        Local working storage for CSECT JTRUE1B
*
RSA      DS    18F                     Register save area
SA       DSECT                         Register save area DSECT
         DS    F
*
RSACB    DS    F       +004
RSACF    DS    F       +008
RSAR14   DS    F       +00C
RSAR15   DS    F       +010
RSAR0    DS    F       +014
RSAR1    DS    F       +018
RSAR2    DS    F
RSAR3    DS    F
RSAR4    DS    F
RSAR5    DS    F
RSAR6    DS    F
RSAR7    DS    F
RSAR8    DS    F
RSAR9    DS    F
RSAR10   DS    F
RSAR11   DS    F
RSAR12   DS    F
         DFHREGS
         DFHUEXIT TYPE=RM
         DFHEISTG
         DFHEIEND
         PRINT NOGEN
         PRINT GEN
         END
```

Figure 9 (Part 2 of 2). Sample code for a task-related user exit program to be invoked at CICS termination

Using EDF with your task-related user exit program

If your exit program sets the EDF bit in the schedule flag word and EDF is active, the exit program is invoked before and after each API request to format screens for EDF to display.

Communication between the task-related user exit and EDF is controlled by the task-related user exit interface. The command flow between this interface, EDF, and the task-related user exit is summarized in Figure 10.

```
Task-related user
exit interface  ──────►  Task-related user exit (T1)
                ◄──────  Prepare 'About to Execute' EDF screen
                ──────►  EDF (E1)  Display screen
                ◄──────
                ──────►  Task-related user exit (T2)
                ◄──────  Response EDF user
                ──────►  Task-related user exit (T3)
                ◄──────  Access resource manager
                ──────►  Task-related user exit (T4)
                ◄──────  Prepare 'Command Execution Complete' EDF screen
                ──────►  EDF (E2)  Display screen
                ◄──────
                ──────►  Task-related user exit (T5)
                ◄──────  Response EDF user
```

Figure 10. Interface between the task-related user exit and EDF

Table 100 describes each stage of the interface between the task-related user exit and EDF, relating the descriptions to the (T*n*) and (E*n*) expressions in Figure 10.

Table 100. Description of each stage of the task-related user exit/EDF interface

Invocation	Description
(T1)	Task-related user exit invoked to set up its EDF requirements. At this stage the task-related user exit prepares the "About to Execute" screen based on the application request.
(E1)	Using information passed back from the task-related user exit at invocation T1, the task-related user exit interface invokes EDF to display the "About to Execute" screen. EDF sets up the EDF user response, for example, if the user has changed the screen.
(T2)	Task-related user exit is invoked with the EDF user response to the "About to Execute" screen.
(T3)	Task-related user exit invoked to access external resource manager for application request.
(T4)	Task-related user exit invoked to prepare a "Command Execution Complete" screen, based on the result of the application request.
(E2)	Using information passed back from the task-related user exit at invocation T4, the task-related user exit interface invokes EDF to display the "Command Execution Complete" screen. EDF sets up the EDF user response, for example, if the user has changed the screen.
(T5)	Task-related user exit is invoked with the EDF user response to the "Command Execution Complete" screen.

Important

The E1/T2 and E2/T5 cycles can be used repeatedly. This may occur, for example, if the EDF user changes the screen a number of times.

Adapter administration

Careful use of task-related user exits can allow your application programmers to be unaffected by the invocation of non-CICS resource managers from CICS application programs. Enabling and disabling task-related user exit programs for an installation should be the responsibility of one or more supervisory or master terminal operators. This section lists what you must do before you can use the adapter, and describes the commands used by the supervisor to administer task-related user exit programs.

For programming information about the use of commands in CICS application programs, see the *CICS Application Programming Reference* manual.

What you must do before using the adapter

1. A task-related user exit program must be defined to the system using the CEDA INSTALL PROGRAM command.
2. If you want to use CICS syncpoint management in task-related user exits, your CICS system must contain the supplied module DFHDBP.
3. To enable the task-related user exit program and to define its working storage needs, you must use the EXEC CICS ENABLE command. A task-related user exit program must be both enabled and started before it is available for execution. For example:

   ```
   EXEC CICS ENABLE PROGRAM('EP9')
        TALENGTH(750) GALENGTH(200) SHUTDOWN
   EXEC CICS ENABLE PROGRAM('EP9')
        START
   ```

   The first command loads the task-related user exit program EP9, and causes a 200-byte work area to be obtained and associated with it. The first command also schedules the allocation of a further 750-byte work area for each task that subsequently invokes EP9, and the invocation of EP9 at CICS termination. The second command starts the exit program, that is, it makes its entry point capable of being invoked.

   Note: If a task-related user exit program is enabled before it has been installed, CICS scans the SVA for the program and may issue message DFHLD0107I, meaning that it was unable to find the program in the SVA and is using a version found in the LIBDEF library search chain for the CICS job.

   For programming information about the EXEC CICS commands, refer to the *CICS System Programming Reference* manual.

The administration routines

As well as being enabled before they can be used, task-related user exit programs should be disabled when you have finished using them. You should prepare procedures (the administration routines) for enabling and disabling your task-related user exit programs, using the EXEC CICS ENABLE and DISABLE commands, and for resynchronizing between sessions or after a system failure. Your enabling routines could be PLT initialization programs or online programs. Your disabling routines could, for example, be started by a TRUE invoked at CICS termination.

The EXTRACT EXIT command obtains the address and the length of a global work area that is owned by, or shared by, a named task-related user exit program.

For programming information about these commands and the rules governing them, and also about resynchronization, refer to the *CICS System Programming Reference* manual.

Tracing a task-related user exit program

CICS outputs a trace entry just before control is passed to the task-related user exit and just after returning from the exit. You can control these trace entries using the EI option of the CETR trace control transaction or the EXEC CICS SET TRACETYPE command.

End of General-use programming interface

Chapter 3. The user exit programming interface (XPI)

This chapter describes the user exit programming interface (XPI) of CICS Transaction Server for VSE/ESA Release 1. It is divided into the following sections:

- **"Overview"** is an introduction to the XPI.
- **"General form of an XPI call"** on page 240 contains information that applies to all the XPI calls.
- **"Global user exit XPI examples, showing the use of storage"** on page 246 contains two pieces of sample code.
- **"The XPI functions"** on page 253 describes the syntax of the individual XPI calls. The calls are grouped according to the type of function they perform (for example, dump control, storage control). The functional groups are ordered alphabetically.

Overview

The user exit programming interface provides global user exit programs with access to some CICS services. It consists of a set of macro function calls that you can use in your user exit programs. It provides opportunities to extend CICS functions beyond the facilities provided in the standard CICS system, but it must be used with care. Any exit programs you write that use the interface must be written following the guidance in this chapter, and they must be carefully tested to ensure that they cannot cause system errors.

The user exit programs must be in assembler language; the XPI is not provided for other languages. You should also note that programs containing XPI calls must be written to 31-bit standards, and must be reentrant.

You must be in primary-space translation mode when you invoke the XPI.

XPI calls sorted by function

This section lists all the XPI calls, sorted into their functional areas.

- Using the XPI **dispatcher functions**, you can:
  - Obtain a suspend token for a task—see "The ADD_SUSPEND call" on page 257.
  - Suspend execution of the issuing task—see "The SUSPEND call" on page 259.
  - Resume execution of a suspended task—see "The RESUME call" on page 262.
  - Release a suspend token associated with a task—see "The DELETE_SUSPEND call" on page 263.
  - Request a wait on one or more VSE/ESA event control blocks (ECBs)—see "The WAIT_EXTERNAL call" on page 264.
  - Change the priority of the issuing task—see "The CHANGE_PRIORITY call" on page 267.

- Using the XPI **dump control functions**, you can:
  - Request a system dump—see “The SYSTEM_DUMP call” on page 268.
  - Request a transaction dump—see “The TRANSACTION_DUMP call” on page 269.
- Using the XPI **kernel domain functions**, you can:
  - Inhibit purge for the current task—see “The START_PURGE_PROTECTION function” on page 272.
  - Reenable purge for the current task—see “The STOP_PURGE_PROTECTION function” on page 272.
- Using the XPI **loader functions**, you can:
  - Define a new program to the loader domain—see “The DEFINE_PROGRAM call” on page 273.
  - Load a program or, if it is already loaded, obtain its load and entry-point addresses—see “The ACQUIRE_PROGRAM call” on page 277.
  - Release the storage occupied by a program, or decrement its use count by one—see “The RELEASE_PROGRAM call” on page 279.
  - Delete a program definition from the list of current programs—see “The DELETE_PROGRAM call” on page 280.
- Using the XPI **monitoring functions**, you can:
  - Process a user event-monitoring point—see “The MONITOR call” on page 281.
  - Retrieve the current monitoring data for the issuing task—see “The INQUIRE_MONITORING_DATA call” on page 284.
- Using the XPI **program management functions**, you can:
  - Inquire about the attributes of a specified program—see “The INQUIRE_PROGRAM call” on page 286.
  - Inquire about the attributes of the program that is currently running—see “The INQUIRE_CURRENT_PROGRAM call” on page 291.
  - Set selected attributes in the definition of a specified program—see “The SET_PROGRAM call” on page 294.
  - Browse through program definitions, optionally starting at the definition of a specified program—see “The START_BROWSE_PROGRAM call” on page 297, “The GET_NEXT_PROGRAM call” on page 298, and “The END_BROWSE_PROGRAM call” on page 299.
  - Inquire about the settings of the autoinstall function for programs, mapsets, and partitionsets—see “The INQUIRE_AUTOINSTALL call” on page 300.
  - Change the settings of the autoinstall function for programs, mapsets, and partitionsets—see “The SET_AUTOINSTALL call” on page 301.
- Using the XPI **state data access functions**, you can:
  - Inquire on application system data in the AP domain—see “The INQ_APPLICATION_DATA call” on page 302.
  - Inquire on CICS system data in the AP domain—see “The INQUIRE_SYSTEM call” on page 305.

  - Set CICS system data values in the AP domain—see “The SET_SYSTEM call” on page 309.
- Using the XPI **storage control functions**, you can:
  - Obtain and initialize storage—see “The GETMAIN call” on page 311.
  - Release storage—see “The FREEMAIN call” on page 314.
  - Inquire about the access-key of an element of storage—see “The INQUIRE_ACCESS call” on page 314.
  - Obtain the start address and length of an element of task-lifetime storage—see “The INQUIRE_ELEMENT_LENGTH call” on page 315.
  - Discover whether CICS is short on storage—see “The INQUIRE_SHORT_ON_STORAGE call” on page 316.
  - Inquire about a task’s task-lifetime storage—see “The INQUIRE_TASK_STORAGE call” on page 317.
- Using the XPI **trace control function**, you can:
  - Write a trace entry to the active trace destinations—see “The TRACE_PUT call” on page 318.
- Using the XPI **transaction management functions**, you can:
  - Discover the name of the dynamic transaction routing transaction definition—see “The INQUIRE_DTRTRAN call” on page 319.
  - Discover the current value of the MXT system initialization parameter—see “The INQUIRE_MXT call” on page 320.
  - Inquire about a specified transaction class—see “The INQUIRE_TCLASS call” on page 321.
  - Inquire about a specified transaction definition—see “The INQUIRE_TRANDEF call” on page 323
  - Inquire about an attached transaction—see “The INQUIRE_TRANSACTION call” on page 329.
  - Change the task priority and transaction class of the current task—see “The SET_TRANSACTION call” on page 333.
- Using the XPI **user journaling function**, you can:
  - Write a record to a CICS journal—see “The WRITE_JOURNAL_DATA call” on page 335.

XPI calls sorted alphabetically

Table 101 on page 238 lists all the XPI calls in alphabetical order.

Table 101 (Page 1 of 2). Alphabetical list of XPI calls

Name of call	Functional area	Purpose	Page
ACQUIRE_PROGRAM	Loader	Load a program or, if it is already loaded, obtain its load and entry-point addresses.	277
ADD_SUSPEND	Dispatcher	Obtain a suspend token for a task.	257
CHANGE_PRIORITY	Dispatcher	Change the priority of the issuing task.	267
DEFINE_PROGRAM	Loader	Define a new program to the loader domain.	273
DELETE_PROGRAM	Loader	Delete a program definition from the list of current programs.	280
DELETE_SUSPEND	Dispatcher	Release a suspend token associated with a task.	263
END_BROWSE_PROGRAM	Program management	End a browse of program definitions.	299
FREEMAIN	Storage control	Release storage.	314
GETMAIN	Storage control	Obtain and initialize storage.	311
GET_NEXT_PROGRAM	Program management	Inquire on the next program definition in a browse sequence.	298
INQUIRE_ACCESS	Storage control	Inquire about the access-key of an element of storage.	314
INQUIRE_APPLICATION_DATA	State data access	Inquire on application system data in the AP domain.	302
INQUIRE_AUTOINSTALL	Program management	Inquire about the settings of the autoinstall function for programs, mapsets, and partitionsets.	300
INQUIRE_CURRENT_PROGRAM	Program management	Inquire about the attributes of the program that is currently running.	291
INQUIRE_DTRTRAN	Transaction management	Discover the name of the dynamic transaction routing transaction definition.	319
INQUIRE_ELEMENT_LENGTH	Storage control	Obtain the start address and length of an element of task-lifetime storage.	315
INQUIRE_MONITORING_DATA	Monitoring	Retrieve the current monitoring data for the issuing task.	284
INQUIRE_MXT	Transaction management	Discover the current value of the MXT system initialization parameter.	320
INQUIRE_PROGRAM	Program management	Inquire about the attributes of a specified program.	286
INQUIRE_SHORT_ON_STORAGE	Storage control	Discover whether CICS is short on storage.	316
INQUIRE_SYSTEM	State data access	Inquire on CICS system data in the AP domain.	305
INQUIRE_TASK_STORAGE	Storage control	Inquire about a task’s task-lifetime storage.	317
INQUIRE_TCLASS	Transaction management	Inquire about a specified transaction class.	321

Table 101 (Page 2 of 2). Alphabetical list of XPI calls

Name of call	Functional area	Purpose	Page
INQUIRE_TRANDEF	Transaction management	Inquire about a specified transaction definition.	323
INQUIRE_TRANSACTION	Transaction management	Inquire about an attached transaction.	329
MONITOR	Monitoring	Process a user event-monitoring point.	281
RELEASE_PROGRAM	Loader	Release the storage occupied by a program, or decrement its use count by one.	279
RESUME	Dispatcher	Resume execution of a suspended task.	262
SET_AUTOINSTALL	Program management	Change the settings of the autoinstall function for programs, mapsets, and partitionsets.	301
SET_PROGRAM	Program management	Set selected attributes in the definition of a specified program.	294
SET_SYSTEM	State data access	Set CICS system data values in the AP domain.	309
SET_TRANSACTION	Transaction management	Change the task priority and transaction class of the current task.	333
START_BROWSE_PROGRAM	Program management	Begin browsing through program definitions.	297
START_PURGE_PROTECTION	Kernel domain	Inhibit purge for the current task.	272
STOP_PURGE_PROTECTION	Kernel domain	Reenable purge for the current task.	272
SUSPEND	Dispatcher	Suspend execution of the issuing task.	259
SYSTEM_DUMP	Dump control	Request a system dump.	268
TRACE_PUT	Trace control	Write a trace entry to the active trace destinations.	318
TRANSACTION_DUMP	Dump control	Request a transaction dump.	269
WAIT_EXTERNAL	Dispatcher	Request a wait on one or more VSE/ESA event control blocks (ECBs).	264
WRITE_JOURNAL_DATA	User journaling	Write a record to a CICS journal.	335

Important

1. You cannot use all of these calls at every global user exit point. You will find an indication of when these calls **cannot** be used both with the description of each function call, and in the lists of exit points in Chapter 1, “Global user exit programs” on page 3.

   Warning: These XPI calls are used to invoke CICS services; using them in the wrong exits causes unpredictable errors in your CICS system.

2. There is a restriction on using the XPI early during initialization. Do not start exit programs that use the XPI functions INQUIRE_MONITOR_DATA, MONITOR, TRANSACTION_DUMP, and WRITE_JOURNAL_DATA until the second phase of the PLTPI. For further information about the PLTPI, refer to Chapter 4, “Writing initialization and shutdown programs” on page 339.

3. These XPI functions are likely to cause the task executing the user exit program to lose control to another task while the XPI function is being executed. Therefore the use of XPI functions must be very carefully considered, as interrupting the flow of CICS functions could cause problems, such as lockouts, to occur.

General form of an XPI call

If you make an XPI call, it must be in the form described below. It consists of two sets of parameters:

- Input parameters, including the XPI function call and the parameters passed to the call
- Output parameters, by which CICS can return values to you, including response and reason codes that tell you whether the call was successful.

To use an XPI macro call, you must include a copy book that defines the input and output parameters. The name of the macro is always of the form DFH*xxyy*X, and the associated copy book has the name DFH*xxyy*Y. For example, the GETMAIN call is part of the storage control XPI. The macro you would use is DFHSMMCX and the associated copy book is DFHSMMCY.

The general format (omitting the assembler-language continuation character) of all XPI calls is:

```
macro-name [CALL],
           [CLEAR],
           [IN,
           FUNCTION(call_name),
           mandin1(value),
           mandin2(value),
           ...
           [optin1(value),]
           [optin2(value),]
           ...]
           [OUT,
           mandout1(value),
           mandout2(value),
           ...
           [optout1(value),]
           [optout2(value),]
           ...
           RESPONSE,
           REASON]
```

XPI calls follow assembler-language coding conventions:

- The “macro-name” must begin before column 16.
- The continuation lines must begin in column 16.
- There must be no embedded blanks apart from the blank between the macro-name and the first keyword (usually CALL).
- Entries on lines other than the final line must end with a comma.
- Lines other than the final line must have a continuation character in column 72.
- Parentheses around the input and output values are required—and if you use a register reference as an input or output value, it must be enclosed in an inner pair of parentheses, thus: ((R6)).
- For details about how to set the values of the XPI options, refer to “The XPI functions” on page 253.

There are three uses of these XPI functions. You can:

- Clear the parameter list used by the XPI call.
- Set up the input parameters.
- Make the call to the CICS function.

You can code all of these individually (see “An example showing how to build a parameter list incrementally” on page 252), or include them in a single statement.

Some options are common to all uses of the XPI. They are included in all of the syntax descriptions, but their explanation is given here. The options are CALL, CLEAR, IN, FUNCTION, OUT, RESPONSE, and REASON.

CALL causes code generation that issues a call to the XPI function. If you specify CALL, IN, FUNCTION, and OUT, then code is generated to perform the whole operation of building the parameter list, invoking the function, and receiving the result. You can omit the CALL, but specify IN to build your parameter list incrementally; later you can use CALL with that list, coding CALL, IN, FUNCTION, OUT, and all required options. You can then represent the values of the preset options by an asterisk (*) to show that the value is already present in the list.

Warning: If you build your parameter list incrementally, do not specify CLEAR when you finally issue the call, because the CLEAR option sets the parameter list to zeros, which will cause you to lose the preset values.

CLEAR sets the existence bits in the parameter list (both mandatory and optional parameters) to binary zeros. Each macro has a COPY code, which defines the parameter list by a DSECT consisting of a header section, followed by a set of existence bits, and the parameters themselves. For performance reasons, the header section and the existence bits only are cleared. The rest of the parameter list is left unchanged.

Warning: Failure to clear the parameter list can cause unpredictable results, such as program checks or storage violations. If you are building the parameter list incrementally, specify CLEAR before specifying any parameters. If you are not building the parameter incrementally, specify CLEAR when the CALL is issued.

IN tells CICS that any parameter following the IN option and preceding the OUT option is an input value. It **must** be specified when CALL is specified. If you use the function without CALL to build a parameter list, you can specify IN and some parameter values to store values into your list.

FUNCTION
specifies which function of the macro you require; for instance, GETMAIN or FREEMAIN. It **must** be specified when CALL is specified, and unlike other options, it must always be explicit—you **cannot** code “FUNCTION(*)”.

mandin(value)
“mandin” represents an option that becomes mandatory if CALL is specified. “value” may be represented by an asterisk (*) to show that a previous use of the macro has already set the value in the parameter list (see above under “CALL”). For further details about how to complete “value”, refer to the specific function calls in “The XPI functions” on page 253.

OUT tells CICS that any parameter following the OUT option is a receiver field. It **must** be specified when CALL is specified.

Note: The use of the following output parameters with values other than an asterisk (*) is invalid if CALL is not specified.

mandout(value)
“mandout” represents an option that becomes mandatory if CALL is specified. The output is placed in the parameter list if an asterisk (*) is coded, or in the location that you have specified in “value”. RESPONSE is a special case of a mandout option (see below). For further details about how to complete “value”, refer to the specific function calls (see “The XPI functions” on page 253).

optin1,2...; optout1,2....
: represent items that are completely optional for **all** forms of the macro; in particular, they do not have to be specified when CALL is specified.

RESPONSE
: is a mandatory data area that you define to receive the response from your XPI call. You can use an asterisk (*) to indicate to CICS that the RESPONSE value is to be placed in the parameter list, or you can specify the name of a field in which you want the RESPONSE value to be placed. You need not code the RESPONSE option if you are using the macro without CALL to build a parameter list.

The response from any XPI call is always one of 'OK', 'EXCEPTION', 'DISASTER', 'INVALID', 'KERNERROR', and 'PURGED'. There are standardized names (EQU symbols) for the response code values provided by CICS:

`xxyy_OK`, `xxyy_EXCEPTION`, `xxyy_DISASTER`, `xxyy_INVALID`, `xxyy_KERNERROR`, and `xxyy_PURGED`,

where "xxyy" is a prefix derived from the four letters of the relevant macro-name following the string 'DFH'. Thus for DFHSMMCX the prefix is SMMC; for DFHLDLDX the prefix is LDLD. Equate values with these names are generated when you include the copy book DFHxxyyY for the macro DFHxxyyX. You cannot assume that the arithmetic values of corresponding RESPONSE codes are the same for all macro calls. The meanings of the RESPONSE codes are as follows:

OK
: The XPI request was completed successfully.

EXCEPTION
: The function was not completed successfully for a reason which could be expected to happen, and which may be coded for by a program (for example, TRANSACTION_DUMP, EXCEPTION = SUPPRESSED_BY_DUMPTABLE). Any REASON value may provide more information.

DISASTER
: The request has failed completely. You cannot recover from this failure within the user exit program. When this failure occurs, CICS takes a system dump, issues an error message, and sets a 'DISASTER' response. On receiving this, your user exit program should exit without attempting any further processing. The REASON value for this response, shown only in the trace, may provide more information. There is no REASON value returned to the calling program.

INVALID
: You have omitted a mandatory value, or you have supplied an invalid value for an option. You cannot recover from this failure within the user exit program. When this failure occurs, CICS takes a system dump, issues an error message, and sets an 'INVALID' response. On receiving this response, your user exit program should return to the caller without attempting any further processing. The REASON value for this response, shown only in the trace, may provide more information. This

may help you to correct any error in your exit program. There is no REASON value returned to the calling program.

KERNERROR
: The kernel has detected an error with the CICS function you are trying to invoke. Either the function you have requested is unavailable or not valid, or there is an error within CICS.

PURGED
: The task has been purged, or an interval specified on your XPI call has expired. Examine the REASON code.

Note that if an XPI call other than DFHDSSRX SUSPEND or WAIT_EXTERNAL gets this RESPONSE, your exit program should set the return code to ‘UERCPURG’ and return to the caller.

If a DFHDSSRX SUSPEND or WAIT_EXTERNAL call specifies an INTERVAL and gets this RESPONSE with a REASON of ‘TIMED_OUT’, it indicates that the INTERVAL you specified has passed. It is up to you to decide what you do next.

If a DFHDSSRX SUSPEND or WAIT_EXTERNAL call specifies an INTERVAL and gets this RESPONSE with a REASON of ‘TASK_CANCELLED’, this indicates that the INTERVAL you specified has not passed but that the task has been purged by an operator or an application. In this case, you must set a return code of ‘UERCPURG’ and return.

If a DFHDSSRX SUSPEND or WAIT_EXTERNAL call does **not** specify an INTERVAL, and gets this RESPONSE with a REASON of ‘TASK_CANCELLED’ or ‘TIMED_OUT’, it indicates that the task has been purged by an operator or an application, or by the deadlock time-out facility. In this case, you must set a return code of ‘UERCPURG’ and return.

You **must not** return the response code ‘UERCPURG’ to CICS for any other reason. If you attempt to do so, your program will have unpredictable results.

REASON This is a mandatory data area that you define in order to receive more information about the RESPONSE value. You can use (*) to indicate to CICS that the REASON value is to be placed in the parameter list. On most XPI calls, standardized reason names (EQU symbols) are provided only for RESPONSE values of ‘EXCEPTION’ and ‘PURGED’. The REASON values that accompany responses vary from one XPI function to another, so details are provided with the descriptions of the XPI calls.

REASON is not applicable where RESPONSE was ‘OK’. In these circumstances, you should not test the REASON field.

Note: For examples of how to initialize the parameter list, set up parameters, make the call, and receive output parameters, refer to “Global user exit XPI examples, showing the use of storage” on page 246. That section includes both a complete example, and also an example in which each step is executed separately.

Setting up the XPI environment

The exit programming interface (XPI) does not require the usual CICS transaction environment, but you do need to set up a special exit programming environment before you can use any XPI calls. If you are going to use any of the XPI functions in an exit program, you must include in your program, at a point **before** you issue any XPI calls, the macro:

```
DFHUEXIT TYPE=XPIENV
```

The expansion of this macro provides the DSECTs that are used in all XPI calls. It also provides a list of register equates (R0 EQU 0, R1 EQU 1, and so on), that you can use in your exit program. The other fields generated by the macro are used by CICS to perform the XPI call processing. You must not use any of these fields: if you do so, your user exit program will have unpredictable results.

The user exit program should be in 31-bit addressing mode.

XPI register usage

Before you can issue an XPI call from a global user exit program, you **must** move the contents of the parameter UEPSTACK (the kernel stack entry) of DFHUEPAR to the exit program’s register 13.

The XPI function expansion uses registers 0, 1, 14, and 15, so the exit program must save and restore them if necessary around an XPI call.

For an example of how to use EXEC CICS commands and XPI calls in the same exit program, see Appendix E, “The example program for the XTSEREQ global user exit, DFH$XTSE” on page 673.

The XPI copy books

There is a copy book for each XPI function, to provide the DSECTs associated with that function. These DSECTs allow you to map the parameters and the response and reason codes of an XPI call. You must include in your exit program a COPY statement for each XPI function that you are going to use. The copy book name is the same as the macro name, except that the final letter “X” becomes a letter “Y”.

For example, to include the copy book for the XPI function DFHSMMCX, you must include the statement:

```
COPY DFHSMMCY
```

Trace entries for your XPI calls show these parameter lists if you have tracing on for the function you are using.

Reentrancy considerations resulting from XPI calls

During an XPI call, CICS may give control to another task while processing the XPI call. This second task could also cause the same exit program to be invoked and the same XPI call to be made, but perhaps this time with different parameter values. **It is your responsibility to ensure that lockout situations do not occur.**

While processing an XPI call, CICS may encounter another user exit point that uses the same user exit program. Therefore the XPI parameter lists must be built in storage associated with a single invocation of the exit program.

If your exit program is a global user exit, CICS provides it with 260 bytes of LIFO storage, which is exclusive to a single invocation of your exit program. Your exit program can access this storage using parameter UEPXSTOR of the DFHUEPAR parameter list. Use this storage to base the DSECT provided by the DFHxxyyY copy book when building the XPI parameter list. In this way, the parameters are not corrupted if the exit program is reentered.

Parameter lists for the XPI services provided here do not exceed 256 bytes. The remaining 4 bytes of the UEPXSTOR storage can be used to store the address of some additional storage that relates to the invocation of the exit program. This storage could be obtained by a DFHSMMCX FUNCTION (GETMAIN) macro.

A suggested standard would be to use the first 4 bytes to hold the address of the additional storage, and to keep the following 256 bytes for XPI parameter lists.

Information to be kept across invocations of an exit program can be stored in the global work area that you can define for an exit program (or group of exit programs). The 260 bytes of LIFO storage cannot be used for this purpose because it is dynamic.

Global user exit XPI examples, showing the use of storage

The example in Figure 11 on page 247 illustrates the use of the XPI and storage in a global user exit program. It is not a complete program, but merely an example of entry and exit code for any global user exit program, and the use of the XPI function.

The options of the DFHSMMCX macro used in the example are described in “Storage control functions” on page 310.

The example uses the technique of obtaining some storage for this invocation of the program using the XPI GETMAIN call, and then saving the address of this storage in the first 4 bytes of the LIFO storage addressed by UEPXSTOR. In this example, the initialization of the parameter list (using the CLEAR option), the building of the parameter list, and the GETMAIN call occur in a single macro. For details of how to build the parameter list incrementally, and how to separate the CLEAR and the GETMAIN call, refer to “An example showing how to build a parameter list incrementally” on page 252.

```
        TITLE 'GUEXPI - GLOBAL USER EXIT PROGRAM WITH XPI'
***********************************************************************
*  The first three instructions set up the global user exit           *
*  environment, identify the user exit point, prepare for the use of  *
*  the exit programming interface, and copy in the definitions that   *
*  are to be used by the XPI function.                                *
***********************************************************************
*
         DFHUEXIT TYPE=EP,ID=XFCREQ     PROVIDE DFHUEPAR PARAMETER
*                                       LIST FOR XFCREQ IN THE FILE
*                                       CONTROL PROGRAM AND LIST
*                                       OF EXITID EQUATES
*
         DFHUEXIT TYPE=XPIENV           SET UP ENVIRONMENT FOR
*                                       EXIT PROGRAMMING INTERFACE --
*                                       MUST BE ISSUED BEFORE ANY
*                                       XPI MACROS ARE ISSUED
*
         COPY  DFHSMMCY                 DEFINE PARAMETER LIST FOR
*                                       USE BY DFHSMMCX MACRO
*
***********************************************************************
*  The following DSECT maps a storage area you can use to make the    *
*  exit program reentrant by storing the address of the storage you   *
*  acquire in the first four bytes of the 260-byte area provided by   *
*  the user exit handler (DFHUEH) and addressed by UEPXSTOR.          *
***********************************************************************
*
TRANSTOR DSECT                          DSECT FOR STORAGE OBTAINED BY
*                                       GETMAIN
⋮
storage declarations
⋮
*
```

Figure 11 (Part 1 of 6). Global user exit program with XPI

```
*************************************************************************
*  The next seven instructions form the normal start of a global user   *
*  exit program, setting the program addressing mode to 31-bit, saving  *
*  the calling program's registers, establishing base addressing, and   *
*  establishing the addressing of the user exit parameter list.         *
*************************************************************************
*
GXPI     CSECT
GXPI     AMODE 31                      SET TO 31-BIT ADDRESSING
*
         SAVE (14,12)                  SAVE CALLING PROGRAM'S REGISTERS
*
         LR    R11,R15                 SET UP USER EXIT PROGRAM'S
         USING GXPI,R11                BASE REGISTER
*
         LR    R2,R1                   SET UP ADDRESSING FOR USER
         USING DFHUEPAR,R2             EXIT PARAMETER LIST -- USE
*                                      REGISTER 2 AS XPI CALLS USE
*                                      REGISTER 1
*
*
*************************************************************************
*  Before issuing an XPI function call, set up addressing to XPI        *
*  parameter list.                                                      *
*************************************************************************
*
         L     R5,UEPXSTOR             SET UP ADDRESSING FOR XPI
*                                      PARAMETER LIST
*
         USING DFHSMMC_ARG,R5          MAP PARAMETER LIST
*
*************************************************************************
*  Before issuing an XPI function call, you must ensure that register   *
*  13 addresses the kernel stack.                                       *
*************************************************************************
*
         L     R13,UEPSTACK            ADDRESS KERNEL STACK
*
```

Figure 11 (Part 2 of 6). Global user exit program with XPI

```
***********************************************************************
*  Issue the DFHSMMCX macro call, specifying:                         *
*                                                                     *
*   CALL --      the macro is to be called immediately                *
*                                                                     *
*   CLEAR --     initialize the parameter list before inserting values. *
*                                                                     *
*   IN --        input values follow.                                 *
*                                                                     *
*                FUNCTION(GETMAIN) -- acquire storage                 *
*                GET_LENGTH(120) -- 120 bytes of it                   *
*                SUSPEND(NO) -- don't suspend if storage not available  *
*                INITIAL_IMAGE(X'00')  -- clear acquired storage       *
*                                         to hex zero throughout.      *
*                STORAGE_CLASS(USER)   -- class of storage to be       *
*                                         acquired is user storage     *
*                                         above the 16MB line.         *
*                                                                     *
*   OUT --       output values follow                                 *
*                                                                     *
*                ADDRESS((R6)) -- put address of acquired storage in    *
*                                 register 6.                         *
*                RESPONSE(*) -- put response at SMMC_RESPONSE in       *
*                               macro parameter list.                 *
*                REASON(*) -- put reason at SMMC_REASON in macro       *
*                             parameter list.                         *
*                                                                     *
***********************************************************************
*
         DFHSMMCX CALL,                                               *
               CLEAR,                                                 *
               IN,                                                    *
               FUNCTION(GETMAIN),                                     *
               GET_LENGTH(120),                                       *
               SUSPEND(NO),                                           *
               INITIAL_IMAGE(X'00'),                                  *
               STORAGE_CLASS(USER),                                   *
               OUT,                                                   *
               ADDRESS((R6)),                                         *
               RESPONSE(*),                                           *
               REASON(*)
*                                                                     *
```

Figure 11 (Part 3 of 6). Global user exit program with XPI

```
***********************************************************************
* Test SMMC_RESPONSE -- if OK, then branch round error handling.      *
***********************************************************************
*                                                                     *
         CLI   SMMC_RESPONSE,SMMC_OK    CHECK RESPONSE AND...
         BE    STOK                     ...IF OK, BYPASS ERROR ROUTINES
*                                                                     *

⋮
         error-handling routines

⋮
*
***********************************************************************
*  The next section maps TRANSTOR on the acquired storage.            *
***********************************************************************
*
STOK     DS    0H
         USING TRANSTOR,R6              MAP ACQUIRED STORAGE
         ST    R6,0(R5)                 SAVE STORAGE ADDRESS IN FIRST
*                                       4 BYTES OF STORAGE ADDRESSED
*                                       BY UEPXSTOR
*
         LA    R5,4(R5)                 ADDRESS 4-BYTE OFFSET
         DROP  R5                       REUSE REGISTER 5 TO BASE ALL
         USING DFHxxyy_ARG,R5           FOLLOWING XPI PARAMETER LISTS
*                                       AT 4-BYTE OFFSET INTO STORAGE
*                                       ADDRESSED BY UEPXSTOR
⋮
rest of user exit program
⋮
*
***********************************************************************
*  When the rest of the exit program is completed, free the storage
*  and return.
***********************************************************************
*
         DROP  R5                       REUSE REGISTER 5 TO MAP DFHSMMC
         USING DFHSMMC_ARG,R5           XPI PARAMETER LIST
*
         L     R13,UEPSTACK             ADDRESS KERNEL STACK
*
```

Figure 11 (Part 4 of 6). Global user exit program with XPI

```
***********************************************************************
*  Issue the DFHSMMCX macro call, specifying:                         *
*                                                                     *
*   CALL --      the macro is to be called immediately.               *
*                                                                     *
*   CLEAR --     initialize the parameter list before inserting values. *
*                                                                     *
*   IN --        input values follow.                                 *
*                                                                     *
*                FUNCTION(FREEMAIN) -- release storage                *
*                ADDRESS((R6)) -- address of storage is in register 6. *
*                STORAGE_CLASS(USER)   -- class of acquired storage was *
*                                         31-bit user storage.        *
*                                                                     *
*   OUT --       output values follow                                 *
*                                                                     *
*                RESPONSE(*) -- put response at SMMC_RESPONSE in      *
*                               macro parameter list.                 *
*                REASON(*) -- put reason at SMMC_REASON in macro      *
*                             parameter list.                         *
*                                                                     *
***********************************************************************
*
         DFHSMMCX CALL,                                               +
               CLEAR,                                                 +
               IN,                                                    +
               FUNCTION(FREEMAIN),                                    +
               ADDRESS((R6)),                                         +
               STORAGE_CLASS(USER),                                   +
               OUT,                                                   +
               RESPONSE(*),                                           +
               REASON(*)
*                                                                     *
```

Figure 11 (Part 5 of 6). Global user exit program with XPI

```
***********************************************************************
* Test SMMC_RESPONSE -- if OK, then branch round error handling.      *
***********************************************************************
*                                                                     *
         CLI   SMMC_RESPONSE,SMMC_OK    CHECK RESPONSE AND...
         BE    STEND               ...IF OK, BYPASS ERROR ROUTINES
*                                                                     *

⋮
         error-handling routines

⋮
*
***********************************************************************
*  Restore registers, set return code, and return to user exit handler  *
***********************************************************************
*                                                                     *
STEND    DS    0H
         L     R13,UEPEPSA
         RETURN (14,12),RC=UERCNORM
         LTORG
         END   GXPI
```

Figure 11 (Part 6 of 6). Global user exit program with XPI

An example showing how to build a parameter list incrementally

In the following example, the parameter list is built incrementally. The initialization of the parameter list (using the CLEAR option), the building of the parameter list, and the GETMAIN call are separated into discrete steps.

```
         DFHSMMCX CLEAR
⋮
         DFHSMMCX GET_LENGTH(100)
⋮
         DFHSMMCX CALL,                                               *
               IN,                                                    *
               FUNCTION(GETMAIN),                                     *
               GET_LENGTH(*),                                         *
               SUSPEND(NO),                                           *
               INITIAL_IMAGE(X'00'),                                  *
               STORAGE_CLASS(USER),                                   *
               OUT,                                                   *
               ADDRESS((R6)),                                         *
               RESPONSE(*),                                           *
               REASON(*)
```

Important

You must set your parameters using **only** the XPI functions.

The XPI functions

The following sections of the chapter provide details of the individual XPI function calls. The description of each function defines only the options that are specific to that call. Options that are applicable to all function calls are described in “General form of an XPI call” on page 240. The following argument types are used:

name1, name2,....
Each of these refers to the name of a field of the given size in bytes. “name1” means that the name you specify should be that of a 1-byte field.

literalconst
A number in the form of a literal, for example `B'00000000'`, `X'FF'`, `X'FCF4'`, `'0'`, or an equate symbol with a similar value.

expression
A valid assembler-language expression: a decimal integer, or any arithmetic expression (including symbolic values) valid in assembler language; for example:

```
20; L'AREA; L'AREA+10; L'AREA+X'22'; SYMB/3+20 .
```

(Rn)
A register reference. The parentheses shown here are required in addition to those that surround the argument. For example: OPTION((R5)).

block-descriptor
Represents a source of both the data address and the data length fields. A block-descriptor can be either a single value or a double value. The following is the single-value form:

```
OPTION(blkdname)
```

blkdname The name of a block-descriptor. A pair of contiguous fullwords, in which the first word contains the address of the data, and the second word contains the length in bytes of the data, as a fullword binary value. Register notation is not accepted for this single-value form.

The following is the double-value form:

```
OPTION(addr,len)
```

addr The data address as {namea | (Ra) | aliteral}:

namea	The name of a location containing the data address.
(Ra)	A register containing the data address.
aliteral	An address constant literal; for example: A(data).

len The data length as {namel | (Rn) | expression}:

namel The name of a location containing a binary fullword giving the data length in bytes.

(Rn) A register, the contents of which specify in fullword binary the number of bytes of data.

expression A decimal integer, or any arithmetic expression, including symbolic values, valid in assembler language; for example:

```
L'AREA ; L'AREA+10 ; L'AREA+X'22' ; SYMB/3+20 .
```

buffer-descriptor

Represents a source of both the data address and the maximum data length fields. Parts of the buffer-descriptor are also reserved to act as receiving fields for output information. A buffer-descriptor can be either a single value or a multiple value. The following is the single-value form:

```
OPTION(bufdname)
```

bufdname The name of a buffer-descriptor. A group of four contiguous fullwords, in which:

- The first word contains the address of the data (input).
- The second word is reserved to receive the current length in bytes of the data, as a fullword binary value (output).
- The third word contains the maximum length in bytes of the data, as a fullword binary value (input).
- The fourth word is reserved for use by the XPI.

Register notation is not accepted for this single-value form.

The following is the multiple-value form:

```
OPTION(addr,maxlen,*)
```

addr The data address as {namea | (Ra) | aliteral}:

namea The name of a location containing the data address.

(Ra) A register containing the data address.

aliteral An address constant literal, for example, A(data).

maxlen The maximum data length as {namel | (Rn) | expression}:

namel The name of a location containing a binary fullword giving the maximum data length in bytes.

(Rn) A register, the contents of which specify in fullword binary the maximum number of bytes of data.

expression A decimal integer, or any arithmetic expression, including symbolic values, valid in assembler language; for example:

```
L'AREA ; L'AREA+10 ; L'AREA+X'22' ; SYMB/3+20 .
```

***** A required parameter to indicate that the parameter list is to be used for the reserved fields.

Dispatcher functions

There are six XPI dispatcher functions. These are the DFHDSSRX calls ADD_SUSPEND, SUSPEND, RESUME, DELETE_SUSPEND, and WAIT_EXTERNAL, and the DFHDSATX call CHANGE_PRIORITY.

Usage of these dispatcher calls is very limited. Check the details supplied for each exit in Chapter 1, "Global user exit programs" on page 3 before using any functions.

Notes:

1. You must issue an ADD_SUSPEND call to create a suspend token **before** you issue a SUSPEND or RESUME call.
2. If a suspended task is canceled, the SUSPEND fails with a RESPONSE value of 'PURGED' and a REASON value of 'TASK_CANCELLED'. A corresponding RESUME call returns with a RESPONSE value of 'EXCEPTION' and a REASON value of 'TASK_CANCELLED'.
3. If a suspended task is timed out, the SUSPEND fails with a RESPONSE value of 'PURGED' and a REASON value of 'TIMED_OUT'. A corresponding RESUME call returns with a RESPONSE value of 'EXCEPTION' and a REASON value of 'TIMED_OUT'.
4. Dispatcher protocols require that you issue a RESUME even if the SUSPEND was purged (due to task cancel or time-out). You must issue one and only one RESUME for each SUSPEND call.

Synchronization protocols for SUSPEND and RESUME processing

This section describes the protocols that must be observed by users of XPI SUSPEND and RESUME processing, so that task purging can be handled effectively.

The normal synchronization protocol

In the normal case, synchronization involves two tasks and three operations. In the following sample operations, the tasks are A (the task that requests a service) and B (the task that processes a request from task A).

1. Task A starts the request by:
   - Setting the parameters to be used by task B
   - Resuming task B
   - Issuing the SUSPEND call

2. Task B performs the action by:
   - Getting the parameters
   - Performing the action
   - Setting the results
   - Terminating (or waiting for new work)
3. Task A ends the interaction by:
   - Getting the results left by task B

This sequence looks like:

```
Task A:  Set parameters  Resume task B  Suspend ─────────────────────────  Get results
                           │                                               ▲
                           ▼                                               │
Task B:                    Get parameters  Process request  Set results  Resume  Detach
                                                                         task A
```

Ignoring the Resume and Suspend, the execution amounts to:

```
Set parameters; Get parameters; Process request; Set results; Get results
```

where these actions are always **sequential**.

The synchronization protocol and task purge

If one of the tasks is to be purged, it is task A, because task A is the one suspended. In this case, execution of task A after the failed SUSPEND would be in parallel with task B; the proper serialization would be lost. If the program were left unchanged, Process request and Set results would be taking place at the same time as Get results, with unpredictable results.

One way of preventing this problem is to ensure that **task A, if it is to be purged, does not do anything that could interfere with task B**. (This may well mean that A must not detach, if doing so releases storage that B needs to access.) Because the only task that is now involved is task B, B is left with the responsibility of cleaning up for both tasks.

The sequence is:

```
Task A:  Set parameters;  Resume task B;  Suspend-fail
                            │
                            ▼
Task B:                   Get parameters;  Process request;  Resume-fail;  Clean up both
```

Because task-purging is effective only if performed between SUSPEND and RESUME, Suspend-fail precedes Resume-fail. This means that, with the same constraints on serialization as in the normal synchronization protocol, the task-purge protocol can be logically reduced to:

```
Set parameters;  Get parameters;  Process request;  Clean up
```

The difference is that Set results and Get results are replaced by Clean up. It is vital that only these two sequences can happen; this means that both programs must be coded correctly. CICS ensures that both tasks are told either that SUSPEND and RESUME processing worked, or that it failed.

The following shows the programming steps that conform to these rules:

```
Program for Task A                  Program for Task B
SET PARAMETERS;
                                    GET PARAMETERS;
RESUME B;                             PROCESS REQUEST;
SUSPEND A;                            RESUME A;
if                                  if
  RESPONSE = OK                       RESPONSE ¬= OK
then                                then
  GET RESULTS;                        CLEAN UP
endif                               endif
```

If both the SUSPEND and RESUME return 'OK', the example follows the rules for the normal synchronization; processing finishes at Get results. If neither SUSPEND nor RESUME returns 'OK', the example follows the rules for the task-purge protocol, and processing finishes at Clean up.

For further information about SUSPEND and RESUME processing, see the *CICS Problem Determination Guide*.

Alternative approach to task purge

The sequence described above is one method for dealing with the problem of task purge. Using this method, task B does not know, when it is processing the request, whether or not task A has been purged; this means that B must take great care in its use of resources owned by A (in case A has been purged). In some situations, this restriction may cause difficulties.

A different approach is as follows; if task A is to be purged:

1. A communicates to B that it is no longer available, thus informing B not to use any resources owned by A.
2. A performs its own clean-up processing (including issuing the RESUME call for the purged SUSPEND, as required by the dispatcher protocols), and abends.
3. B performs its own clean-up processing.

The ADD_SUSPEND call

ADD_SUSPEND acquires a suspend token that can later be used to identify a SUSPEND/RESUME pair.

ADD_SUSPEND

```
DFHDSSRX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(ADD_SUSPEND),
      [RESOURCE_NAME(name8 | string | 'string'),]
      [RESOURCE_TYPE(name8 | string | 'string'),]]
      [OUT,
      SUSPEND_TOKEN(name4 | (Rn)),
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

RESOURCE_NAME(name8 | string | 'string')
specifies an 8-character string that can be used to document and trace the resource involved in suspend and resume processing. You cannot use register notation to specify the address of the string.

name8	The name of the location where an 8-byte value is stored.
string	A string of characters without intervening blanks; if it is not 8 bytes long, it is extended with blanks or truncated as required.
'string'	A string of characters enclosed in quotation marks. Blanks are permitted in the enclosed string. If you want to document a name (label) in your program, use this form.

Note: RESOURCE_NAME on ADD_SUSPEND supplies a default value which is used if RESOURCE_NAME is not specified on a SUSPEND call.

RESOURCE_TYPE(name8 | string | 'string')
specifies an 8-character string that can be used to document and trace the resource involved in suspend and resume processing. You cannot use register notation to specify the address of the string.

name8	The name of the location where an 8-byte value is stored.
string	A string of characters without intervening blanks; if it is not 8 bytes long, it is extended with blanks or truncated as required.
'string'	A string of characters enclosed in quotation marks. Blanks are permitted in the enclosed string. If you want to document a name (label) in your program, use this form.

Note: RESOURCE_TYPE on ADD_SUSPEND supplies a default value which is used if RESOURCE_TYPE is not specified on a SUSPEND call.

SUSPEND_TOKEN(name4 | (Rn))
returns a token assigned by the system to identify the SUSPEND/RESUME pair of operations used on the task.

name4	The name of a 4-byte field where the token is stored.
(Rn)	A register into which the token value is loaded.

RESPONSE and REASON values for ADD_SUSPEND:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	None

INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The SUSPEND call

SUSPEND suspends execution of a running task. The task can be resumed in one of two ways. You can issue the XPI RESUME call, or the task is resumed automatically if the INTERVAL value that you specify on the DFHDSSRX macro expires. Suspended tasks can also be purged by the operator, or by an application, or by the deadlock time-out facility.

SUSPEND

```
DFHDSSRX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(SUSPEND),
      PURGEABLE(YES|NO),
      SUSPEND_TOKEN(name4 | (Rn)),
      [DELAY(name4 | (Rn)),]
      [INTERVAL(name4 | (Rn)),]
      [RESOURCE_NAME(name8 | string | 'string'),]
      [RESOURCE_TYPE(name8 | string | 'string'),]
      [RETRY(YES|NO),]
      [TIME_UNIT(SECOND|MILLI_SECOND),]
      [WLM_WAIT_TYPE,]]
      [OUT,
      [COMPLETION_CODE(name1 | (Rn)),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

COMPLETION_CODE(name1 | (Rn))
returns a user-defined "reason for action" code during suspend and resume processing.

name1	The name of a 1-byte area that contains the code.
(Rn)	A register, in which the low-order byte contains the completion code and the other bytes are zero.

DELAY(name4 | (Rn))
Ensures that the issuing task is not dispatched more often than the specified delay interval. DELAY postpones the addition of a task that has been posted (or resumed) to the dispatchable queue, and adds it instead to the delay_queue, where it remains until the delay interval is complete. The delay interval, which starts from the time the SUSPEND request is issued, is specified in seconds or milliseconds, depending on the setting of the TIME_UNIT option.

name4	The name of a 4-byte area, which is interpreted as a binary fullword.
(Rn)	A register containing the interval value, a binary fullword.

INTERVAL(name4 | (Rn))
specifies in seconds or milliseconds the time after which the task is automatically resumed and given a RESPONSE value of ‘PURGED’ and a REASON value of ‘TIMED_OUT’. The time unit used on the INTERVAL option depends on the setting of the TIME_UNIT option. The INTERVAL value overrides any time-out (DTIMOUT) value specified for the transaction.

name4	The name of a 4-byte area, which is interpreted as a binary fullword.
(Rn)	A register containing the interval value, a binary fullword.

PURGEABLE(YES|NO)
specifies whether your code can cope with the request being abnormally terminated as a result of a purge. There are four types of purge, as shown in Table 102. Specifying PURGEABLE(NO) tells the dispatcher:

- To reject any attempt to PURGE the task.
- To suppress the deadlock time-out (DTIMOUT) facility (if applicable to this task) for the duration of this request.

Table 102. SUSPEND call – RESPONSE(PURGED)

REASON	TASK_CANCELLED		TIMED_OUT	
CONDITION	PURGE	FORCEPURGE	DTIMOUT	INTERVAL
PURGEABLE (NO)	Canceled	Proceeds normally	Canceled	Proceeds normally
PURGEABLE (YES)	Proceeds normally	Proceeds normally	Proceeds normally	Proceeds normally

Note: A FORCEPURGE always assumes that the user wants the task to be purged, and so overrides the PURGEABLE(NO) option. If the user has set an INTERVAL, then this, too, overrides the PURGEABLE(NO) option.

RESOURCE_NAME(name8 | string | 'string')
specifies an 8-character string that can be used to document and trace the resource involved in suspend and resume processing. You cannot use register notation to specify the address of the string.

name8	The name of the location where an 8-byte value is stored.
string	A string of characters without intervening blanks; if it is not 8 bytes long, it is extended with blanks or truncated as required.
'string'	A string of characters enclosed in quotation marks. Blanks are permitted in the enclosed string. If you want to document a name (label) in your program, use this form.

Notes:

1. CICS does not use the RESOURCE_NAME information but includes it in trace entries, and displays it on appropriate CEMT screens to help you to see what your task is doing. CICS internal requests specify values, and you should use different values to avoid ambiguity. CICS internal request values are documented in the *CICS Problem Determination Guide*.
2. If RESOURCE_NAME is not specified, the default value, if any, from ADD_SUSPEND is used.

RESOURCE_TYPE(name8 | string | 'string')
specifies an 8-character string that can be used to document and trace the resource involved in suspend and resume processing. You cannot use register notation to specify the address of the string.

name8	The name of the location where an 8-byte value is stored.
string	A string of characters without intervening blanks; if it is not 8 bytes long, it is extended with blanks or truncated as required.
'string'	A string of characters enclosed in quotation marks. Blanks are permitted in the enclosed string. If you want to document a name (label) in your program, use this form.

Notes:

1. CICS does not use the RESOURCE_TYPE information but includes it in trace entries, and displays it on appropriate CEMT screens to help you to see what your task is doing. CICS internal requests specify values, and you should use different values to avoid ambiguity. CICS internal request values are documented in the *CICS Problem Determination Guide*.
2. If RESOURCE_TYPE is not specified, the default value, if any, from ADD_SUSPEND is used.

RETRY(YES | NO)
Specifying RETRY(YES) continues the DTIMOUT interval started on the last SUSPEND or WAIT that did not specify RETRY(YES). This allows DTIMOUT to work even if a legitimate loop keeps resuming and then resuspending the task.

SUSPEND_TOKEN(name4 | (Rn))
specifies a token previously assigned by the system to identify the SUSPEND/RESUME pair of operations used on the task.

name4	The name of a location where you have a 4-byte token previously obtained as output from an ADD_SUSPEND call.
(Rn)	A register containing the token value.

TIME_UNIT(SECOND | MILLI_SECOND)
specifies the time unit used on the INTERVAL option.

SECOND	The INTERVAL option specifies the number of seconds before timeout.
MILLI_SECOND	The INTERVAL option specifies the number of milliseconds before timeout.

WLM_WAIT_TYPE
This parameter is retained for compatibility with CICS for MVS/ESA™ 4.1.

RESPONSE and REASON values for SUSPEND:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	TASK_CANCELLED
	TIMED_OUT

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.
2. After a 'PURGED' response, the suspend token must not be reused in another SUSPEND until it has been reset by a RESUME corresponding to the purged SUSPEND.
3. 'TASK_CANCELLED' means that the task has been canceled by operator action or by an application command.
4. 'TIMED_OUT' means that the task has been automatically resumed because the specified INTERVAL (or the time-out value specified at task attach) has expired. The token, however, remains suspended and must be the object of a RESUME before it can be the object of a DELETE_SUSPEND.

The RESUME call

RESUME restarts execution of a task that is suspended or timed out. There must be only one RESUME request for each SUSPEND. However, because this is an asynchronous interface, a SUSPEND can be received either before or after its corresponding RESUME. You must ensure that you keep account of the SUSPEND and RESUME requests issued from your exit program.

RESUME

```
DFHDSSRX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(RESUME),
      SUSPEND_TOKEN(name4 | (Rn)),
      [COMPLETION_CODE(name1 | (Rn)),]]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

COMPLETION_CODE (name1 | (Rn))
specifies a user-defined "reason for RESUME" code.

name1	The name of a 1-byte area that contains the code. The value in this field is user-defined, and is ignored by CICS.
(Rn)	A register in which the low-order byte contains the completion code and the other bytes are zero.

SUSPEND_TOKEN(name4 | (Rn))
specifies a token previously assigned by the system to identify the SUSPEND/RESUME pair of operations used on the task.

name4	The name of a location where you have a 4-byte token previously obtained as output from an ADD_SUSPEND call.
(Rn)	A register containing the token value.

RESPONSE and REASON values for RESUME:

RESPONSE	*REASON*
OK	None
EXCEPTION	TASK_CANCELLED
	TIMED_OUT
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.
2. 'TASK_CANCELLED' means that the task was canceled by operator action while it was suspended, and that the suspend token is available for use.

The DELETE_SUSPEND call

DELETE_SUSPEND releases a suspend token associated with this task.

DELETE_SUSPEND

```
DFHDSSRX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(DELETE_SUSPEND),
      SUSPEND_TOKEN(name4 | (Rn)),]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

SUSPEND_TOKEN(name4 | (Rn))
specifies a token previously assigned by the system to identify the SUSPEND/RESUME pair of operations used on the task.

name4	The name of a 4-byte field, where the token obtained by an ADD_SUSPEND call has been stored.
(Rn)	A register containing the token value previously obtained.

RESPONSE and REASON values for DELETE_SUSPEND:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The WAIT_EXTERNAL call

WAIT_EXTERNAL requests a wait on a VSE/ESA event control block (ECB) or on a list of VSE/ESA ECBs. For example, you could issue the WAIT_EXTERNAL to wait for completion of a VSE/ESA task for which you have issued ATTACH and provided a task-completion ECB.

The dispatcher does not clear the ECBs when a WAIT_EXTERNAL request is received. If any ECB is already posted, control is returned immediately to the exit program with a response of ‘OK’.

A WAIT_EXTERNAL ECB can be posted using either a VSE POST macro or “hand-posting”.

WAIT_EXTERNAL

```
DFHDSSRX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(WAIT_EXTERNAL),
      {ECB_ADDRESS(name4 | (Ra)) | ECB_LIST_ADDRESS(name4 | (Ra)),}
      PURGEABLE(YES|NO),
      [DELAY(name4 | (Rn)),]
      [INTERVAL(name4 | (Rn)),]
      [RESOURCE_NAME(name8 | string | 'string'),]
      [RESOURCE_TYPE(name8 | string | 'string'),]]
      [RETRY(YES|NO),]
      [TIME_UNIT(SECOND|MILLI_SECOND),]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

DELAY(name4 | (Rn))
Ensures that the issuing task is not dispatched more often than the specified delay interval. DELAY postpones the addition of a task that has been posted (or resumed) to the dispatchable queue, and adds it instead to the delay_queue, where it remains until the delay interval is complete. The delay interval, which starts from the time the SUSPEND request is issued, is specified in seconds or milliseconds, depending on the setting of the TIME_UNIT option.

name4	The name of a 4-byte area, which is interpreted as a binary fullword.
(Rn)	A register containing the interval value, a binary fullword.

ECB_ADDRESS(name4 | (Ra))
specifies the address of the ECB to be waited on.

name4	The name of a location that contains an ECB address.
(Ra)	A register that contains the address of an ECB.

ECB_LIST_ADDRESS(name4 | (Ra))
specifies the address of a list of ECB addresses to be waited on.

name4	The name of a location that contains an ECB address, possibly followed by more ECB addresses. The last address word in the list has the high-order bit set to 1.
(Ra)	A register pointing to an address list as described above.

INTERVAL(name4 | (Rn))

specifies in seconds or milliseconds the time after which the task is automatically resumed and given a RESPONSE value of ‘PURGED’ and a REASON value of ‘TIMED_OUT’. The time unit used on the INTERVAL option depends on the setting of the TIME_UNIT option.

The INTERVAL value overrides any time-out (DTIMOUT) value specified for the transaction.

name4	The name of a 4-byte area, which is interpreted as a binary fullword
(Rn)	A register containing the interval value, a binary fullword.

PURGEABLE(YES|NO)

specifies whether your code can cope with the request being abnormally terminated as a result of a purge. There are four types of purge, as shown in Table 103. Specifying PURGEABLE(NO) tells the dispatcher:

- To reject any attempt to PURGE the task
- To suppress the deadlock time-out (DTIMOUT) facility (if applicable to this task) for the duration of this request

Table 103. WAIT_EXTERNAL call – RESPONSE(PURGED)

REASON	TASK_CANCELLED		TIMED_OUT	
CONDITION	PURGE	FORCEPURGE	DTIMOUT	INTERVAL
PURGEABLE (NO)	Canceled	Proceeds normally	Canceled	Proceeds normally
PURGEABLE (YES)	Proceeds normally	Proceeds normally	Proceeds normally	Proceeds normally

Note: A FORCEPURGE always assumes that the user wants the task to be purged, and so overrides the PURGEABLE(NO) option. If the user has set an INTERVAL, then this, too, overrides the PURGEABLE(NO) option.

RESOURCE_NAME(name8 | string | 'string')

specifies an 8-character string that can be used to document and trace the resource involved in suspend and resume processing. You cannot use register notation to specify the address of the string.

name8	The name of the location where an 8-byte value is stored.
string	A string of characters without intervening blanks; if it is not 8 bytes long, it is extended with blanks or truncated as required.
'string'	A string of characters enclosed in quotation marks. Blanks are permitted in the enclosed string. If you want to document a name (label) in your program, use this form.

Note: CICS does not use the RESOURCE_NAME information but includes it in trace entries, and displays it on appropriate CEMT screens to help you to see what your task is doing. CICS internal requests specify values, and you should use different values to avoid ambiguity. CICS internal request values are documented in the *CICS Problem Determination Guide*.

RESOURCE_TYPE(name8 | string | 'string')

specifies an 8-character string that can be used to document and trace the resource involved in suspend and resume processing. You cannot use register notation to specify the address of the string.

name	The name of the location where an 8-byte value is stored.
string	A string of characters without intervening blanks; if it is not 8 bytes long, it will be extended with blanks or truncated as required.
'string'	A string of characters enclosed in quotation marks. Blanks are permitted in the enclosed string. If you want to document a name (label) in your program, use this form.

Note: CICS does not use the RESOURCE_TYPE information but includes it in trace entries, and displays it on appropriate CEMT screens to help you to see what your task is doing. CICS internal requests specify values, and you should use different values to avoid ambiguity. CICS internal request values are documented in the *CICS Problem Determination Guide*.

RETRY(YES | NO)
Specifying RETRY(YES) continues the DTIMOUT interval started on the last SUSPEND or WAIT that did not specify RETRY(YES). This allows DTIMOUT to work even if a legitimate loop keeps resuming and then resuspending the task.

TIME_UNIT(SECOND | MILLI_SECOND)
specifies the time unit used on the INTERVAL option.

SECOND	The INTERVAL option specifies the number of seconds before timeout.
MILLI_SECOND	The INTERVAL option specifies the number of milliseconds before timeout.

RESPONSE and REASON values for WAIT_EXTERNAL:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	TASK_CANCELLED
	TIMED_OUT

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.
2. ‘TIMED_OUT’ is returned if the INTERVAL expires, or if a deadlock time-out interval expires.
3. ‘TASK_CANCELLED’ means that the task has been canceled by operator action or by an application command.

The CHANGE_PRIORITY call

CHANGE_PRIORITY allows the issuing task to change its own priority. It cannot be used to change the priority of another task. This command causes the issuing task to release control, and so provide other tasks with the opportunity to run.

CHANGE_PRIORITY

```
DFHDSATX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(CHANGE_PRIORITY),
      PRIORITY(name1 | (Rn) | decimalint | literalconst),]
      [OUT,
      [OLD_PRIORITY(name1 | (Rn)),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

OLD_PRIORITY(name1 | (Rn))
returns the previous priority of the issuing task.

name1	The name of a 1-byte field where the task's previous priority is stored.
(Rn)	A register in which the low-order byte receives the previous priority value and the other bytes are set to zero.

PRIORITY(name1 | (Rn) | decimalint | literalconst)
specifies the new priority to be assigned to the issuing task.

name1	The name of a 1-byte field, with a value in the range 0 through 255.
(Rn)	A register with the low-order byte containing the new priority value.
decimalint	A decimal integer not exceeding 255 in value. Neither an expression nor hexadecimal notation is allowed.
literalconst	A number in the form of a literal, for example `B'00000000'`, `X'FF'`, `X'FCF4'`, `'0'` or an equate symbol with a similar value.

RESPONSE and REASON values for CHANGE_PRIORITY:

RESPONSE	*REASON*
OK	None
DISASTER	None
INVALID	None
KERNERROR	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

Dump control functions

There are two XPI dump control functions. These are the DFHDUDUX macro calls SYSTEM_DUMP and TRANSACTION_DUMP.

DFHDUDUX calls cannot be used in any exit program invoked from any global user exit point in the:

- Statistics domain
- Monitor domain
- Dump domain
- Dispatcher domain
- Journal control program
- Transient data program

The SYSTEM_DUMP call

SYSTEM_DUMP causes a system dump to be taken. If the system dump code that you supply on input is in the system dump code table, the dump may be suppressed. For information about the dump table and how it works, refer to the *CICS Problem Determination Guide* and the *CICS System Programming Reference* manual.

SYSTEM_DUMP

```
DFHDUDUX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(SYSTEM_DUMP),
      SYSTEM_DUMPCODE(name8 | string | 'string'),
      [CALLER(block-descriptor),]
      [TITLE(block-descriptor),]]
      [OUT,
      DUMPID(name9 | *),
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

CALLER(block-descriptor)
specifies the source of a system dump request. The information that you supply here appears in the dump header, so you could use it to identify the exit program that initiated the system dump request. For a description of valid block-descriptors, see page 253.

DUMPID(name9 | *)
returns the dump identifier.

name9	The name of a 9-byte field to receive the assigned ID.

SYSTEM_DUMPCODE(name8 | string | 'string')
specifies the code corresponding to the error that caused this system dump call. System dump codes are held in the dump table; for information about the dump table and how it works, refer to the *CICS Problem Determination Guide* and the *CICS System Programming Reference* manual.

name8	The name of a location containing an 8-byte string.

string	A string of characters without intervening blanks. The macro generates, from the string, a literal constant of length 8 bytes, extending with blanks or truncating as required.
'string'	A string, enclosed in quotation marks and possibly containing blanks. This value is processed in the same way as the “string” above.

TITLE(block-descriptor)
specifies an area containing the text you want to appear in the dump header when the system dump is printed.

RESPONSE and REASON values for SYSTEM_DUMP:

RESPONSE	*REASON*
OK	None
EXCEPTION	FESTAE_FAILED
	INSUFFICIENT_STORAGE
	INVALID_DUMPCODE
	NO_DATASET
	PARTIAL_SYSTEM_DUMP
	SDUMP_FAILED
	SDUMP_LIBRARY_FULL
	SDUMP_NOT_AUTHORIZED
	SUPPRESSED_BY_DUMPOPTION
	SUPPRESSED_BY_DUMPTABLE
	SUPPRESSED_BY_USEREXIT
DISASTER	None
INVALID	INVALID_SVC_CALL
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The TRANSACTION_DUMP call

TRANSACTION_DUMP causes a transaction dump to be taken. If the transaction dump code that you supply on input is in the transaction dump code table, the dump may be suppressed and, optionally, a system dump may be taken. For information about the dump table and how it works, refer to the *CICS Problem Determination Guide* and the *CICS System Programming Reference* manual.

Important

There is a restriction in using the XPI early during initialization. Do not start exit programs that use the XPI functions TRANSACTION_DUMP, WRITE_JOURNAL_DATA, MONITOR, and INQUIRE_MONITOR_DATA until the second phase of the PLTPI. For further information about the PLTPI, refer to Chapter 4, “Writing initialization and shutdown programs” on page 339.

TRANSACTION_DUMP

```
DFHDUDUX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(TRANSACTION_DUMP),
      TRANSACTION_DUMPCODE(name4 | string | 'string')
      [CSA(YES| NO),]
      [PROGRAM(YES| NO),]
      [SEGMENT(block-descriptor),]
      [SEGMENT_LIST(block-descriptor),]
      [TCA(YES| NO),]
      [TERMINAL(YES| NO),]
      [TRANSACTION(YES| NO),]
      [TRT(YES| NO),]]
      [OUT,
      DUMPID(name9 | *),
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

CSA(YES| NO)
specifies whether the common system area (CSA) is to be included in the transaction dump. The default is NO.

DUMPID(name9 | *)
returns the dump identifier.

name9	The name of a 9-byte field to receive the assigned ID.

PROGRAM(YES| NO)
specifies whether all program storage areas associated with this task are to be included in the transaction dump. The default is NO.

SEGMENT(block-descriptor)
specifies the address and the length of a single block of storage that is to be dumped. See page 253 for a description of valid block-descriptors. SEGMENT and SEGMENT_LIST are mutually exclusive.

SEGMENT_LIST(block-descriptor)
specifies the address and length of a *set* of contiguous word pairs. The first word in each pair specifies the **length** in bytes of a storage segment to be dumped; the second word contains the **address** of the storage segment. The end of the list must be marked by a word containing X'FFFFFFFF'. SEGMENT and SEGMENT_LIST are mutually exclusive.

TCA(YES| NO)
specifies whether the task control area (TCA) is to be included in the transaction dump. The default is NO.

TERMINAL(YES| NO)
specifies whether all terminal storage areas associated with the task are to be included in the transaction dump. The default is NO.

TRANSACTION(YES| NO)
specifies whether all transaction storage areas associated with the task are to be included in the transaction dump. The default is NO.

TRANSACTION_DUMPCODE(name4 | string | 'string')
specifies the code corresponding to the error that caused this transaction dump call. Transaction dump codes are held in the dump table; for information about the dump table and how it works, refer to the *CICS Problem Determination Guide* and the *CICS System Programming Reference* manual.

name4	The name of a location containing a 4-byte string.
string	A string of characters without intervening blanks. The macro generates a literal constant of length 4 bytes from the string, extending with blanks or truncating as required.
'string'	A string, enclosed in quotation marks and possibly containing blanks. This value is processed in the same way as the "string" above.

TRT(YES| NO)
specifies whether the trace table (TRT) is to be included in the transaction dump. The default is NO.

RESPONSE and REASON values for TRANSACTION_DUMP:

RESPONSE	*REASON*
OK	None
EXCEPTION	FESTAE_FAILED
	INSUFFICIENT_STORAGE
	INVALID_DUMPCODE
	NOT_OPEN
	OPEN_ERROR
	PARTIAL_SYSTEM_DUMP
	PARTIAL_TRANSACTION_DUMP
	SDUMP_FAILED
	SDUMP_LIBRARY_FULL
	SDUMP_NOT_AUTHORIZED
	SUPPRESSED_BY_DUMPOPTION
	SUPPRESSED_BY_DUMPTABLE
	SUPPRESSED_BY_USEREXIT
DISASTER	None
INVALID	INVALID_SVC_CALL
KERNERROR	None
PURGED	None

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.
2. 'NOT_OPEN' means that the CICS dump data set is closed.
3. 'OPEN_ERROR' means that an error occurred while a CICS dump data set was being opened.
4. 'PARTIAL' means that the transaction dump resulting from this request is incomplete.

Kernel domain functions

The START_PURGE_PROTECTION function

The START_PURGE_PROTECTION function is provided on the DFHKEDSX macro call. It inhibits purge, but not force-purge, for the current task. This function can be used by all global user exit programs if they want to inhibit purge during a global user exit call.

In general, each START_PURGE_PROTECTION call should have a corresponding STOP_PURGE_PROTECTION function call to end the purge protection period on completion of any program logic that needs such protection.

START_PURGE_PROTECTION

```
DFHKEDSX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(START_PURGE_PROTECTION),]
       [OUT,
       RESPONSE (name1 | *)]
```

There are no input or output parameters on this call, only a RESPONSE.

RESPONSE values for START_PURGE_PROTECTION:

RESPONSE	*REASON*
OK	None
DISASTER	None
INVALID	None

The STOP_PURGE_PROTECTION function

The STOP_PURGE_PROTECTION function is provided on the DFHKEDSX macro call. It re-enables purge for the current task after purge has been suspended by a preceding START_PURGE_PROTECTION function call.

STOP_PURGE_PROTECTION

```
DFHKEDSX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(STOP_PURGE_PROTECTION),]
       [OUT,
       RESPONSE (name1 | *)]
```

There are no input or output parameters on this call, only a RESPONSE.

RESPONSE values for STOP_PURGE_PROTECTION:

RESPONSE	*REASON*
OK	None
DISASTER	None
INVALID	None

Nesting purge protection calls

Note that the START_ and STOP_PURGE_PROTECTION functions can be nested. You should ensure that, if multiple START_PURGE_PROTECTION calls are issued for a task, that the correct number of STOP_PURGE_PROTECTION calls are issued to cancel the purge protection. If you issue two starts and only one stop, purge protection is left on for the current task.

For example, for any current task, more than one global user exit program may be driven. You must design your exit programs to ensure that purge protection is correctly cancelled. An example of nesting is shown as follows:

```
XEIIN:
 EXIT_PROG1: Calls START_PURGE_PROTECTION

   XFCREQ:
    EXIT_PROG2: Calls START_PURGE_PROTECTION

   XFCREQC:
    EXIT_PROG3: Calls STOP_PURGE_PROTECTION

XEIOUT:
 EXIT_PROG4: Calls STOP_PURGE_PROTECTION
```

Loader functions

There are four XPI loader functions. These are the DFHLDLDX calls ACQUIRE_PROGRAM, RELEASE_PROGRAM, DEFINE_PROGRAM, and DELETE_PROGRAM.

DFHLDLDX calls cannot be used in any exit program invoked from any global user exit point in the:

- Statistics domain
- Monitor domain
- Dump domain
- Dispatcher domain
- Journal control program
- Transient data program

The DEFINE_PROGRAM call

DEFINE_PROGRAM allows you to define new programs to the loader domain, or to change the details of programs that have already been defined. The details that you provide are recorded on the local catalog, and become immediately available. They are used on all subsequent ACQUIRE requests for the named program. However, note that program definitions made in this way are **not** retained over an XRF takeover.

DEFINE_PROGRAM

```
DFHLDLDX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(DEFINE_PROGRAM),
      PROGRAM_NAME(name8 | string | 'string' ),
      [EXECUTION_KEY(CICS|USER),]
      [PROGRAM_ATTRIBUTE(RELOAD|RESIDENT|REUSABLE|TRANSIENT),]
      [PROGRAM_TYPE(PRIVATE|SHARED|TYPE_ANY),]
      [REQUIRED_AMODE(24|31|AMODE_ANY),]
      [REQUIRED_RMODE(24|RMODE_ANY),]]
      [OUT,
      [NEW_PROGRAM_TOKEN(name4),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

EXECUTION_KEY(CICS|USER)
specifies, in conjunction with other program attributes, the type of dynamic storage area (DSA) into which the loader is to load the program.

CICS For non-reentrant programs, means that the program is to be loaded into a CICS DSA, above or below the 16MB line; that is, the CDSA or ECDSA. The choice of CICS DSA is dependent on the residence mode (RMODE) attribute of the program as defined to the linkage-editor.

For reentrant RMODE(24) programs, means that the program is to be loaded into the CDSA.

USER For non-reentrant programs, means that the program is to be loaded into a user DSA, above or below the 16MB line; that is, the UDSA or EUDSA. The choice of user DSA is dependent on the residence mode (RMODE) attribute of the program as defined to the linkage-editor.

For reentrant RMODE(24) programs, means that the program is to be loaded into the UDSA.

Reentrant programs If a program is link-edited as reentrant (with the SVA link-edit option), the EXECUTION_KEY option is ignored, and it is loaded into a read-only DSA (the RDSA or ERDSA). For details of the type of storage allocated for read-only DSAs, see the RENTPGM system initialization parameter.

See Table 104 on page 275 for a summary of the effect of the EXECUTION_KEY option in conjunction with other factors.

Table 104. Summary of attributes defining DSA eligibility

EXECUTION_KEY option	Reentrant	Above or below 16MB line	Dynamic storage area (DSA)
CICS	No	Below	CDSA
CICS	Yes	Below	RDSA
CICS	No	Above	ECDSA
CICS	Yes	Above	ERDSA
USER	No	Below	UDSA
USER	Yes	Below	RDSA
USER	No	Above	EUDSA
USER	Yes	Above	ERDSA

NEW_PROGRAM_TOKEN(name4)
returns the token supplied for the newly-defined program.

name4 The name of a location to receive the 4-byte token.

PROGRAM_ATTRIBUTE(RELOAD|RESIDENT|REUSABLE|TRANSIENT)
specifies the residency status of the program.

RELOAD Every ACQUIRE_PROGRAM request for this program is satisfied by loading a new copy into storage. When a RELEASE request is issued for a copy, it is removed from storage.

Note: Do not use this attribute when defining an exit program.

RESIDENT There is a single copy of the program that is not removed from storage unless deleted. RESIDENT programs must be at least quasireentrant.

REUSABLE The program is at least quasireentrant; a single copy in storage can be used by several tasks in the system. A REUSABLE program becomes eligible for removal from storage as part of the normal dynamic program compression scheme when its use count reaches zero.

TRANSIENT Similar to REUSABLE, except that the program is removed from storage immediately its use count reaches zero. This should be specified only for less-frequently used programs, or for programs in systems that are critically short on storage.

PROGRAM_NAME(name8 | string | 'string')
specifies the name of the program to be defined.

name8 The name of a location where there is an 8-byte program name.

string A string of characters, without intervening blanks, naming the program.

'string' A string of characters within quotation marks. The string length is set to 8 by padding with blanks or by truncation.

PROGRAM_TYPE(PRIVATE|SHARED|TYPE_ANY)
specifies where to load the program from.

PRIVATE The program is in the LIBDEF sublibrary concatenation. A PRIVATE program need not be reentrant, and is given only limited protection from unauthorized overwriting. The degree of protection depends on the type of dynamic storage area (DSA) into which the program is loaded (see the EXECUTION_KEY option):

DSA	Protection from unauthorized overwriting
CDSA	Cannot be overwritten by USER-key tasks.
ECDSA	Cannot be overwritten by USER-key tasks.
ERDSA	Complete—cannot be overwritten by USER-key tasks nor by CICS-key tasks.
EUDSA	None.
RDSA	Complete—cannot be overwritten by USER-key tasks nor by CICS-key tasks.
UDSA	None.

SHARED The program is located in the shared virtual area (SVA), is reentrant, and is protected.

TYPE_ANY Either the LIBDEF sublibrary concatenation or the SVA copy of the program may be used, though preference is given to the SVA copy.

REQUIRED_AMODE(24|31|AMODE_ANY)
specifies the addressing mode of the program. If, during subsequent ACQUIRE_PROGRAM processing, no copy of the program that meets the defined addressing requirement can be found, the ACQUIRE_PROGRAM call receives an ‘EXCEPTION’ response and the REASON value ‘PROGRAM_NOT_FOUND’.

Notes:

1. AMODE_ANY and AMODE 31 have identical meanings for this function.
2. You cannot use this option to override the link-edited addressing mode of the program.

REQUIRED_RMODE(24|RMODE_ANY)
specifies the residency mode of the program. If, during subsequent ACQUIRE_PROGRAM processing, no copy of the program that meets the defined addressing requirement can be found, the ACQUIRE_PROGRAM call receives an ‘EXCEPTION’ response and the REASON value ‘PROGRAM_NOT_FOUND’.

Note: You cannot use this option to override the link-edited residence mode of the program.

RESPONSE and REASON values for DEFINE_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	CATALOG_ERROR
	CATALOG_NOT_OPERATIONAL
	INVALID_PROGRAM_NAME
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The ACQUIRE_PROGRAM call

ACQUIRE_PROGRAM returns the entry and load point addresses, the length, and a new program token for a usable copy of the named program, which can be identified by either its name or a program token.

ACQUIRE_PROGRAM

```
DFHLDLDX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(ACQUIRE_PROGRAM),
      {PROGRAM_NAME(name8 | string | 'string')|
      PROGRAM_TOKEN(name4)},
      [SUSPEND(YES|NO),]]
      [OUT,
      ENTRY_POINT(name4 | (Ra)),
      [PROGRAM_ATTRIBUTE(name1 | (Rn)),]
      [LOAD_POINT(name4 | (Ra)),]
      [NEW_PROGRAM_TOKEN(name4),]
      [PROGRAM_LENGTH(name4 | (Rn)),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

ENTRY_POINT(name4 | (Ra))
returns the program's entry point address.

name4	The name of a 4-byte location to receive the 31-bit entry address.
(Ra)	A register to receive the entry address.

LOAD_POINT(name4 | (Ra))
returns the program's load point address.

name4	The name of a 4-byte location to receive the loaded address.
(Ra)	A register that is to contain the load address.

NEW_PROGRAM_TOKEN(name4)
returns the new program token for a usable copy of the named program.

name4	The name of a location to receive a 4-byte token that identifies this program and instance.

PROGRAM_ATTRIBUTE(name1 | (Rn))
returns the program attribute.

name1	The name of a 1-byte location to receive the program attribute.
(Rn)	A register in which the low-order byte receives the program attribute and the other bytes are set to zero. It can have the values RELOAD, RESIDENT, REUSABLE, or TRANSIENT.

RELOAD	The program is not reusable, and therefore several copies of the program may be loaded. A copy is removed from storage when a RELEASE_PROGRAM call (for that copy) is issued.
RESIDENT	There is a single copy of the program that is not removed from storage unless deleted. RESIDENT programs must be at least quasireentrant. Any program of PROGRAM_TYPE(SHARED) has the RESIDENT attribute by default. The DELETE_PROGRAM call has no effect on this type of RESIDENT program.
REUSABLE	Similar to RESIDENT, except that a REUSABLE program that is not in use can be removed from storage by CICS, for storage optimization reasons.
TRANSIENT	Similar to RESIDENT, except that a TRANSIENT program is removed from storage as soon as its use count drops to zero.

PROGRAM_LENGTH(name4 | (Rn))
returns the length of the named program.

name4	The name of a 4-byte location that is to receive the length in bytes, expressed in binary.
(Rn)	A register to contain the length in bytes, expressed in binary.

PROGRAM_NAME(name8 | string | 'string')
specifies the name of the program to be acquired.

name8	The name of a location containing an 8-byte program name.
string	A string of characters naming the program.
'string'	A string in quotation marks. The string length is set to 8 by padding with blanks or truncating.

PROGRAM_TOKEN(name4),
specifies a token identifying the program whose details are to be acquired.

name4	The name of a location containing a 4-byte token obtained by a previous DEFINE_PROGRAM or ACQUIRE_PROGRAM call.

SUSPEND(YES|NO)
specifies whether execution is to be suspended until the request can be granted.

RESPONSE and REASON values for ACQUIRE_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	NO_STORAGE (if SUSPEND(NO))
	PROGRAM_NOT_DEFINED
	PROGRAM_NOT_FOUND
DISASTER	NO_STORAGE (if SUSPEND(YES))
INVALID	None
KERNERROR	None
PURGED	None

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.
2. A REASON of 'NO_STORAGE' with a RESPONSE of 'EXCEPTION' means that there was insufficient storage to satisfy this request, and SUSPEND(NO) was specified.
3. A REASON of 'PROGRAM_NOT_FOUND' is returned if the program has not been included in the library concatenation, or if the link-edit failed. In such a case, the program is marked as "not executable"; it must be re-linked before it can be successfully acquired.

The RELEASE_PROGRAM call

RELEASE_PROGRAM decrements the use count of a currently loaded program by one.

If the program has been defined with the RELOAD attribute, the storage occupied by this copy of the program is released.

You should issue the ACQUIRE_PROGRAM and RELEASE_PROGRAM requests for a single program during the same execution of the exit program. If you do not want to do this, you should acquire the program once during CICS initialization, and leave it resident until CICS termination.

RELEASE_PROGRAM

```
DFHLDLDX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(RELEASE_PROGRAM),
      ENTRY_POINT(pointer),
      {PROGRAM_NAME(name8 | string | 'string')|
      PROGRAM_TOKEN(name4)},]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

ENTRY_POINT(pointer)
specifies the address of the entry point of this copy of the named program.

PROGRAM_NAME(name8 | string | 'string')
specifies the name of the program to be released.

name8	The name of a location containing an 8-byte program name.
string	A string of characters naming the program.
'string'	A string in quotation marks. The string length is set to 8 by padding with blanks or truncating.

PROGRAM_TOKEN(name4),
specifies a token identifying the program to be released.

name4	The name of a location containing an 4-byte token obtained by a previous DEFINE_PROGRAM or ACQUIRE_PROGRAM call.

RESPONSE and REASON values for RELEASE_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	PROGRAM_NOT_DEFINED
	PROGRAM_NOT_IN_USE
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.
2. 'PROGRAM_NOT_DEFINED' is returned if the program that you name is not known to the system.
3. 'PROGRAM_NOT_IN_USE' is returned when the use count for the named program is already zero.

The DELETE_PROGRAM call

DELETE_PROGRAM removes the definition of a named program from the catalog and from the list of current programs. When this request executes successfully, subsequent ACQUIRE_PROGRAM requests fail with a REASON value of 'PROGRAM_NOT_DEFINED'.

DELETE_PROGRAM

```
DFHLDLDX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(DELETE_PROGRAM),
      PROGRAM_NAME(name8 | string | 'string' ),]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

PROGRAM_NAME(name8 | string | 'string')
specifies the name of the program to be deleted.

name8	The name of a location containing an 8-byte program name.
string	A string of characters naming the program.
'string'	A string in quotation marks. The string length is set to 8 by padding with blanks or truncating.

RESPONSE and REASON values for DELETE_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	PROGRAM_NOT_DEFINED
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

Monitoring functions

There are two XPI monitoring functions. These are the DFHMNMNX calls MONITOR and INQUIRE_MONITORING_DATA.

DFHMNMNX calls cannot be used in any exit program invoked from any global user exit point in the:

- Dispatcher domain
- Dump domain
- Journal control program (DFHJCP)
- Monitor domain
- Statistics domain
- Transient data program

INQUIRE_MONITORING_DATA calls cannot be used in any exit program invoked from any global user exit point in DFHTCP or DFHZCP (that is, at any of the exit points named “XTCx...” or “XZCx...”).

The MONITOR call

The MONITOR XPI call is similar to the EXEC CICS MONITOR command. It enables you to invoke user event-monitoring points (EMPs) in your exit programs. The user event-monitoring points must be defined in the usual way in the monitoring control table (MCT). For more information about CICS monitoring, read Chapter 18, “CICS monitoring” on page 531.

At a user EMP, you can add your own data (up to 256 counters, up to 256 clocks, and a single character string of up to 256 bytes) to fields reserved unconditionally for you in performance class monitoring data records.

MONITOR

```
DFHMNMNX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(MONITOR),
      POINT(expression | name2 | (Rn)),
      [DATA1(expression | name4 | (Ra) | *),]
      [DATA2(expression | name4 | (Rn) | *),]
      [ENTRYNAME(name8 | string | 'string'),]]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

Important

There is a restriction in using the XPI early during initialization. Do not start exit programs that use the XPI functions TRANSACTION_DUMP, WRITE_JOURNAL_DATA, MONITOR, and INQUIRE_MONITOR_DATA until the second phase of the PLTPI. For further information about the PLTPI, refer to Chapter 4, “Writing initialization and shutdown programs” on page 339.

DATA1(expression | name4 | (Ra) | *)
specifies a fullword binary variable whose contents depend on the type of user EMP being used:

- If the MCT user EMP definition contains an ADDCNT, SUBCNT, NACNT, EXCNT, or ORCNT option, the DATA1 variable is an area used as defined by the user EMP definition.
- If the MCT user EMP definition contains an MLTCNT option, the DATA1 variable is an area with the address of a series of adjacent fullwords containing the values to be added to the user count fields defined in the user EMP definition.
- If the MCT user EMP definition contains a MOVE option, the DATA1 variable is an area with the address of the character string to be moved.

For details of the user EMP options, see the *CICS Resource Definition Guide*.

expression	A valid assembler-language expression giving the fullword binary variable for this EMP.
name4	The name of a 4-byte field containing the fullword binary variable for this EMP.
(Ra)	A register containing the fullword binary variable for this EMP.
*****	The value of this option is already present in the parameter list, or the option is not specified for this EMP.

DATA2(expression | name4 | (Rn) | *)
specifies a fullword binary variable whose contents depend on the type of user EMP being used:

- If the MCT user EMP definition contains an ADDCNT, SUBCNT, NACNT, EXCNT, or ORCNT option, the DATA2 variable is an area used as defined by the user EMP definition.

- If the MCT user EMP definition contains an MLTCNT option, the DATA2 variable is an area with the number of user count fields to be updated.

  The number specified in DATA2 overrides the default value defined in the MCT for the operation. A value of 0 instructs monitoring to use the default. Not specifying a value for DATA2 does not prevent the MLTCNT operation from being successful; but, if it is, an exception response of 'DATA2_NOT_SPECIFIED' is returned. See note 5 on page 284.

- If the MCT user EMP definition contains a MOVE option, the DATA2 variable is an area with the length of the character string to be moved.

  The length specified in DATA2 overrides the default value defined in the MCT for the operation. A value of 0 instructs monitoring to use the default. Not specifying a value for DATA2 does not prevent the MOVE operation from being successful; but, if it is, an exception response of 'DATA2_NOT_SPECIFIED' is returned. See note 5 on page 284.

For details of the user EMP options, see the *CICS Resource Definition Guide*.

expression	A valid assembler-language expression giving the fullword binary variable for this EMP.
name4	The name of a 4-byte field containing the fullword binary variable for this EMP.
(Rn)	A register containing the fullword binary variable for this EMP.
*****	The value of this option is already present in the parameter list, or the option is not specified for this EMP.

ENTRYNAME(name8 | string | 'string')

specifies the monitoring point entry name, which qualifies the POINT value and which is defined in the monitoring control table (MCT).

name8	The name of a location containing an 8-byte string.
string	A string of characters without intervening blanks. The macro generates, from the string, a literal constant of length 8 bytes, extending with blanks or truncating as required.
'string'	A string, enclosed in quotation marks, and possibly containing blanks. This value is processed in the same way as the "string" above.

Note: If, when defining the EMP in the MCT, you do not specify an entry name, the entry name defaults to 'USER'. ENTRYNAME likewise defaults to 'USER' if not specified.

POINT(expression | name2 | (Rn))

specifies the monitoring point identifier as defined in the MCT, and is in the range 0 through 255. Note, however, that point identifiers in the range 200 through 255 are reserved for use by IBM program products.

expression	A valid assembler-language expression that can be expressed in 2 bytes.
name2	The name of a 2-byte source of point data.
(Rn)	A register containing the point data in the low-order 2 bytes.

RESPONSE and REASON values for MONITOR:

RESPONSE	*REASON*
OK	None
EXCEPTION	DATA1_NOT_SPECIFIED
	DATA2_NOT_SPECIFIED
	INVALID_DATA1_VALUE
	INVALID_DATA2_VALUE
	POINT_NOT_DEFINED
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.
2. ‘POINT_NOT_DEFINED’ means that the EMP you have specified was not defined in the MCT.
3. ‘INVALID_DATA1_VALUE’ and ‘INVALID_DATA2_VALUE’ are most likely to have been caused by provision of bad addresses; this causes a program check.
4. DATA1_NOT_SPECIFIED and DATA2_NOT_SPECIFIED mean that you have not specified DATA1 or DATA2 respectively when the operation required them. See the description of DATA2.
5. Any error response terminates processing of the EMP. Operations defined to execute before the point of failure will have done so; later operations are canceled.

The INQUIRE_MONITORING_DATA call

The INQUIRE_MONITORING_DATA function returns to the exit program the performance class monitoring data that has been accumulated for the issuing task.

The DFHMNTDS DSECT that maps the data is of fixed format. Note that:

- *All* the CICS system-defined fields in the performance records (including fields that you have specified for exclusion using the EXCLUDE option of the DFHMCT TYPE=RECORD macro) are listed.
- *No* user-defined data fields are listed.

INQUIRE_MONITORING_DATA

```
DFHMNMNX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(INQUIRE_MONITORING_DATA),
      DATA_BUFFER(buffer-descriptor),]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

Important

There is a restriction in using the XPI early during initialization. Do not start exit programs that use the XPI functions TRANSACTION_DUMP, WRITE_JOURNAL_DATA, MONITOR, and INQUIRE_MONITOR_DATA until the second phase of the PLTPI. For further information about the PLTPI, refer to Chapter 4, "Writing initialization and shutdown programs" on page 339.

DATA_BUFFER(buffer-descriptor)
specifies the address and the length of a buffer to contain the returned monitoring data; see page 254 for a full definition of a buffer-descriptor. The DSECT DFHMNTDS maps the monitoring data.

RESPONSE and REASON values for INQUIRE_MONITORING_DATA:

RESPONSE	*REASON*
OK	None
EXCEPTION	LENGTH_ERROR
	MONITOR_DATA_UNAVAILABLE
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.
2. 'LENGTH_ERROR' means that the length specified in the buffer-descriptor was too short for the monitoring data returned from the XPI call.

Program management functions

There are eight XPI program management functions. These are the DFHPGISX calls:

INQUIRE_PROGRAM
INQUIRE_CURRENT_PROGRAM
SET_PROGRAM
START_BROWSE_PROGRAM
GET_NEXT_PROGRAM
END_BROWSE_PROGRAM

and the DFHPGAQX calls:

INQUIRE_AUTOINSTALL
SET_AUTOINSTALL.

Used with the Loader functions DEFINE_PROGRAM, ACQUIRE_PROGRAM, RELEASE_PROGRAM, and DELETE_PROGRAM, these calls give you a comprehensive set of tools for manipulating programs. (Note, however, that the tokens returned in the NEW_PROGRAM_TOKEN fields of DFHPGISX calls are different from those returned by DFHLDLDX Loader calls. You should not use a token obtained from a DFHPGISX call in a DFHLDLDX call, or vice versa.)

The INQUIRE_PROGRAM call

INQUIRE_PROGRAM returns information about the attributes of a specified program.

INQUIRE_PROGRAM

```
DFHPGISX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(INQUIRE_PROGRAM),
      {PROGRAM_NAME(name8 | string | 'string')|
      PROGRAM_TOKEN(name8)},]
      [OUT,
      [ACCESS(CICS|NONE|READ_ONLY|USER),]
      [AVAIL_STATUS(DISABLED|ENABLED),]
      [CEDF_STATUS(CEDF|NOCEDF|NOT_APPLIC),]
      [DATA_LOCATION(ANY|BELOW|NOT_APPLIC),]
      [ENTRY_POINT(name4),]
      [EXECUTION_KEY(CICS|NOT_APPLIC|USER),]
      [EXECUTION_SET(DPLSUBSET|FULLAPI|NOT_APPLIC),]
      [HOLD_STATUS(CICS_LIFE|NOT_APPLIC|TASK_LIFE),]
      [INSTALL_TYPE(AUTO|CATALOG|GROUPLIST|MANUAL|RDO|SYSAUTO),]
      [LANGUAGE_DEDUCED(ASSEMBLER|C|COBOL|COBOL_LE|
                        COBOL2|NOT_APPLIC|NOT_DEDUCED|PLI),]
      [LANGUAGE_DEFINED(ASSEMBLER|C|COBOL|
                        NOT_APPLIC|NOT_DEFINED|PLI),]
      [LOAD_POINT(name4),]
      [LOAD_STATUS(LOADABLE|NOT_APPLIC|NOT_LOADABLE|NOT_LOADED),]
      [LOCATION(CDSA|ECDSA|ERDSA|ESDSA|ESVA|NONE|RDSA|SDSA|SVA),]
      [MODULE_TYPE(MAPSET|PARTITIONSET|PROGRAM),]
      [NEW_PROGRAM_TOKEN(name8),]
      [PROGRAM_ATTRIBUTE(RELOAD|RESIDENT|REUSABLE|TRANSIENT),]
      [PROGRAM_LENGTH(name4),]
      [PROGRAM_TYPE(NOT_APPLIC|PRIVATE|SHARED|TYPE_ANY),]
      [PROGRAM_USAGE(APPLICATION|NUCLEUS),]
      [PROGRAM_USE_COUNT(name4),]
      [PROGRAM_USER_COUNT(name4),]
      [REMOTE_DEFINITION(LOCAL|REMOTE),]
      [REMOTE_PROGID(name8),]
      [REMOTE_SYSID(name4),]
      [REMOTE_TRANID(name4),]
      [SPECIFIED_AMODE(24|31|AMODE_ANY|AMODE_NOT_SPECIFIED),]
      [SPECIFIED_RMODE(24|RMODE_ANY|RMODE_NOT_SPECIFIED),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

ACCESS(CICS|NONE|READ_ONLY|USER)
returns a value indicating the type of storage into which the program has been loaded.

CICS	CICS-key.
NONE	The program has not been loaded.
READ_ONLY	Readonly.

USER	User-key.

AVAIL_STATUS(DISABLED|ENABLED)
returns a value indicating whether the program can be used—that is, whether or not it has been enabled.

CEDF_STATUS(CEDF|NOCEDF|NOT_APPLIC)
returns the EDF status of the program.

CEDF	When the program is running under the control of the CICS execution diagnostic facility (EDF), EDF diagnostic screens are displayed.
NOCEDF	EDF diagnostic screens are not displayed.
NOT_APPLIC	Not applicable. This is a mapset, partitionset, or a remote program.

DATA_LOCATION(ANY|BELOW|NOT_APPLIC)
returns a value indicating whether or not the program can access data located above the 16MB line.

ANY	The program can handle 31-bit addresses, and can therefore be passed data located above or below the 16MB line.
BELOW	The program can handle only 24-bit addresses, and must therefore only be passed data located below the 16MB line.
NOT_APPLIC	Not applicable. This is a mapset, partitionset, or a remote program.

ENTRY_POINT(name4)
returns the program's entry point address, as it would be returned by a Loader domain ACQUIRE_PROGRAM call.

EXECUTION_KEY(CICS|NOT_APPLIC|USER)
returns the key in which CICS gives control to the program, which determines whether the program can modify CICS-key storage.

CICS	CICS gives control to the program in CICS key. The program is loaded into a CICS dynamic storage area (DSA), above or below the 16MB line; that is, the CDSA or ECDSA, depending on its residency mode (RMODE) attribute as defined to the linkage-editor.
NOT_APPLIC	Not applicable. This is a mapset, partitionset, or a remote program.
USER	CICS gives control to the program in user key. The program is loaded into a user DSA, above or below the 16MB line; that is, the UDSA or EUDSA, depending on its residency mode (RMODE) attribute as defined to the linkage-editor.

EXECUTION_SET(DPLSUBSET|FULLAPI|NOT_APPLIC)
returns a value indicating whether CICS links to and runs the program as if it were running in a remote CICS region.

DPLSUBSET	CICS links to and runs the program with the API restrictions of a remote DPL program. The program can use only a subset of the CICS API.
FULLAPI	CICS links to and runs the program without the API restrictions of a remote DPL program. The program can use the full CICS API.

NOT_APPLIC	Not applicable. This is a mapset, partitionset, or a remote program. (The EXECUTIONSET option of DEFINE PROGRAM applies only to local program definitions. Its purpose is to test programs in a local CICS environment as if they were running as DPL programs.)

HOLD_STATUS(CICS_LIFE|NOT_APPLIC|TASK_LIFE)
returns a value indicating how long the program is to remain loaded.

CICS_LIFE	The program remains loaded until CICS is shut down.
NOT_APPLIC	Not applicable. The program is not loaded, or is remote.
TASK_LIFE	The program remains loaded for the lifetime of the task.

INSTALL_TYPE(AUTO|CATALOG|GROUPLIST|MANUAL|RDO|SYSAUTO)
returns the method that was used to install the PROGRAM resource definition.

AUTO	Autoinstall.
CATALOG	The CICS global catalog, after a restart.
GROUPLIST	A CICS startup grouplist.
MANUAL	The program is a CICS internal module explicitly defined to the Program Manager by another CICS component.
RDO	RDO commands.
SYSAUTO	System autoinstall (that is, autoinstalled by CICS without calling the autoinstall user program). The program may be a CICS internal module or, for example, a first phase PLTPI program.

LANGUAGE_DEDUCED(ASSEMBLER|C|COBOL|COBOL2|COBOL_LE|
NOT_APPLIC|NOT_DEDUCED|PLI)
returns the language deduced by CICS for the program.

LANGUAGE_DEFINED(ASSEMBLER|C|COBOL|
NOT_APPLIC|NOT_DEFINED|PLI)
returns the programming language specified on the resource definition.

LOAD_POINT(name4)
returns the program's load point address, as it would be returned by a Loader domain ACQUIRE_PROGRAM call.

LOAD_STATUS(LOADABLE|NOT_APPLIC|NOT_LOADABLE|NOT_LOADED)
returns a value indicating whether or not the program can be loaded.

LOADABLE	The program is loadable.
NOT_APPLIC	Not applicable. The program is remote.
NOT_LOADABLE	CICS has tried to load the program and failed; the program is not in the library.
NOT_LOADED	CICS has not yet tried to load the program.

LOCATION(CDSA|ECDSA|ERDSA|ESDSA|ESVA|NONE|RDSA|SDSA|SVA)
returns a value indicating where the most recently loaded copy of the program resides.

CDSA	The CICS dynamic storage area.
ECDSA	The extended CICS dynamic storage area.
ERDSA	The extended readonly dynamic storage area.
ESDSA	The extended shared dynamic storage area.
ESVA	The shared virtual area above 16M.
NONE	The program has not been loaded.
RDSA	The readonly dynamic storage area.

SDSA	The shared dynamic storage area.
SVA	The shared virtual area.

MODULE_TYPE(MAPSET|PARTITIONSET|PROGRAM)
returns the kind of program resource.

NEW_PROGRAM_TOKEN(name8)
returns a token that can be used to identify the named program.

name8	The name of a location to receive a 8-byte token that identifies this program.

If PROGRAM_NAME is specified on the request, NEW_PROGRAM_TOKEN is set to a program token that can be used on subsequent requests for the same program. If PROGRAM_TOKEN is specified on the request, NEW_PROGRAM_TOKEN is set to the same value.

PROGRAM_ATTRIBUTE(RELOAD|RESIDENT|REUSABLE|TRANSIENT)
returns the residency status of the program—that is, when its storage is released.

RELOAD	The program is not reusable, and therefore several copies may be loaded. A copy is removed from storage when a RELEASE_PROGRAM call (for that copy) is issued.
RESIDENT	There is a single copy of the program that is not removed from storage unless deleted. RESIDENT programs must be at least quasireentrant. Any program of PROGRAM_TYPE SHARED is RESIDENT by default.
REUSABLE	Similar to RESIDENT, except that a REUSABLE program that is not in use can be removed from storage by CICS, for storage optimization reasons.
TRANSIENT	Similar to RESIDENT, except that a TRANSIENT program is removed from storage as soon as its user count drops to zero.

PROGRAM_LENGTH(name4)
returns the length of the program, in bytes, expressed in binary.

PROGRAM_NAME(name8 | string | 'string')
specifies the name of the program to be queried.

name8	The name of a location containing an 8-byte program name.
string	A string of characters naming the program.
'string'	A string of characters in quotation marks. The string length is set to 8 by padding with blanks or truncating.

PROGRAM_TOKEN(name8)
specifies a token identifying the program to be queried.

name8	The name of a location containing an 8-byte token obtained from a previous INQUIRE_PROGRAM call.

PROGRAM_TYPE(NOT_APPLIC|PRIVATE|SHARED|TYPE_ANY)
returns a value indicating where the next new copy of the program is to be loaded from.

NOT_APPLIC	Not applicable. The program is remote.
PRIVATE	The program is to be loaded from the CICS library concatenation. A PRIVATE program need not be reentrant, and is given only limited protection against unauthorized overwriting.

	The degree of protection depends on the type of dynamic storage area into which the program is loaded (see the description of the PROGRAM_TYPE option of the DEFINE_PROGRAM call).
SHARED	The program is to be loaded from the shared virtual area (SVA). SHARED programs must be reentrant, and are protected. The next time a NEWCOPY or PHASEIN is received, an SVA copy of the program is used if it is available. If no SVA version is available, the program is loaded from the LIBDEF search chain for the CICS job.
TYPE_ANY	Either the CICS library concatenation or the SVA copy of the program can be used, though preference is given to the SVA copy.

PROGRAM_USAGE(APPLICATION|NUCLEUS)
returns a value indicating whether the program is used as a CICS nucleus program or as a user application program.

PROGRAM_USE_COUNT(name4)
returns the current number of users of the program.

PROGRAM_USER_COUNT(name4)
returns the number of different users that have invoked the program.

REMOTE_DEFINITION(LOCAL|REMOTE)
returns a value indicating whether this program is a local or a remote resource. If it is a remote resource, CICS treats requests to link to the program as distributed program link (DPL) requests, and ships them to the remote region.

REMOTE_PROGID(name8)
returns the name by which the program is known in the remote CICS region, if the program is a remote resource. If REMOTESYSTEM was specified on the PROGRAM definition, and REMOTENAME omitted, the remote name will be the same as the local name (that is, REMOTE_PROGID will default to the value of PROGRAM_NAME).

REMOTE_SYSID(name4)
returns the name of the remote CICS region that owns the program, if the program is a remote resource.

REMOTE_TRANID(name4)
returns the name of the transaction that the remote CICS attaches, and under which it runs the program, if the program is a remote resource.

SPECIFIED_AMODE(24|31|AMODE_ANY|AMODE_NOT_SPECIFIED)
returns the addressing mode specified on a DEFINE_PROGRAM call.

SPECIFIED_RMODE(24|RMODE_ANY|RMODE_NOT_SPECIFIED)
returns the residency mode (that is, whether the program should be loaded above or below the 16MB line) specified on a DEFINE_PROGRAM call.

RESPONSE and REASON values for INQUIRE_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	PROGRAM_NOT_DEFINED_TO_LD
	PROGRAM_NOT_DEFINED_TO_PG
DISASTER	ABEND
	LOCK_ERROR
INVALID	INVALID_PROGRAM_TOKEN
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The INQUIRE_CURRENT_PROGRAM call

INQUIRE_CURRENT_PROGRAM returns information about the attributes of the program that is currently running. If this call is issued from within a global or task-related user exit, it returns the attributes of the global or task-related user exit program itself.

INQUIRE_CURRENT_PROGRAM

```
DFHPGISX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(INQUIRE_CURRENT_PROGRAM),]
      [OUT,
      [AVAIL_STATUS(DISABLED|ENABLED),]
      [CEDF_STATUS(CEDF|NOCEDF|NOT_APPLIC),]
      [CURRENT_AMODE(24|31),]
      [CURRENT_CEDF_STATUS(CEDF|NOCEDF),]
      [CURRENT_ENTRY_POINT(name4),]
      [CURRENT_ENVIRONMENT(EXEC|GLUE|PLT|SYSTEM|TRUE|URM),]
      [CURRENT_EXECUTION_SET(DPLSUBSET|FULLAPI),]
      [CURRENT_LOAD_POINT(name4),]
      [CURRENT_PROGRAM_LENGTH(name4),]
      [CURRENT_PROGRAM_NAME(name8),]
      [DATA_LOCATION(ANY|BELOW|NOT_APPLIC),]
      [EXECUTION_KEY(CICS|NOT_APPLIC|USER),]
      [EXECUTION_SET(DPLSUBSET|FULLAPI|NOT_APPLIC),]
      [HOLD_STATUS(CICS_LIFE|NOT_APPLIC|TASK_LIFE),]
      [INSTALL_TYPE(AUTO|CATALOG|GROUPLIST|MANUAL|RDO|SYSAUTO),]
      [INVOKING_ENVIRONMENT (EXEC|GLUE|PLT|SYSTEM|TRUE|URM),]
      [INVOKING_PROGRAM_NAME(name8),]
      [LANGUAGE_DEDUCED(ASSEMBLER|C|COBOL|COBOL_LE|
                    COBOL2|NOT_APPLIC|NOT_DEDUCED|PLI),]
      [LANGUAGE_DEFINED(ASSEMBLER|C|COBOL|
                    NOT_APPLIC|NOT_DEFINED|PLI),]
      [LOAD_STATUS(LOADABLE|NOT_LOADABLE|NOT_LOADED|NOT_APPLIC),]
      [MODULE_TYPE(MAPSET|PARTITIONSET|PROGRAM),]
      [NEW_PROGRAM_TOKEN(name8),]
      [REMOTE_DEFINITION(LOCAL|REMOTE),]
      [REMOTE_PROGID(name8),]
      [REMOTE_SYSID(name4),]
      [REMOTE_TRANID(name4),]
      [RETURN_PROGRAM_NAME(name8),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

Note: The options not described in the following list are identical to the equivalent options of the INQUIRE_PROGRAM call.

CURRENT_AMODE(24|31)
returns the addressing mode which the running program is currently using.

CURRENT_CEDF_STATUS(CEDF|NOCEDF)
returns the EDF status of the current instance of the program. The value returned is the same as for CEDF_STATUS, which is the EDF status specified on the program definition. See the CEDF_STATUS option of INQUIRE_PROGRAM.

CURRENT_ENTRY_POINT(name4)
returns the entry point address of the current program.

CURRENT_ENVIRONMENT(EXEC|GLUE|PLT|SYSTEM|TRUE|URM)
returns the environment in which the current program is running—that is, the type of program it is.

EXEC	User application program.
GLUE	Global user exit program.
PLT	Program list table program.
SYSTEM	CICS system code.
TRUE	Task-related user exit program.
URM	User-replaceable program.

CURRENT_EXECUTION_SET(DPLSUBSET|FULLAPI)
returns the API execution set used by the current instance of the program. The value returned is the same as for EXECUTION_SET (which is the API execution set specified on the program definition) *unless* this is the first program in a transaction, when the value may be different. This is because the DPLSUBSET attribute applies only to linked-to programs. It is ignored for the first program in a transaction, because this cannot be the target of a DPL call. Therefore, for the first program in a transaction, if EXECUTION_SET returns DPLSUBSET CURRENT_EXECUTION_SET nevertheless returns FULLAPI. See the EXECUTION_SET option of INQUIRE_PROGRAM.

CURRENT_LOAD_POINT(name4)
returns the load point address of the current program.

CURRENT_PROGRAM_LENGTH(name4)
returns the length of the current program, in bytes, expressed in binary.

CURRENT_PROGRAM_NAME(name8)
returns the name of the program that is currently running.

INVOKING_ENVIRONMENT (EXEC|GLUE|PLT|SYSTEM|TRUE|URM)
returns the environment from which the current program was invoked. The values are as described for CURRENT_ENVIRONMENT.

INVOKING_PROGRAM_NAME(name8)
returns the name of the most recent program to invoke the current program, which was not itself a global user exit or task-related user exit program.

RETURN_PROGRAM_NAME(name8)
returns the name of the program to which control will be returned, after any intermediate global user exit or task-related user exit programs have completed.

RESPONSE and REASON values for INQUIRE_CURRENT_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	NO_CURRENT_PROGRAM
DISASTER	LOCK_ERROR
	ABEND
INVALID	None
KERNERROR	None
PURGED	None

The SET_PROGRAM call

SET_PROGRAM allows you to set selected attributes in the definition of a specified program.

SET_PROGRAM

```
DFHPGISX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(SET_PROGRAM),
      {PROGRAM_NAME(name8 | string | 'string')|
      PROGRAM_TOKEN(name8)},]
      [AVAIL_STATUS(DISABLED|ENABLED),]
      [CEDF_STATUS(CEDF|NOCEDF),]
      [EXECUTION_KEY(CICS|USER),]
      [EXECUTION_SET(DPLSUBSET|FULLAPI),]
      [PROGRAM_ATTRIBUTE(RELOAD|RESIDENT|REUSABLE|TRANSIENT),]
      [PROGRAM_TYPE(PRIVATE|SHARED|TYPE_ANY),]
      [PROGRAM_USAGE(APPLICATION|NUCLEUS),]
      [REQUIRED_AMODE(24|31|AMODE_ANY),]
      [REQUIRED_RMODE(24|RMODE_ANY),]]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

AVAIL_STATUS(DISABLED|ENABLED)
specifies whether the program can be used—that is, whether or not it is enabled.

CEDF_STATUS(CEDF|NOCEDF)
specifies whether, when the program is running under the control of the CICS execution diagnostic facility (EDF), EDF diagnostic screens are displayed.

EXECUTION_KEY(CICS|USER)
specifies the key in which CICS is to give control to the program, which determines whether the program can modify CICS-key storage.

CICS	CICS gives control to the program in CICS key. The program is loaded into a CICS dynamic storage area (DSA), above or below the 16MB line; that is, the CDSA or ECDSA, depending on its residency mode (RMODE) attribute as defined to the linkage-editor.
USER	CICS gives control to the program in user key. The program is loaded into a user DSA, above or below the 16MB line; that is, the UDSA or EUDSA, depending on its residency mode (RMODE) attribute as defined to the linkage-editor.

Note: If the program has been link-edited as reentrant with AMODE(31),RMODE(ANY), the EXECUTION_KEY option is ignored, and it is loaded into the extended readonly DSA (ERDSA). For details of the type of storage allocated for the ERDSA, see the RENTPGM system initialization parameter.

EXECUTION_SET(DPLSUBSET|FULLAPI)
specifies whether CICS is to link to and run the program as if it were running in a remote CICS region.

Note: EXECUTION_SET applies only to local program definitions. Its purpose is to test programs in a local CICS environment as if they were running as DPL programs.

DPLSUBSET	CICS links to and runs the program with the API restrictions of a remote DPL program. The program can use only a subset of the CICS API.
FULLAPI	CICS links to and runs the program without the API restrictions of a remote DPL program. The program can use the full CICS API.

PROGRAM_ATTRIBUTE(RELOAD|RESIDENT|REUSABLE|TRANSIENT)
specifies the residency status of the program—that is, when its storage is to be released.

RELOAD	The program is not reusable, and therefore several copies may be loaded. A copy is removed from storage when a RELEASE_PROGRAM call (for that copy) is issued.
RESIDENT	At any one time there will be no more than a single copy of the program in storage, and this will not be removed unless deleted. RESIDENT programs must be at least quasireentrant. Any program of PROGRAM_TYPE SHARED is RESIDENT by default.
REUSABLE	Similar to RESIDENT, except that a REUSABLE program that is not in use can be removed from storage by CICS, for storage optimization reasons.
TRANSIENT	Similar to RESIDENT, except that a TRANSIENT program is removed from storage as soon as its user count drops to zero.

PROGRAM_NAME(name8 | string | 'string')
specifies the name of the program whose attributes are to be changed.

name8	The name of a location containing an 8-byte program name.
string	A string of characters naming the program.
'string'	A string of characters in quotation marks. The string length is set to 8 by padding with blanks or truncating.

PROGRAM_TOKEN(name8)
specifies a token identifying the program.

name8	The name of a location containing an 8-byte token obtained from a previous INQUIRE_PROGRAM, INQUIRE_CURRENT_PROGRAM, START_BROWSE_PROGRAM, or GET_NEXT_PROGRAM call.

PROGRAM_TYPE(PRIVATE|SHARED|TYPE_ANY)
specifies where the program is to be loaded from.

PRIVATE	The program is in the LIBDEF search chain for the CICS job. A PRIVATE program need not be reentrant, and is given only limited protection against unauthorized overwriting. The degree of protection depends on the type of dynamic storage area into which the program is loaded (see the description of the PROGRAM_TYPE option of the DEFINE_PROGRAM call).
SHARED	The program is located in the shared virtual area (SVA), is reentrant, and is protected.

TYPE_ANY Either the LIBDEF search chain or the SVA copy of the program can be used, though preference is given to the SVA copy.

PROGRAM_USAGE(APPLICATION|NUCLEUS)
specifies whether the program is used as a CICS nucleus program or as a user application program.

REQUIRED_AMODE(24|31|AMODE_ANY)
specifies the addressing mode of the program. If, during subsequent processing, no copy of the program that meets the defined addressing requirement can be found, an exception occurs.

Notes:

1. AMODE_ANY and 31 have identical meanings for this function.
2. You cannot use this option to override the link-edited addressing mode of the program.

REQUIRED_RMODE(24|AMODE_ANY)
specifies the residency mode of the program (that is, whether it is to be loaded above or below the 16MB line). If, during subsequent processing, no copy of the program that meets the defined residency requirement can be found, an exception occurs.

Note: You cannot use this option to override the link-edited residency mode of the program.

RESPONSE and REASON values for SET_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	CEDF_STATUS_NOT_FOR_MAPSET
	CEDF_STATUS_NOT_FOR_PTNSET
	CEDF_STATUS_NOT_FOR_REMOTE
	EXEC_KEY_NOT_FOR_MAPSET
	EXEC_KEY_NOT_FOR_PTNSET
	EXEC_KEY_NOT_FOR_REMOTE
	EXEC_SET_NOT_FOR_MAPSET
	EXEC_SET_NOT_FOR_PTNSET
	EXEC_SET_NOT_FOR_REMOTE
	PROGRAM_NOT_DEFINED_TO_LD
	PROGRAM_NOT_DEFINED_TO_PG
	PROGRAM_TYPE_NOT_FOR_REMOTE
DISASTER	ABEND
	CATALOG_ERROR
	CATALOG_NOT_OPERATIONAL
	LOCK_ERROR
INVALID	INVALID_MODE_COMBINATION
	INVALID_PROGRAM_NAME
	INVALID_PROGRAM_TOKEN
	INVALID_TYPE_ATTRIB_COMBIN
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The START_BROWSE_PROGRAM call

START_BROWSE_PROGRAM returns a token that enables you to begin browsing through program definitions, optionally starting at the definition of a specified program.

START_BROWSE_PROGRAM

```
DFHPGISX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(START_BROWSE_PROGRAM),
      [PROGRAM_NAME(name8 | string | 'string'),]]
      [OUT,
      BROWSE_TOKEN(name4)
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

BROWSE_TOKEN(name4)
returns a token to be used on a GET_NEXT_PROGRAM call, to initiate a sequential browse of program definitions.

name4	The name of a location to receive a 4-byte token.

PROGRAM_NAME(name8 | string | 'string')
specifies the name of the program whose definition you want to look at first. The browsing sequence is alphabetical. If there is no program with the specified name, CICS returns a token for the next definition in the alphabetic sequence. If you do not specify a program, CICS returns a token for the first definition.

name8	The name of a location containing an 8-byte program name.
string	A string of characters naming the program.
'string'	A string of characters in quotation marks. The string length is set to 8 by padding with blanks or truncating.

RESPONSE and REASON values for START_BROWSE_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	ABEND
	INVALID_DIRECTORY
	LOCK_ERROR
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The GET_NEXT_PROGRAM call

GET_NEXT_PROGRAM allows you to inquire on the next program definition during a browse sequence initiated by START_BROWSE_PROGRAM. The browsing sequence is alphabetical. The end of the alphabetic list of definitions is indicated by an 'END_LIST' exception response.

GET_NEXT_PROGRAM

```
DFHPGISX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(GET_NEXT_PROGRAM),
      BROWSE_TOKEN(name4),]
      [OUT,
      PROGRAM_NAME(name8),
      [ACCESS(CICS|NONE|READ_ONLY|USER),]
      [AVAIL_STATUS(DISABLED|ENABLED),]
      [CEDF_STATUS(CEDF|NOCEDF|NOT_APPLIC),]
      [DATA_LOCATION(ANY|BELOW|NOT_APPLIC),]
      [ENTRY_POINT(name4),]
      [EXECUTION_KEY(CICS|NOT_APPLIC|USER),]
      [EXECUTION_SET(DPLSUBSET|FULLAPI|NOT_APPLIC),]
      [HOLD_STATUS(CICS_LIFE|NOT_APPLIC|TASK_LIFE),]
      [INSTALL_TYPE(AUTO|CATALOG|GROUPLIST|MANUAL|RDO|SYSAUTO),]
      [LANGUAGE_DEDUCED(ASSEMBLER|C|COBOL|COBOL_LE|
                        COBOL2|NOT_APPLIC|NOT_DEDUCED|PLI),]
      [LANGUAGE_DEFINED(ASSEMBLER|C|COBOL|
                        NOT_APPLIC|NOT_DEFINED|PLI),]
      [LOAD_POINT(name4),]
      [LOAD_STATUS(LOADABLE|NOT_APPLIC|NOT_LOADABLE|NOT_LOADED),]
      [LOCATION(CDSA|ECDSA|ERDSA|ESDSA|ESVA|NONE|RDSA|SDSA|SVA),]
      [MODULE_TYPE(MAPSET|PARTITIONSET|PROGRAM),]
      [NEW_PROGRAM_TOKEN(name8),]
      [PROGRAM_ATTRIBUTE(RELOAD|RESIDENT|REUSABLE|TRANSIENT),]
      [PROGRAM_LENGTH(name4),]
      [PROGRAM_TYPE(NOT_APPLIC|PRIVATE|SHARED|TYPE_ANY),]
      [PROGRAM_USAGE(APPLICATION|NUCLEUS),]
      [PROGRAM_USE_COUNT(name4),]
      [PROGRAM_USER_COUNT(name4),]
      [REMOTE_DEFINITION(LOCAL|REMOTE),]
      [REMOTE_PROGID(name8),]
      [REMOTE_SYSID(name4),]
      [REMOTE_TRANID(name4),]
      [SPECIFIED_AMODE(24|31|AMODE_ANY|AMODE_NOT_SPECIFIED),]
      [SPECIFIED_RMODE(24|RMODE_ANY|RMODE_NOT_SPECIFIED),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

Note: The options not described in the following list are identical to the equivalent options of the INQUIRE_PROGRAM call.

BROWSE_TOKEN(name4)
specifies a token identifying the definition to be browsed. This can be either the token returned in the NEW_PROGRAM_TOKEN field of the last GET_NEXT_PROGRAM call, or that in the BROWSE_TOKEN field of the START_BROWSE_PROGRAM call (this token is updated after every GET_NEXT_PROGRAM call).

name4	The name of a location containing a 4-byte token.

NEW_PROGRAM_TOKEN(name8)
returns a token that identifies the next definition in the browse sequence. You can use it in the BROWSE_TOKEN field of your next GET_NEXT_PROGRAM call (or END_BROWSE_PROGRAM call, if you want to end the sequence). You can also use it in the PROGRAM_TOKEN field of INQUIRE_ and SET_PROGRAM calls.

name8	The name of a location to receive an 8-byte token that identifies the next program definition.

RESPONSE and REASON values for GET_NEXT_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	END_LIST
	INVALID_BROWSE_TOKEN
	PROGRAM_NOT_DEFINED_TO_LD
DISASTER	ABEND
	LOCK_ERROR
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The END_BROWSE_PROGRAM call

END_BROWSE_PROGRAM allows you to end a browse of program definitions initiated by START_BROWSE_PROGRAM.

END_BROWSE_PROGRAM

```
DFHPGISX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(END_BROWSE_PROGRAM),
      BROWSE_TOKEN(name4),]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

BROWSE_TOKEN(name4)
specifies either the token returned in the NEW_PROGRAM_TOKEN field of the last GET_NEXT_PROGRAM call, or that in the BROWSE_TOKEN field of the

START_BROWSE_PROGRAM call (this token is updated after every GET_NEXT_PROGRAM call).

RESPONSE and REASON values for END_BROWSE_PROGRAM:

RESPONSE	*REASON*
OK	None
EXCEPTION	INVALID_BROWSE_TOKEN
DISASTER	ABEND
	LOCK_ERROR
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The INQUIRE_AUTOINSTALL call

INQUIRE_AUTOINSTALL returns information about the current settings of the autoinstall function for programs, mapsets, and partitionsets.

INQUIRE_AUTOINSTALL

```
DFHPGAQX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(INQUIRE_AUTOINSTALL),]
      [OUT,
      [AUTOINSTALL_CATALOG (ALL|MODIFY|NONE),]
      [AUTOINSTALL_EXIT_NAME(name8),]
      [AUTOINSTALL_STATE (ACTIVE|INACTIVE),]
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

AUTOINSTALL_CATALOG(ALL|MODIFY|NONE)
returns the catalog status for autoinstalled program definitions.

ALL	All autoinstalled program, map, and partitionset definitions are cataloged.
MODIFY	Autoinstalled program, map, and partitionset definitions are recorded on the CICS global catalog only if they are modified by a SET PROGRAM command after being autoinstalled.
NONE	No autoinstalled program, map, or partitionset definitions are cataloged.

AUTOINSTALL_EXIT_NAME(name8)
is the name of the user-replaceable autoinstall control program for programs, mapsets, and partitionsets.

AUTOINSTALL_STATE(ACTIVE|INACTIVE)
returns the status of the program autoinstall function.

ACTIVE	Autoinstall is enabled for programs, mapsets, and partitionsets.
INACTIVE	Autoinstall is not enabled for programs, mapsets, and partitionsets.

RESPONSE and REASON values for INQUIRE_AUTOINSTALL:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	None
INVALID	INVALID_FUNCTION
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The SET_AUTOINSTALL call

SET_AUTOINSTALL enables you to change the settings of the autoinstall function for programs, mapsets, and partitionsets.

SET_AUTOINSTALL

```
DFHPGAQX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(SET_AUTOINSTALL),
      [AUTOINSTALL_CATALOG (ALL|MODIFY|NONE),]
      [AUTOINSTALL_EXIT_NAME(name8),]
      [AUTOINSTALL_STATE (ACTIVE|INACTIVE),]
      [LANGUAGES_AVAILABLE(YES|NO),]]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

AUTOINSTALL_CATALOG(ALL|MODIFY|ALL)
specifies the catalog status for autoinstalled program definitions.

ALL	All autoinstalled program, map, and partitionset definitions are to be cataloged.
MODIFY	Autoinstalled program, map, and partitionset definitions are to be recorded on the CICS global catalog only if they are modified by a SET PROGRAM command after being autoinstalled.
NONE	No autoinstalled program, map, or partitionset definitions are to be cataloged.

AUTOINSTALL_EXIT_NAME(name8)
specifies the name of the user-replaceable autoinstall control program for programs, mapsets, and partitionsets.

AUTOINSTALL_STATE(ACTIVE|INACTIVE)
specifies the status of the program autoinstall function.

ACTIVE	Enable autoinstall for programs, mapsets, and partitionsets.
INACTIVE	Disable autoinstall for programs, mapsets, and partitionsets.

LANGUAGES_AVAILABLE(YES|NO)
specifies whether the autoinstall control program can be called. It can only be called after language establishment.

YES	The control program can be called.
NO	The control program cannot be called.

RESPONSE and REASON values for SET_AUTOINSTALL:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	None
INVALID	INVALID_FUNCTION
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

State data access functions

The state data access functions allow you to inquire on and set certain system data in the AP domain.

The INQ_APPLICATION_DATA call

The INQ_APPLICATION_DATA call enables you to inquire on application system data in the AP domain.

INQ_APPLICATION_DATA

```
DFHAPIQX [CALL,]
   [CLEAR,]
   [IN,
   FUNCTION(INQ_APPLICATION_DATA),]
   [OUT,
   [DSA(name4 | (Rn) | * ),]
   [EIB(name4 | (Rn) | * ),]
   [RSA(name4 | (Rn) | * ),]
   [SYSEIB(name4 | (Rn) | * ),]
   [TCTUA(name4 | (Rn) | * ),]
   [TCTUASIZE(name4 | * ),]
   [TWA(name4 | (Rn) | * ),]
   [TWASIZE(name4 | (Rn) | * ),]
   RESPONSE (name1 | * ),
   REASON (name1 | * )]
```

DSA(name4 | (Rn | *)
returns the head of the chain of dynamic storage used by application programs to make them reentrant (for example, for assembler programs, the DFHEISTG storage).

name4	The name of a 4-byte area that is to receive the address of the head of the dynamic storage chain.
(Rn)	A register that is to receive the DSA address.
*****	The parameter list itself, in name APIQ_DSA, is used to hold the address.

EIB(name4 | (Rn) | *)
returns the address of the EXEC interface block (EIB) for the current task.

name4	The name of a fullword area that is to receive the address of the EIB.
(Rn)	A register that is to receive the address of the EIB.
*****	The parameter list itself, in name APIQ_EIB, is used to hold the address.

RSA(name4 | (Rn | *)
returns the address of the register save area for the current task.

name4	The name of a fullword area that is to receive the address of the register save area.
(Rn)	A register that is to receive the address of the register save area.
*****	The parameter list itself, name APIQ_RSA, is used to hold the address.

SYSEIB(name4 | (Rn) | *)
returns the address of the system EXEC interface block of the current task.

name4	The name of a fullword area that is to receive the address of the system EXEC interface block.
(Rn)	A register that is to receive the address of the system EXEC interface block.
*****	The parameter list itself, name APIQ_SYSEIB, is used to hold the address.

TCTUA(name4 | (Rn) | *)
returns the address of the terminal control table user area (TCTUA) for the current task.

name4	The name of a fullword area that is to receive the address of the TCTUA.
(Rn)	A register that is to receive the address of the TCTUA.
*****	The parameter list itself, name APIQ_TCTUA, is used to hold the address.

TCTUASIZE(name4 | (Rn) | *)
returns the length in bytes of the TCTUA for the current task.

name4	The name of a 4-byte area that is to receive the length in bytes of the TCTUA.
(Rn)	A register that is to receive the length of the TCTUA.
*****	The parameter list itself, name APIQ_TCTUASIZE, is used to hold the length of the TCTUA.

TWA(name4 | (Rn) | *)
returns the address of the transaction work area.

name4	The name of a fullword area that is to receive the address of the TWA.
(Rn)	A register that is to receive the address of the TWA.
*****	The parameter list itself, name APIQ_TWA, is used to hold the address of the TWA.

TWASIZE(name4 | (Rn) | *)
returns the length, in bytes, of the transaction work area (TWA).

name4	The name of a 4-byte area that is to receive the length, in bytes, of the TWA.
(Rn)	A register that is to receive the length of the TWA.
*****	The parameter list itself, name APIQ_TWASIZE, is used to hold the length of the TWA.

RESPONSE and REASON values for INQ_APPLICATION_DATA:

RESPONSE	*REASON*
OK	None
EXCEPTION	DPL_PROGRAM
	NO_TRANSACTION_ENVIRONMENT
	TRANSACTION_DOMAIN_ERROR
DISASTER	ABEND
	LOOP
	INQ_FAILED
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The INQUIRE_SYSTEM call

The INQUIRE_SYSTEM call gives you access to CICS system data in the AP domain.

INQUIRE_SYSTEM

```
DFHSAIQX [CALL,]
   [CLEAR,]
   [IN,
   FUNCTION(INQUIRE_SYSTEM),
   [GMMTEXT(name4),]]
   [OUT,
   [AKP(name4 | *),]
   [CICSREL(name4 | *),]
   [CICSSTATUS(ACTIVE | FINALQUIESCE | FIRSTQUIESCE |
                      INITIALIZING),]
   [CICSSYS(name1 | *),]
   [CICSTSLEVEL(name6 | *),]
   [CWA(name4 | (Rn) | *),]
   [CWALENGTH(name2 | *),]
   [DATE(name4|*),]
   [DTRPRGRM(name8 | *),]
   [GMMLENGTH(name2 | *),]
   [GMMTRANID(name4 | *),]
   [INITSTATUS(FIRSTINIT | INITCOMPLETE | SECONDINIT |
                    THIRDINIT),]
   [JOBNAME(name8 | *),]
   [OPREL(name4 | *),]
   [OPSYS(name1 | *),]
   [PLTPI(name2 | *),]
   [SECURITYMGR(EXTSECURITY | NOSECURITY),]
   [SHUTSTATUS(CANCELLED | CONTROLSHUT | NOTSHUTDOWN | SHUTDOWN),]
   [STARTUP(COLDSTART | EMERGENCY | WARMSTART),]
   [STARTUPDATE(name4| *),]
   [TERMURM(name8 | *),]
   [TIMEOFDAY(name4| *),]
   [XRFSTATUS(NOXRF | PRIMARY | TAKEOVER),]
   RESPONSE (name1 | * ),
   REASON (name1 | * )]
```

AKP(name4 | *)
returns the activity keypointing frequency of the CICS region.

name4	The name of a 4-byte location that is to receive the frequency value

CICSREL(name4 | *)
returns the release under which the CICS region is running.

name4	The name of a 4-byte location that is to receive the release characters as hexadecimal values.

CICSSTATUS(ACTIVE|FINALQUIESE|FIRSTQUIESCE|INITIALIZING)
returns the status of the CICS region.

ACTIVE	The CICS region is active and ready to receive work.

FINALQUIESCE	The CICS region is shutting down, and is in the final stage of quiescing.
FIRSTQUIESCE	The CICS region is shutting down, and is in the first stage of quiescing.
INITIALIZING	The CICS region is initializing.

CICSSYS(name1 | *)
returns the operating system for which the running CICS has been built.

name1	The name of a 1-byte area that is to receive the hexadecimal character representing the operating system. A value of “F” represents VSE/ESA.

CICSTSLEVEL(name6 | *)
returns the release of CICS Transaction Server under which CICS is running.

name6	The name of a 6-byte area that is to receive the release characters as hexadecimal values. The value is in the form `vvrrmm`. CICS Transaction Server for VSE/ESA Release 1 returns X'010100'.

CWA(name4 | (Rn) | *)
returns the address of the common work area.

name4	The name of a 4-byte field that is to receive the address of the CWA.
(Rn)	A register to receive the address of the CWA.

CWALENGTH(name2 | *)
returns the length in bytes of the CWA.

name2	The name of a 2-byte field that is to receive the length of the CWA.

DATE(name4 | *)
returns today’s date in packed-decimal form—4-bytes **0iyydddc**, where:

i is a century indicator. (0=1900, 1=2000, 2=2100, and so on.)
yy=years
ddd=days
c is the sign.

name4	The name of a 4-byte location that is to receive the date.

DTRPRGRM(name8 | *)
returns the name of the dynamic transaction routing program.

name8	The name of an 8-byte area that is to receive the name of the dynamic transaction routing program.

GMMLENGTH(name2 | *)
returns the length in bytes of the “good morning” message.

name2	The name of a 2-byte area that is to receive the length of the good morning message.

GMMTEXT(name4)
specifies the address of an area of storage, at least 244 bytes in length and owned by the caller, into which CICS is to return the good morning message.

name4	The address of an area of storage that is to receive the good morning message.

Note: The GMMTEXT parameter must follow the IN statement as an input parameter.

GMMTRANID(name4 | *)
returns the transaction identifier of the CICS good morning transaction.

name4	The name of a 4-byte area that is to receive the CICS good morning transaction id.

INITSTATUS(FIRSTINIT|INITCOMPLETE|SECONDINIT|THIRDINIT)
returns a value indicating the stage reached during CICS initialization.

FIRSTINIT	The first stage of CICS initialization.
INITCOMPLETE	CICS initialization is complete.
SECONDINIT	The second stage of CICS initialization. This stage corresponds to the period when first phase PLTPI programs are run; that is those programs in a PLT that are defined **before** the DFHDELIM statement.
THIRDINIT	The third stage of CICS initialization. This stage corresponds to the period when second phase PLTPI programs are run; that is those programs in a PLT that are defined **after** the DFHDELIM statement.

JOBNAME(name8 | *)
returns the 8-character VSE/ESA job name under which the CICS region is running.

name8	The name of a 8-byte area that is to receive the VSE/ESA job name.

OPREL(name2 | *)
returns the release number of the currently running operating system

name2	The name of a 2-byte area that is to receive, as a half-word binary value, the release number of the operating system.

OPSYS(name1 | *)
returns the type of operating system on which the CICS regions is running.

name1	The name of a 1-byte area that is to receive the hexadecimal character representing the operating system on which CICS is running. A value of “F” represents VSE/ESA.

PLTPI(name2 | *)
returns the suffix that identifies the program list table (PLT) containing the list of programs to be run during CICS initialization—the program list table post initialization (PLTPI) list.

name2	The name of a 2-byte area that is to receive the suffix.

SECURITYMGR(EXTSECURITY|NOSECURITY)
returns a value ndicating whether security is active.

EXTSECURITY	CICS is using an external security manager.
NOSECURITY	Security is not in use in the CICS region—SEC=NO is specified as a system initialization parameter.

SHUTSTATUS(CANCELLED|CONTROLSHUT|NOTSHUTDOWN|SHUTDOWN)
returns the shutdown status of the CICS region.

CANCELLED	CICS has been cancelled.
CONTROLSHUT	CICS is performing a controlled shutdown; that is, a normal shutdown with a warm keypoint.
NOTSHUTDOWN	CICS is not in shutdown mode.
SHUTDOWN	CICS is performing an immediate shutdown.

STARTUP(COLDSTART|EMERGENCY|WARMSTART)
returns the type of startup the CICS region performed.

COLDSTART	CICS performed a cold start, either because this was explicitly specified on the system initialization parameter, or because CICS forced a cold start because of the state of the global catalog.
EMERGENCY	CICS performed an emergency restart because the previous run did not shut down normally with a warm keypoint.
WARMSTART	CICS performed a warm restart following the normal shutdown of the previous run.

STARTUPDATE(name4 | *)
returns the start-up-date of this CICS region in packed-decimal form—4-bytes **0iyydddc**, where:

i is a century indicator. (0=1900, 1=2000, 2=2100, and so on.)
yy=years
ddd=days
c is the sign.

name4	The name of a 4-byte location that is to receive the startup date of this CICS system.

TERMURM(name8 | *)
returns the name of the autoinstall user program for terminals.

name8	The name of an 8-byte area that is to receive the name of the autoinstall user program for terminals.

TIMEOFDAY(name4 | *)
returns the current time-of-day in packed decimal form (4-bytes **hhmmsstc** where **hh**=hours, **mm**=minutes, **ss**=seconds, **t**=tenths of a second, and **c** is the sign).

name4	The name of a 4-byte location that is to receive the time.

XRFSTATUS(NOXRF|PRIMARY|TAKEOVER)
returns the XRF status of the CICS region.

NOXRF	CICS was started with the system initialization parameter XRF=NO specified. XRF is not active.
PRIMARY	The CICS region was started as an active CICS in an XRF environment.
TAKEOVER	The CICS region was started as an alternate CICS, with the START=STANDBY system initialization parameter.

RESPONSE and REASON values for INQUIRE_SYSTEM

RESPONSE	*REASON*
OK	None
INVALID	None
EXCEPTION	LENGTH_ERROR
	UNKNOWN_DATA
DISASTER	ABEND
	INQ_FAILED
	LOOP
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The SET_SYSTEM call

The SET_SYSTEM call allows you to set CICS system data values in the AP domain.

SET_SYSTEM

```
DFHSAIQX [CALL,]
   [CLEAR,]
   [IN,
   FUNCTION(SET_SYSTEM),
   [AKP(name4 | (Rn) ),]
   [DTRPRGRM(name8 | string | 'string'),]
   [GMMLENGTH(name2 | (Rn) | expression),]
   [GMMTEXT(name8 | (Rn)),]]
   [OUT,
   RESPONSE (name1 | * ),
   REASON (name1 | * )]
```

AKP(name4 | (Rn))
specifies the activity keypointing frequency of the CICS region.

name4	The name of a 4-byte location that contains the new frequency value.
(Rn)	A register that contains the new frequency value.

DTRPRGRM(name8 | string | 'string')
specifies the name of the dynamic transaction routing program.

name8	The name of an 8-byte area that contains the name of the dynamic transaction routing program.
string	A string of character, without intervening blanks, that defines the name of the dynamic transaction routing program being set.
'string'	A string of characters without intervening blanks. If you want to document a name (label) in your program, use this form.

GMMLENGTH(name2 | (Rn))
specifies the length of the new "good morning" message supplied by the GMMTEXT parameter.

name2	The name of a 2-byte area that contains, as a half-word binary value, the length of the new good morning message.
(Rn)	A register that contains the length of the new good morning message.

GMMTEXT(name4 | (Rn))
specifies the new good morning message.

name4	The name of a 4-byte location that contains the address of a storage area (up to a maximum of 246 bytes long) that contains the good morning message.
(Rn)	A register that contains the address of a storage area (up to a maximum of 246 bytes long) that contains the good morning message.

RESPONSE and REASON values for SET_SYSTEM:

RESPONSE	*REASON*
OK	None
INVALID	None
EXCEPTION	AKP_SIZE_ERROR
	LENGTH_ERROR
	NO_KEYPOINTING
DISASTER	ABEND
	LOOP
	SET_FAILED
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

Storage control functions

There are six XPI storage control functions. These are the DFHSMMCX macro calls GETMAIN, FREEMAIN, INQUIRE_ELEMENT_LENGTH, and INQUIRE_TASK_STORAGE, and the DFHSMSRX calls INQUIRE_ACCESS and INQUIRE_SHORT_ON_STORAGE.

DFHSMMCX calls cannot be used in any exit program invoked from any global user exit point in the:

- Dispatcher domain
- Dump domain
- Journal control program
- Monitor domain
- Statistics domain
- Transient data program

The GETMAIN call

GETMAIN acquires an element of storage for use by your exit program. You can ask for a particular CLASS of storage, and you can request that it be initialized to a single-byte value.

Storage in the following classes, acquired by a GETMAIN call, is released by CICS when the TCA being used at the time of the acquisition terminates:

CICS
CICS24
USER
USER24

In contrast, storage in the following classes is **not** released automatically at task-end: you should use the FREEMAIN call to release it:

SHARED_CICS24
SHARED_CICS
SHARED_USER24
SHARED_USER
TERMINAL

In addition, some user exits may be invoked from system tasks, and in these circumstances storage is not released until the next CICS shutdown. Therefore you should use FREEMAIN to release all storage areas acquired by GETMAIN as soon as you have finished using them.

GETMAIN

```
DFHSMMCX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(GETMAIN),
      GET_LENGTH(name4 | (Rn) | expression),
      STORAGE_CLASS(CICS|CICS24|LINE|SHARED_CICS|SHARED_CICS24|
                    SHARED_USER|SHARED_USER24|TERMINAL|USER|USER24),
      SUSPEND(YES|NO),
      [INITIAL_IMAGE(name1 | literalconst),]
      [TCTTE_ADDRESS(name4 | (Ra)),]]
      [OUT,
      ADDRESS(name4 | (Rn) | *),
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

ADDRESS(name4 | (Rn) | *)
returns the address of the storage obtained by the call.

name4	The name of a fullword where the obtained storage address is saved.
(Rn)	A register that is set to point to the obtained storage.
*****	The parameter list itself, name SMMC_ADDRESS, is used to keep the address.

GET_LENGTH(name4 | (Rn) | expression)
specifies the number of bytes of storage you want, expressed in any of the following ways:

name4	The name of a fullword specifying, in binary, the number of bytes.
(Rn)	A register containing, in binary, the number of bytes.
expression	A valid assembler-language expression; for instance, a number, a symbolic expression, or a combination of the two.

If you request TERMINAL storage, the length you specify should not include the length of the storage accounting area (SAA), and the maximum length you can specify is 65 515 bytes. CICS storage management adds an 8-byte SAA, and the address returned by the XPI call is that of the start of the SAA.

If you request CICS24, CICS, USER24, USER, SHARED_CICS24, SHARED_CICS, SHARED_USER24, or SHARED_USER storage, you need only specify the length needed by your program. The address returned is that of the start of your data storage. The maximum size of storage for these storage classes is the same as the size of the DSA from which they are allocated.

INITIAL_IMAGE(name1 | literalconst)
specifies the initializing pattern. For example, you might want to set the acquired storage to binary zeros.

name1	The name of a location where the one-byte initializing pattern is stored.
literalconst	A number in the form of a literal, for example `B'00000000'`, `X'FF'`, `X'FC'`, `'0'`, or an equate symbol with a similar value.

STORAGE_CLASS(CICS|CICS24|LINE|SHARED_CICS|SHARED_CICS24|SHARED_USER|SHARED_USER24|TERMINAL|USER|USER24)
specifies the class of the storage that is the subject of the call. The values you can assign to this option, and the type of storage each represents, are listed in Table 105.

Table 105. CICS storage classes

STORAGE_CLASS	Type of storage
CICS	Task-lifetime CICS-key storage above 16MB
CICS24	Task-lifetime CICS-key storage below 16MB
LINE	Shared CICS-key storage below 16MB
SHARED_CICS	Shared CICS-key storage above 16MB
SHARED_CICS24	Shared CICS-key storage below 16MB
SHARED_USER	Shared user-key storage above 16MB
SHARED_USER24	Shared user-key storage below 16MB
TERMINAL	Shared CICS-key storage below 16MB with an 8-byte SAA
USER	Task-lifetime user-key storage above 16MB
USER24	Task-lifetime user-key storage below 16MB

You must specify a storage class on a GETMAIN request. On a FREEMAIN request it is an optional parameter, and any value that you specify is not checked by CICS.

SUSPEND(YES|NO)
specifies whether to suspend your request if there is less storage available than you have asked for on the GET_LENGTH option.

TCTTE_ADDRESS(name4 | (Ra))
specifies the address of the terminal control table terminal entry (TCTTE). On GETMAIN requests, you must code this option if, on the STORAGE_CLASS option, you specify a class of TERMINAL. On FREEMAIN requests, you must code it if you are freeing TERMINAL-class storage.

Note: Before obtaining TERMINAL class storage, ensure that the task is running under a terminal. To do this, issue an INQUIRE_TRANSACTION XPI call; the FACILITY_TYPE option returns the type of principal facility associated with the task.

name4	The name of a fullword containing the address.
(Ra)	A register that points to the TCTTE.

RESPONSE and REASON values for GETMAIN:

RESPONSE	*REASON*
OK	None
EXCEPTION	INSUFFICIENT_STORAGE
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Notes:

1. For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.
2. ‘INSUFFICIENT_STORAGE’ is returned if the GETMAIN request was specified with SUSPEND(NO), and there was not enough storage available to satisfy the request.
3. ‘PURGED’ is returned if the GETMAIN request was specified with SUSPEND (YES), there was not enough storage to satisfy the request, and the task was purged.

The FREEMAIN call

FREEMAIN releases an area of storage that is currently allocated to your exit program.

FREEMAIN

```
DFHSMMCX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(FREEMAIN),
      ADDRESS(name4 | (Rn) | *),
      [STORAGE_CLASS(CICS|CICS24|LINE|SHARED_CICS|SHARED_CICS24|
                    SHARED_USER|SHARED_USER24|TERMINAL|USER|USER24),]
      [TCTTE_ADDRESS(pointer),]]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

The explanation of the options is the same as that given above for the GETMAIN function.

RESPONSE and REASON values for FREEMAIN:

RESPONSE	*REASON*
OK	None
EXCEPTION	None
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The INQUIRE_ACCESS call

INQUIRE_ACCESS returns the access-key of an element of storage specified by start address and length. If the element is not wholly contained within one of the CICS dynamic storage areas (DSAs), CICS returns an exception response.

INQUIRE_ACCESS

```
DFHSMSRX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(INQUIRE_ACCESS),
      ELEMENT_ADDRESS(name4 | (Rn) | *),
      ELEMENT_LENGTH(name4 | (Rn) | *),]
      [OUT,
      ACCESS(CICS | READ_ONLY | USER),
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

ACCESS(CICS | READ_ONLY | USER)
returns the access-key of the storage element.

CICS	CICS-key.
USER	User-key.
READ_ONLY	Readonly storage.

ELEMENT_ADDRESS(name4 | (Rn) | *)
specifies the address of the storage element.

ELEMENT_LENGTH(name4 | (Rn) | *)
specifies the length of the storage element, in bytes. A length of zero is treated as a length of one.

RESPONSE and REASON values for INQUIRE_ACCESS:

RESPONSE	*REASON*
OK	None
EXCEPTION	INVALID_ELEMENT
DISASTER	None
INVALID	None
KERNERROR	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The INQUIRE_ELEMENT_LENGTH call

The INQUIRE_ELEMENT_LENGTH call’s purpose is to enable the caller to pass the address of any part of an element of task-lifetime storage, and to obtain from CICS the start address and the length of the storage element that contains the passed address.

INQUIRE_ELEMENT_LENGTH

```
DFHSMMCX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION (INQUIRE_ELEMENT_LENGTH),
       ADDRESS (name4 | (Rn) | *),]
       [OUT,
       [ELEMENT_ADDRESS(name4 | (Rn) | *),]
       ELEMENT_LENGTH(name4 | (Rn) | *),
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

ADDRESS(name4 | (Rn) | *)
specifies an address that lies within an element of task-lifetime storage of the current task.

CICS accepts addresses that reference the leading or trailing check zones as being valid addresses for the element of storage you are inquiring upon.

ELEMENT_ADDRESS(name4 | (Rn) | *)
returns the start address of the element of task-lifetime storage referenced by the ADDRESS parameter. The start address returned does **not** include the leading check zone.

ELEMENT_LENGTH(name4 | (Rn) | *)
returns the length of the element of task-lifetime storage referenced by the ADDRESS parameter. The length returned does **not** include the leading or trailing check zones.

RESPONSE and REASON values for INQUIRE_ELEMENT_LENGTH:

RESPONSE	*REASON*
OK	None
EXCEPTION	INVALID_ADDRESS
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The INQUIRE_SHORT_ON_STORAGE call

The INQUIRE_SHORT_ON_STORAGE call's purpose is to enable the caller to determine whether CICS is short on storage either above or below the 16MB line.

INQUIRE_SHORT_ON_STORAGE

```
DFHSMSRX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(INQUIRE_SHORT_ON_STORAGE),]
       [OUT,
       SOS_ABOVE_THE_LINE(YES|NO),
       SOS_BELOW_THE_LINE(YES|NO),
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

SOS_ABOVE_THE_LINE(YES|NO),
returns YES if CICS is currently short-on-storage in any of the DSAs above the 16MB line, and NO if not.

SOS_BELOW_THE_LINE(YES|NO),
returns YES if CICS is currently short-on-storage in any of the DSAs below the 16MB line, and NO if not.

RESPONSE and REASON values for INQUIRE_SHORT_ON_STORAGE:

RESPONSE	*REASON*
OK	None
DISASTER	None
KERNERROR	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The INQUIRE_TASK_STORAGE call

The INQUIRE_TASK_STORAGE call's purpose is to enable the caller to request details of all elements of task-lifetime storage belonging to a task. You can specify the transaction number of the task explicitly on the call, or let it default to the current task.

INQUIRE_TASK_STORAGE

```
DFHSMMCX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION (INQUIRE_TASK_STORAGE),
       ELEMENT_BUFFER(buffer-descriptor),
       LENGTH_BUFFER(buffer-descriptor),
       [TRANSACTION_NUMBER(name4 | (Rn) | *),]]
       [OUT,
       NUMBER_OF_ELEMENTS(name4 | (Rn) | *),
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

ELEMENT_BUFFER(buffer-descriptor)
defines the address and length of a buffer into which CICS returns a list of start addresses of all the elements of task-lifetime storage belonging to either the specified task or, by default, the current task.

The start addresses returned do **not** include the leading check zone.

LENGTH_BUFFER(buffer-descriptor)
defines the address and length of a buffer into which CICS returns a list of the lengths of the elements of task-lifetime storage belonging to either the specified task or, by default, the current task. The lengths returned do **not** include the leading or trailing check zones.

NUMBER_OF_ELEMENTS(name4 | (Rn) | *)
returns the number of entries in each of the two buffers, ELEMENT_BUFFER and LENGTH_BUFFER, as a full-word binary value.

TRANSACTION_NUMBER(name4 | (Rn) | *)
specifies, as a 4-byte packed decimal value, the transaction number of the task to whom the storage belongs.

If you omit the transaction (task) number, CICS assumes the current task.

RESPONSE and REASON values for INQUIRE_TASK_STORAGE:

RESPONSE	*REASON*
OK	None
EXCEPTION	INSUFFICIENT_STORAGE
	NO_TRANSACTION_ENVIRONMENT
DISASTER	None
INVALID	None

KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

Trace control function

There is one XPI trace control function. This is the DFHTRPTX call TRACE_PUT.

DFHTRPTX calls cannot be used in any exit program invoked from any global user exit point in the:

- Dispatcher domain
- Dump domain
- Journal control program
- Monitor domain
- Statistics domain
- Transient data program.

The TRACE_PUT call

TRACE_PUT writes a trace entry to the active trace destinations. You should only make a TRACE_PUT call when UEPTRON indicates that tracing is active for the function containing the exit program (see UEPTRON in DFHUEPAR). You may prefer to make "exception" trace entries, in case of serious errors, without testing UEPTRON.

If you use TRACE_PUT to write exception trace entries, you should identify these so they are highlighted as exception trace entries by the trace formatting utility program. To identify an exception trace entry, enter the literal string 'USEREXC' in the DATA1 block descriptor field on the DFHTRPTX call. See the *CICS Problem Determination Guide* for details of how an exception trace entry is interpreted.

TRACE_PUT

```
DFHTRPTX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(TRACE_PUT),
      POINT_ID(literalconst | name2 | (Rn)),
      [DATA1(block-descriptor),]
      [DATA2(block-descriptor),]
      [DATA3(block-descriptor),]
      [DATA4(block-descriptor),]
      [DATA5(block-descriptor),]
      [DATA6(block-descriptor),]
      [DATA7(block-descriptor),]
      [RETURN_ADDR(expression | name4 | (Ra)),]]
      [OUT,
      RESPONSE(name1 | *)]
```

DATA*n*(block-descriptor)
specifies up to seven areas to be included in the data section of the trace entry. For a description of valid block-descriptors, see page 253. If you specify

any given DATA*n*, then DATA1 through DATA(*n*–1) **must** be coded before DATA*n*. The specified DATA items are printed in the trace output in the order specified, that is, in order of DATA1 through DATA*n*. A 2-byte length field is printed before the data field itself. The maximum total length of the data that can be traced in one call is 4040 – (2 * *n*) bytes, where *n* is the number of data fields that you specify.

POINT_ID(literalconst | name2 | (Rn))
specifies the trace entries made as a result of this request. Every TRACE_PUT call within a calling domain should specify a unique POINT_ID; this enables you to locate the origin of a trace call when examining a formatted trace. The POINT_IDs must be in the range decimal 256 through 511 (`X'100'` through `X'1FF'`). This range is not used in CICS modules, but is reserved for user exits.

literalconst	A number in the form of a literal, containing the ID.
name2	The name of a 2-byte field containing the ID.
(Rn)	A register, the two low-order bytes of which contain the ID.

RETURN_ADDR(expression | name4 | (Ra))
specifies the value that appears in the return address field of the trace entry.

expression	A valid assembler-language expression that results in the
name4	The name of a fullword containing the address.
(Ra)	A register containing the address.

RESPONSE values for TRACE_PUT: The RESPONSE field is never set for the TRACE_PUT function. This is for performance reasons. It is not considered that any useful purpose could be served by testing for this value. Note, however, that the syntax requires that RESPONSE is always specified as a parameter on the call. It is recommended that RESPONSE(*) is always used.

Transaction management functions

This section describes the transaction management XPI calls.

The INQUIRE_DTRTRAN call

The INQUIRE_DTRTRAN call returns the name of the dynamic transaction routing (DTR) transaction definition.

The DTR transaction definition provides common attributes for transactions that are to be dynamically routed and which do not have a specific transaction definition. It is specified on the DTRTRAN system initialization parameter; the CICS-supplied default definition is CRTX.

INQUIRE_DTRTRAN

```
DFHXMSRX  [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(INQUIRE_DTRTRAN),]
      [OUT,
      DTRTRAN(name4),
      RESPONSE (name1 | *),
      REASON (name1 | *)]
```

DTRTRAN(name4)
returns the name of the DTR transaction definition used for routing transactions that are not defined by an explicit transaction resource definition.

name4	The name of a 4-byte location that is to receive the name of the DTR transaction definition. If `'NO'` was specified on the DTRTRAN system initialization parameter, `'NO'` will be placed in this field.

RESPONSE and REASON values for INQUIRE_DTRTRAN:

RESPONSE	*REASON*
OK	None
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The INQUIRE_MXT call

The INQUIRE_MXT function is provided on the DFHXMSRX macro call. Its purpose is to provide current value of the MXT parameter.

INQUIRE_MXT

```
DFHXMSRX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(INQUIRE_MXT),]
       [OUT,
       [CURRENT_ACTIVE(name4 | (Rn) ),]
       [MXT_LIMIT(name4 | (Rn)),]
       [MXT_QUEUED(name4 | (Rn) ),]
       [TCLASS_QUEUED(name4 | (Rn) ),]
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

CURRENT_ACTIVE(name4 | (Rn))
returns the current number of all active user tasks.

name4	The name of a 4-byte location that is to receive the current number of active user tasks, expressed as a binary value.
(Rn)	A register to receive the current number of active user tasks, expressed as a binary value.

MXT_LIMIT(name4 | (Rn))
returns the current value of the MXT parameter.

name4	The name of a 4-byte location that is to receive the maximum number of all user tasks currently allowed, expressed as a binary value.
(Rn)	A register to receive the maximum number of all tasks currently allowed, expressed as a binary value.

MXT_QUEUED(name4 | (Rn))
returns the current number of user transactions that are queued as a result of the maximum tasks (MXT) being reached.

name4	The name of a 4-byte location that is to receive the current number of queued user tasks, expressed as a binary value.
(Rn)	A register to receive the current number of queued user tasks, expressed as a binary value.

TCLASS_QUEUED(name4 | (Rn))
returns the current number of all transactions that are queued for transaction class membership.

name4	The name of a 4-byte location that is to receive the current number of queued transaction class members, expressed as a binary value.
(Rn)	A register to receive the current number of queued transaction class members, expressed as a binary value.

RESPONSE and REASON values for INQUIRE_MXT:

RESPONSE	*REASON*
OK	None
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in "General form of an XPI call" on page 240.

The INQUIRE_TCLASS call

The INQUIRE_TCLASS function is provided on the DFHXMCLX macro call. Its purpose is to provide current information about the specified transaction class (TCLASS).

INQUIRE_TCLASS

```
DFHXMCLX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(INQUIRE_TCLASS),
       INQ_TCLASS_NAME(name8 | string | 'string'),]
       [OUT,
       [CURRENT_ACTIVE(name4 | (Rn)),]
       [CURRENT_QUEUED(name4 | (Rn)),]
       [MAX_ACTIVE(name4 | (Rn)),]
       [PURGE_THRESHOLD(name4 | (Rn)),]
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

CURRENT_ACTIVE(name4 | (Rn))
returns the current number of active user tasks in this transaction class.

name4	The name of a 4-byte location that is to receive the current number of active user tasks for this transaction class, expressed as a binary value.
(Rn)	A register to receive the current number of active user tasks for this transaction class, expressed as a binary value.

CURRENT_QUEUED(name4 | (Rn))
returns the current number of queued user tasks.

name4	The name of a 4-byte location that is to receive the current number of queued user tasks in this transaction class, expressed as a binary value.
(Rn)	A register to receive the current number of queued user tasks, expressed as a binary value.

INQ_TCLASS_NAME(name8 | string | ‘string’)
specifies the name of the transaction class for this inquiry.

name8	The name of an 8-byte location that contains the name of the transaction class being inquired on.
string	A string of characters, without intervening blanks, naming the transaction class.
‘string’	A string of characters, within quotation marks, naming the transaction class. The string length is set to 8 by padding with blanks within the quotation marks.

MAX_ACTIVE(name4 | (Rn))
returns the current maximum number of active tasks allowed for the transaction class.

name4	The name of a 4-byte location that is to receive the current maximum number of active tasks currently allowed for this transaction class, expressed as a binary value.
(Rn)	A register to receive the current maximum number of active tasks currently allowed for this transaction class, expressed as a binary value.

PURGE_THRESHOLD(name4 | (Rn))
returns the purge threshold limit for this transaction class.

name4	The name of a 4-byte location that is to receive the current purge threshold limit for this transaction class, expressed as a binary value.
(Rn)	A register to receive the current purge threshold limit for this transaction class, expressed as a binary value.

RESPONSE and REASON values for INQUIRE_TCLASS:

RESPONSE	*REASON*
OK	None
DISASTER	LOGIC_ERROR
INVALID	None
EXCEPTION	UNKNOWN_TCLASS

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The INQUIRE_TRANDEF call

The INQUIRE_TRANDEF function is provided on the DFHXMXDX macro call. Its purpose is to allow you to obtain information about the specified transaction definition. In general, this function call is equivalent to the EXEC CICS INQUIRE TRANSACTION command, with some differences.

INQUIRE_TRANDEF

```
DFHXMXDX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(INQUIRE_TRANDEF),
       INQ_TRANSACTION_ID(name4 | string
       | 'string'),]
       [OUT,
       [CMDSEC(name1),]
       [CONFDATA(name1),]
       [DTIMEOUT(name4 | (Rn)),]
       [DUMP(name1),]
       [DYNAMIC(name1),]
       [INDOUBT(name1),]
       [INITIAL_PROGRAM(name8),]
       [LOCAL_QUEUING(name1),]
       [PARTITIONSET(name1),]
       [PARTITIONSET_NAME(name8),]
       [PROFILE_NAME(name8),]
       [REMOTE(name1),]
       [REMOTE_NAME(name8),]
       [REMOTE_SYSTEM(name4),]
       [RESSEC(name1),]
       [RESTART(name1),]
       [RUNAWAY_LIMIT(name4 | (Rn)),]
       [SHUTDOWN(name1),]
       [SPURGE(name1),]
       [STATUS(name1),]
       [STORAGE_CLEAR(name1),]
       [STORAGE_FREEZE(name1),]
       [SYSTEM_ATTACH(name1),]
       [SYSTEM_RUNAWAY(name1),]
       [TASKDATAKEY(name1),]
       [TASKDATALOC(name1),]
       [TCLASS(name1),[TCLASS_NAME(name8),]]
       [TPURGE(name1),]
       [TRACE(name1),]
       [TRAN_PRIORITY(name1 | (Rn)),]
       [TRAN_ROUTING_PROFILE(name8),]
       [TRANSACTION_ID(name4),]
       [TWASIZE(name4 | (Rn)),]
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

The following parameter descriptions explain briefly the possible values that can be returned on an INQUIRE_TRANDEF call. For a more detailed explanation of some of these parameters, see the corresponding parameter descriptions for the TRANSACTION resource definition in the *CICS Resource Definition Guide*.

CMDSEC(name1)
returns, in a 1-byte location (*name1*), whether command security checking is required for the transaction.

YES	Command security checking is required.
NO	Command security checking is not required.

CONFDATA(name1)
returns, in a 1-byte location (*name1*), whether CICS is to suppress user data from CICS trace entries. transaction.

YES	CICS suppresses user data from the CICS trace points.
NO	CICS does not suppress user data from the CICS trace points.

Note: If the CONFDATA system initialization parameter specifies SHOW, the CONFDATA option of the transaction definition is ignored.

DTIMEOUT(name4)
returns the deadlock time-out value for the transaction.

name4	The name of a 4-byte location that is to receive the deadlock time-out value, expressed as a binary value.
(Rn)	A register to receive the deadlock time-out value, expressed as a binary value.

Note that a value of zero means that the transaction resource definition specifies DTIMOUT(NO).

DUMP(name1)
returns, in a 1-byte location (*name1*), whether CICS is to take a transaction dump if the transaction abends.

YES	A transaction dump is required.
NO	A transaction dump is not required.

DYNAMIC(name1)
returns, in a 1-byte location (*name1*), whether the transaction is defined for dynamic transaction routing.

YES	The transaction is to be dynamically routed to a remote CICS.
NO	The transaction is not to be dynamically routed.

INDOUBT(name1)
returns, in a 1-byte location (*name1*), the action CICS is to take if the transaction abends while using intercommunication, and syncpointing status is in doubt.

BACKOUT	Any changes made by the transaction to recoverable resources are to be backed out.
COMMIT	Any changes made by the transaction to recoverable resources are to be committed.
WAIT	Any changes made to recoverable temporary storage are locked until the session is recovered.

INITIAL_PROGRAM(name8)
returns the name of the initial program to be given control for the transaction.

name8	The name of an 8-byte location to receive the initial program name.

INQ_TRANSACTION_ID(name4 | string | ‘string’)
specifies the transaction identifier for this transaction definition inquiry.

name4	The name of a 4-byte location that contains the name of the transaction identifier.
string	A string of characters, without intervening blanks, naming the transaction identifier.
‘string’	A string of characters, within quotation marks, naming the transaction identifier. The string length is set to 4 by padding with blanks within the quotation marks.

LOCAL_QUEUING(name1)
returns, in a 1-byte location (*name1*), whether a start request for this transaction is eligible to queue locally if the transaction is to be started on another system, and the remote system is not available.

YES	The request can be queued locally.
NO	The request is not to be queued locally.

PARTITIONSET(name1)
returns, in a 1-byte location (*name1*), the partitionset specified on the transaction definition.

KEEP	The reserved name KEEP is specified for the partitionset, which means tasks running under this transaction definition use the application partitionset for the terminal associated with the transaction.
NONE	There is no partitionset specified for the transaction definition.
NAMED	The partitionset is named specifically on the transaction definition. The name is returned on the PARTITIONSET_NAME parameter.
OWN	The reserved name OWN is specified for the partitionset, which means tasks running under this transaction definition perform their own partitionset management.

PARTITIONSET_NAME(name8)
returns the name of the partitionset defined on the transaction definition.

name8	The name of an 8-byte location that is to receive the name of the partitionset.

PROFILE_NAME(name8)
returns the name of the profile definition that is associated with the transaction definition.

name8	The name of an 8-byte location to receive the name of the profile definition associated with the transaction definition.

REMOTE(name1)
returns, in a 1-byte location (*name1*), whether the transaction is defined as remote.

YES	The transaction is a remote transaction.
NO	The transaction is not a remote transaction.

REMOTE_NAME(name8)
returns the name by which the transaction is known in a remote system.

name8	The name of an 8-byte location to receive the transaction's remote name.

REMOTE_SYSTEM(name4)
returns the name of the remote system as specified on the transaction definition.

If the DYNAMIC parameter returns YES, REMOTE_SYSTEM returns the default name, which can be changed by the dynamic routing program.

If the DYNAMIC parameter returns NO, this is the actual remote system to which the transaction is to be routed.

name4	The name of a 4-byte location to receive the defined name of the remote system.

RESSEC(name1)
returns, in a 1-byte location (*name1*), whether resource security checking is required for the transaction.

YES	Resource security checking is required.
NO	Resource security checking is not required.

RESTART(name1)
returns, in a 1-byte location (*name1*), whether the transaction restart is to be considered for transaction restart.

YES	The transaction can be restarted.
NO	The transaction cannot be restarted.

RUNAWAY_LIMIT(name4 | (Rn))
returns the runaway-task time limit specified on the RDO TRANSACTION definition. If SYSTEM_RUNAWAY is YES, the value returned is the value defined by the ICVR system initialization parameter.

name4	The name of a 4-byte location that is to receive the task runaway limit, expressed as a binary value.
(Rn)	A register to receive the task runaway limit, expressed as a binary value.

SHUTDOWN(name1)
returns, in a 1-byte location (*name1*), whether the transaction can be run during CICS shutdown.

DISABLED	The transaction is disabled from running during CICS shutdown.
ENABLED	The transaction is enabled to run during CICS shutdown.

SPURGE(name1)
returns, in a 1-byte location (*name1*), whether the transaction is defined as system-purgeable.

YES	The transaction is system-purgeable.
NO	The transaction is not system-purgeable.

STATUS(name1)
returns, in a 1-byte location (*name1*), the status of the transaction definition.

DISABLED	The transaction definition is disabled.
ENABLED	The transaction definition is enabled.

STORAGE_CLEAR(name1)
returns, in a 1-byte location (*name1*), whether task-lifetime storage, of tasks associated with this transaction definition, is to be cleared before it is freed by a FREEMAIN command.

YES	Task-lifetime storage must be cleared before it's freed.
NO	Task-lifetime storage need not be cleared before it's freed.

STORAGE_FREEZE(name1 | (Rn))
returns, in a 1-byte location (*name1*), whether storage freeze is defined for the transaction by means of the STGFRZ option on the CICS-supplied field engineering transaction, CSFE.

YES	Storage that is normally freed during the running of a transaction is frozen.
NO	Storage is freed normally during the running of the transaction.

SYSTEM_ATTACH(name1)
returns, in a 1-byte location (*name1*), whether the tasks attached with this tranid are always to be attached as system tasks.

YES	A system task is being attached for this transaction.
NO	A user task is being attached for this transaction.

SYSTEM_RUNAWAY(name1)
returns, in a 1-byte location (*name1*), whether the transaction definition specifies the system default runaway-task time limit, which is specified on the ICVR system initialization parameter.

YES	The transaction definition specifies the system default runaway limit.
NO	The transaction is not governed by the system runaway limit.

TASKDATAKEY(name1)
returns, in a 1-byte location (*name1*), the storage key of task-lifetime storage for tasks associated with this transaction definition.

CICS	CICS key is specified for task-lifetime storage.
USER	USER key is specified for task-lifetime storage.

TASKDATALOC(name1)
returns, in a 1-byte location (*name1*), the data location of task-lifetime storage for tasks associated with this transaction definition.

ANY	Task-lifetime storage can be located above 16MB in virtual storage.
BELOW	Task-lifetime storage must be located below 16MB in virtual storage.

TCLASS(name1)
returns, in a 1-byte location (*name1*), whether the transaction belongs to a transaction class.

YES	The transaction is a member of the transaction class named in the TCLASS_NAME parameter.
NO	The transaction is not a member of a transaction class.

TCLASS_NAME(name8)
returns the name of the transaction class to which the transaction belongs.

name8	The name of an 8-byte location to receive transaction class name to which the transaction belongs.

TPURGE(name1)
returns, in a 1-byte location (*name1*), whether the transaction is defined as purgeable in the event of a VTAM terminal error.

YES	The transaction can be purged if a terminal error occurs.
NO	The transaction can not be purged if a terminal error occurs.

TRACE(name1)
returns, in a 1-byte location (*name1*), the level of tracing defined for the transaction

SPECIAL
CICS special-level trace This is the result of special trace being set by means of an EXEC CICS SET TRANSACTION command.

STANDARD
CICS standard-level trace This equates to TRACE(YES) in the TRANSACTION resource definition.

SUPPRESSED
Tracing is suppressed for the transaction This equates to TRACE(NO) in the TRANSACTION resource definition.

TRAN_PRIORITY(name1 | (Rn))
returns the transaction priority specified on the transaction definition.

name1	The name of a 1-byte location to receive the transaction priority, expressed as a binary value.
(Rn)	A register to receive the transaction priority, expressed as a binary value.

TRAN_ROUTING_PROFILE(name8)
returns the name of the profile that CICS is to use to route the transaction to a remote system.

name8	The name of an 8-byte location to receive the transaction-routing profile.

TRANSACTION_ID(name4)
returns the primary transaction identifier for this transaction definition inquiry.

name4	The name of a 4-byte location that contains the name of the transaction identifier.

TWASIZE(name4 | (Rn))
returns the size of the transaction work area specified on the transaction definition.

name4	The name of a 4-byte location to receive the size of the transaction work area, expressed as a binary value.
(Rn)	A register to receive the size of the transaction work area, expressed as a binary value.

RESPONSE and REASON values for INQUIRE_TRANDEF:

RESPONSE	*REASON*
OK	None
EXCEPTION	UNKNOWN_TRANSACTION_ID
INVALID	None
DISASTER	LOGIC_ERROR
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The INQUIRE_TRANSACTION call

The INQUIRE_TRANSACTION function is provided on the DFHXMIQX macro call. Its purpose is to allow you to obtain information about a transaction that is attached (task). In general, this call is equivalent to the EXEC CICS INQUIRE TASK command, with some minor differences.

INQUIRE_TRANSACTION

```
DFHXMIQX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(INQUIRE_TRANSACTION),
       [TRANSACTION_TOKEN(name8),]]
       [OUT,
       [CICS_UOW_ID(name8),]
       [CMDSEC(name1),]
       [CONFDATA(name1),]
       [DTIMEOUT(name4 | (Rn)),]
       [DUMP(name1),]
       [DYNAMIC(name1),]
       [FACILITY_NAME(name4),]
       [FACILITY_TYPE(name1),]
       [INDOUBT(name1),]
       [INITIAL_PROGRAM(name8),]
       [LOCAL_QUEUING(name1),]
       [NETNAME(name8),]
       [ORIGINAL_TRANSACTION_ID(name4),]
       [OUT_TRANSACTION_TOKEN(name8),]
       [PROFILE_NAME(name8),]
       [REMOTE(name1),]
       [REMOTE_NAME(name8),]
       [REMOTE_SYSTEM(name4),]
       [RESOURCE_NAME(name8),]
       [RESOURCE_TYPE(name8),]
       [RESSEC(name1),]
       [RESTART(name1),]
       [RESTART_COUNT(name2 | (Rn)),]
       [RUNAWAY_LIMIT(name4 | (Rn)),]
       [SPURGE(name1),]
       [START_CODE(name1),]
       [STATUS(name1),]
       [STORAGE_CLEAR(name1),]
       [SUSPEND_TIME(name4 | (Rn)),]
       [SYSTEM_TRANSACTION(name1),]
       [TASKDATAKEY(name1),]
       [TASKDATALOC(name1),]
       [TASK_PRIORITY(name1),]
       [TCLASS(name1),[TCLASS_NAME(name8),]]
       [TPURGE(name1),]
       [TRACE(name1),]
       [TRANNUM(name4 | string | ‘string’),]
       [TRAN_PRIORITY(name1),]
       [TRAN_ROUTING_PROFILE(name8),]
       [TRANSACTION_ID(name4),]
       [TWASIZE(name4),]
       [USERID(name8),]
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

The descriptions of the following parameters are the same as the corresponding parameters on the INQUIRE_TRANDEF function call.

```
CMDSEC          RUNAWAY_LIMIT
CONFDATA        SPURGE
DTIMEOUT        STATUS
DUMP            STORAGE_CLEAR
DYNAMIC         TASKDATAKEY
INDOUBT         TASKDATALOC
INITIAL_PROGRAM TCLASS
LOCAL_QUEUING   TCLASS_NAME
PROFILE_NAME    TPURGE
REMOTE          TRACE
REMOTE_NAME     TRAN_PRIORITY
REMOTE_SYSTEM   TRAN_ROUTING_PROFILE
RESSEC          TRANSACTION_ID
RESTART         TWASIZE
```

The parameter descriptions that follow explain briefly the possible values that can be returned on an INQUIRE_TRANSACTION call. For a more detailed explanation of these parameters, see the corresponding parameter descriptions for the TRANSACTION resource definition in the *CICS Resource Definition Guide*.

CICS_UOW_ID(name8)
returns the CICS unit of work identifier for the task.

name8	The name of an 8-byte location to receive the unit of work id.

FACILITY_NAME(name4)
returns the name of the principal facility associated with the task.

name4	The name of a 4-byte location to receive the name of the principal facility.

FACILITY_TYPE(name1)
returns, in a 1-byte location (*name1*), the type of principal facility associated with the task.

NONE	There is no principal facility.
START	The principal facility is an interval control element.
TD	The principal facility is a transient data queue.
TERMINAL	The principal facility is a terminal.

NETNAME(name8)
returns the network name of the principal facility associated with this task.

name8	The name of an 8-byte location to receive the network name.

ORIGINAL_TRANSACTION_ID(name4)
returns the transaction id that was used to attach the transaction. For example, if an alias was used at a terminal, this field returns the alias.

name4	The name of a 4-byte location to receive the name of the original transaction identifier.

OUT_TRANSACTION_TOKEN(name8)
returns the token that represents the task.

name8	The name of an 8-byte location to receive the transaction token for the task.

RESOURCE_NAME(name8)
returns the name of a resource that the (suspended) transaction is waiting for.

name8	The name of an 8-byte location to receive the name of the resource on which the transaction is waiting.

RESOURCE_TYPE(name8)
returns the type of resource that the (suspended) transaction is waiting for.

name8	The name of an 8-byte location to receive the type of resource on which the transaction is waiting.

RESTART_COUNT(name2 | (Rn))
returns the number of times this instance of the transaction has been restarted.

name2	The name of a 2-byte location to receive the number of times the transaction has been restarted, expressed as a half-word binary value.
(Rn)	A register to receive the number of times the transaction has been restarted, expressed as a half-word binary value.

START_CODE(name1)
returns, in a 1-byte location (*name1*), how the task was started:

C	A CICS internal attach.
DF	The start code is not yet known—to be set later.
QD	A transient data trigger level attach.
S	A START command without any data.
SD	A START command with data.
SZ	A front end programming interface (FEPI) attach.
T	A terminal input attach.
TT	A permanent transaction terminal attach.

SUSPEND_TIME(name4 | (Rn))
returns the length of time that the task has been in its current suspended state.

name4	The name of a 4-byte location to receive the number of seconds, rounded down, the task has been suspended, expressed as a binary value.
(Rn)	A register to receive the number of seconds, rounded down, the task has been suspended, expressed as a binary value.

SYSTEM_TRANSACTION(name1)
returns, in a 1-byte location (*name1*), whether the task is CICS system task.

YES	The task is a CICS system task.
NO	The task is not a CICS system task.

TASK_PRIORITY(name1)
returns the combined task priority, which is the sum of the priorities defined for the terminal, transaction, and operator.

name1	The name of a 1-byte location to receive the task priority, expressed as a binary number.

TRANNUM(name4)
returns the task number of the transaction.

name4	The name of a 4-byte location to receive the task number.

TRANSACTION_TOKEN(name8)
specifies the transaction token for the task being inquired upon. This parameter is optional, and if omitted, the current task is assumed.

If you issue this call within an XXMATT global user exit program, the current task may be a CICS system task. To inquire on the user task for which XXMATT is invoked, you must specify the transaction token passed on the XXMATT exit-specific parameter list.

name8	The name of an 8-byte location that contains the transaction token.

USERID(name8)
returns the userid associated with this task.

name8	The name of an 8-byte location to receive the userid.

RESPONSE and REASON values for INQUIRE_TRANSACTION:

RESPONSE	*REASON*
OK	None
DISASTER	ABEND
	LOOP
INVALID	None
EXCEPTION	NO_TRANSACTION_ENVIRONMENT
	BUFFER_TOO_SMALL
	INVALID_TRANSACTION_TOKEN
KERNERROR	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

The SET_TRANSACTION call

The SET_TRANSACTION function is provided on the DFHXMIQX macro call. Its purpose is to allow you to change the task priority and transaction class of the current task.

Note that you can use this call to change the TCLASS_NAME only when it is invoked from an XXMATT global user exit program.

SET_TRANSACTION

```
DFHXMIQX  [CALL,]
       [CLEAR,]
       [IN,
       FUNCTION(SET_TRANSACTION),
       [TASK_PRIORITY(name4),]
       [TCLASS_NAME(name8),]
       [TRANSACTION_TOKEN(name8),]]
       [OUT,
       RESPONSE (name1 | *),
       REASON (name1 | *)]
```

TASK_PRIORITY(name4)
specifies the new task priority being set for the task identified by TRANSACTION_TOKEN.

name4	The name of a 4-byte location that contains the new task priority number, expressed as a binary value.

TCLASS_NAME(name8)
specifies the new transaction class name that you want to associate this task with. To specify that the task is not to be in any transaction class, specify the special default system name DFHTCL00.

name8	The name of an 8-byte location that contains the name of the new transaction class. Set this field to DFHTCL00 for no transaction class.

TRANSACTION_TOKEN(name8)
specifies the transaction token that represents the task being modified. If you omit this parameter, the call defaults to the current task.

name8	The name of an 8-byte location that contains the transaction token.

RESPONSE and REASON values for SET_TRANSACTION:

RESPONSE	*REASON*
OK	None
EXCEPTION	NO_TRANSACTION_ENVIRONMENT
	INVALID_TRANSACTION_TOKEN
	UNKNOWN_TCLASS
DISASTER	ABEND
	LOOP
INVALID	None
KERNERROR	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

User journaling function

There is one XPI user journaling function, which is the DFHJCJCX call WRITE_JOURNAL_DATA.

DFHJCJCX calls cannot be used in any exit program invoked from any global user exit point in the:

- Statistics domain
- Monitor domain
- Dump domain
- Dispatcher domain
- Transient data program
- Journal control program (DFHJCP).

The WRITE_JOURNAL_DATA call

WRITE_JOURNAL_DATA writes a single journal record to a named CICS journal data set.

WRITE_JOURNAL DATA

```
DFHJCJCX [CALL,]
      [CLEAR,]
      [IN,
      FUNCTION(WRITE_JOURNAL_DATA),
      FROM(block-descriptor),
      JOURNAL_ID(name2 | (Rn) | expression),
      JOURNAL_RECORD_ID(name2 | string | 'string'),
      WAIT(YES|NO),
      [RECORD_PREFIX(block-descriptor),]]
      [OUT,
      RESPONSE(name1 | *),
      REASON(name1 | *)]
```

Important

There is a restriction in using the XPI early during initialization. Do not start exit programs that use the XPI functions TRANSACTION_DUMP, WRITE_JOURNAL_DATA, MONITOR, and INQUIRE_MONITOR_DATA until the second phase of the PLTPI. For further information about the PLTPI, refer to Chapter 4, “Writing initialization and shutdown programs” on page 339.

FROM(block-descriptor)
specifies the address and the length of the journal record.

JOURNAL_ID(name2 | (Rn) | expression)
specifies the number of the journal data set to which the journal record is to be written.

name2	The name of a 2-byte location where the ID is held.
(Rn)	A register with the low-order 2 bytes holding the ID.
expression	Any arithmetic expression, valid in assembler language, that yields a number that can be expressed in 2 bytes.

JOURNAL_RECORD_ID(name2 | string | 'string')
specifies a 2-character value to be written to the journal record to identify its origin.

name2	The name of a 2-byte location.
string	A character string that is limited to a length of 2 in the generated code.
'string'	A character string enclosed in quotation marks.

RECORD_PREFIX(block-descriptor)
specifies the optional user prefix.

WAIT(YES|NO)
specifies whether CICS is to wait until the record is written to auxiliary storage before returning control to the exit program.

RESPONSE and REASON values for WRITE_JOURNAL_DATA:

RESPONSE	*REASON*
OK	None
EXCEPTION	IO_ERROR
	JOURNAL_NOT_FOUND
	JOURNAL_NOT_OPEN
	LENGTH_ERROR
	STATUS_ERROR
DISASTER	None
INVALID	None
KERNERROR	None
PURGED	None

Note: For more detail, refer to the explanation of RESPONSE and REASON in “General form of an XPI call” on page 240.

Part 2. Customizing with initialization and shutdown programs

Table 106. Initialization and shutdown road map

If you want to...	Refer to...
Write a program to perform tasks during CICS startup or shutdown	Chapter 4, “Writing initialization and shutdown programs” on page 339

Chapter 4. Writing initialization and shutdown programs

You can write programs to run during the initialization and shutdown phases of CICS processing. Any program that is to run at these times must be defined to CICS in a program list table (PLT). Information about how to code the PLT is provided in the *CICS Resource Definition Guide*.

The chapter is divided into the following sections:

1. **"Initialization programs"**
2. **"Shutdown programs"** on page 341
3. **"General considerations"** on page 342

Initialization programs

There are three stages in CICS initialization processing and two phases of program list table (PLT) execution. You can write programs to execute during the second and the third stages of initialization, but not during the first. Any program that is to execute during CICS initialization must be specified in a PLT, and the suffix of that PLT must be named on the program list table post initialization (PLTPI) system initialization parameter.

PLT programs for the second stage of initialization

During the *second* stage of CICS initialization processing, the only PLT programs that can execute are those containing the enabling commands for global and task-related user exit programs. These programs are specified in the *first* part of the PLTPI list. This allows you to enable those exit programs that are needed during recovery.

The following points apply to all first phase PLTPI programs:

- The programs must be written in assembler language.
- They must run AMODE 31.
- The only EXEC CICS commands they should contain are:
  - ENABLE
  - EXTRACT EXIT

  Because this stage occurs before recovery when initialization is incomplete, no other CICS services can be invoked.
- If a first phase PLTPI program enables an exit program that issues any of the XPI calls INQUIRE_MONITORING_DATA, MONITOR, TRANSACTION_DUMP, or WRITE_JOURNAL_DATA, it must not specify the START option on the EXEC CICS ENABLE COMMAND.
- First phase PLTPI programs must not enable any task-related user exit program with the TASKSTART option.
- You do not have to define first phase PLTPI programs to CICS. If you do not, default definitions are installed automatically by CICS. Note that this happens whether or not program autoinstall is specified as active on the PGAIPGM system initialization parameter. The autoinstall user program is **not** invoked to

allow the definitions to be modified. The programs are defined with the following attributes:

LANGUAGE(Assembler)
RELOAD(No)
STATUS(Enabled)
CEDF(No)
DATALOCATION(Below)
EXECKEY(CICS)
EXECUTIONSET(Fullapi)

If any of the default attributes are unsuitable, you must define the programs statically (by defining entries in the CSD and installing the definitions).

PLT programs for the third stage of initialization

During the *third* stage of CICS initialization, most CICS services are available to PLT programs. These programs are specified in the *second* part of the PLTPI list. The limitations on the services that are available to second phase PLTPI programs are described below.

- Because interregion communication (IRC) and intersystem communication (ISC) have pseudo-terminal entries associated with their function, you cannot run any IRC or ISC functions during PLTPI processing. This includes performing inquiries on those ISC/IRC functions.
- PLTPI programs may request services that could suspend the issuing task. (But note that this affects the time at which control is given to CICS.) The SUSPEND must not require the decision to resume to be taken by another task.
- Although PLTPI programs can issue interval control START commands, the requested transactions are not attached before the initialization stages have completed. Because this cannot happen until after the PLTPI programs themselves have been completed, the latter must not be dependent on anything that the requested transactions might do.
- PLTPI programs must not issue dump requests.
- PLTPI programs must not use the EXEC CICS PERFORM SHUTDOWN command, or a severe error will occur in DFHDMDM. The EXEC CICS PERFORM SHUTDOWN IMMEDIATE command is allowed.
- You must define second phase PLTPI programs to CICS. You can either define the programs statically, or use program autoinstall. (For general information about program autoinstall, see the *CICS Resource Definition Guide* (For information about how to write a program to control the autoinstall of programs, see Chapter 13, “Writing a program to control autoinstall of programs” on page 461.)

Rebuilding protected resources from second phase programs

When a protected resource is accessed, CICS normally enqueues on the resource to ensure that the issuing task has exclusive control. The automatic dequeuing of a protected resource is deferred until the task terminates or until the task issues an EXEC CICS SYNCPOINT command.

When a second phase PLTPI program is involved in rebuilding a protected resource during recovery, an enqueue occurs on each logical record. Because the dequeues are deferred, you should declare syncpoints throughout the recovery process to allow dequeues to occur. If you do not do this, dynamic storage fills up with the CICS control blocks that control the enqueue and dequeue processes. However, note that you must not issue a SYNCPOINT ROLLBACK command in a PLTPI program. Also, you should ensure that no other task is attached that could access the resource until the PLTPI program has completed its recovery work, because the second task would be able to gain control of the resource whenever the PLTPI program declared a syncpoint.

Shutdown programs

A controlled CICS shutdown has three quiesce stages. You can write programs to execute during the first two quiesce stages, but not during the third. Any program that is to execute during CICS shutdown must be defined in a program list table (PLT), and the PLT must be named on the program list table shutdown (PLTSD) system initialization parameter. You can override the PLTSD value by providing a PLT name on the CEMT PERFORM SHUTDOWN command, or on the EXEC CICS PERFORM SHUTDOWN command. If a PLTSD program abends, syncpoint rollback occurs.

PLT programs for first quiesce stage

Programs that are to execute during the first quiesce stage of CICS shutdown are specified in the first half of the PLT.

You must define first stage PLTSD programs to CICS. You can either define the programs statically, or use program autoinstall.

Although terminals are still available during the first quiesce stage, tasks that are started by terminal input are rejected unless they are named in a shutdown transaction list table (XLT), or are CICS-supplied transactions, such as CEMT, CSAC, CSTE, and CSNE, that are defined as SHUTDOWN(ENABLED) in the supplied definitions.

The first quiesce stage is complete when all of the first-stage PLT programs have executed, and when there are no user tasks in the system.

PLT programs for the second quiesce stage

Programs that are to execute during the second quiesce stage of CICS shutdown are specified in the second half of the PLT.

You do not have to define second stage PLTSD programs to CICS. If you do not, default definitions are installed automatically by CICS, as described for first phase PLTPI programs. If any of the default attributes are unsuitable, you must define the programs statically.

During the second quiesce stage, no new tasks can start, and no terminals are available. Because of this, second phase PLT programs must not cause other tasks to be started, and they cannot communicate with terminals. Further, second phase PLT programs must not cause any resource security checking to be performed.

If a transaction abend occurs while the PLTSD program is running, CICS is left in a permanent wait state. To avoid this happening, ensure that your PLTSD program handles **all** abend conditions.

The second quiesce stage is complete when all of the second phase PLT programs have been executed.

The sample shutdown program, DFH$SDAP

CICS provides a sample shutdown program, DFH$SDAP, for use during the first quiesce stage of shutdown.

DFH$SDAP's function is to prevent CICS from becoming suspended for long periods when doing a normal shutdown, because of long running tasks which have not completed. The program is in four phases. Each phase issues one of the following commands, with a delay between each one:

- FORCE
- FORCEPURGE
- VTAM FORCECLOSE
- SHUTDOWN IMMEDIATE.

Tasks which are purged during the first three of these instructions should be backed out. If the system is successfully terminated before the SHUTDOWN IMMEDIATE is issued, a warm keypoint is taken.

You may want to change the delay intervals to suit the level of activity in your system. For example, the VTAM FORCECLOSE command should be given sufficient time to work. If it is not, the warm keypoint is not taken.

The source code of the sample program is provided in assembler only. You must translate, assemble, and link-edit it. You must then use RDO to define and install DFH$SDAP and its associated transaction SDAP. You must define SDAP with the SHUTDOWN attribute specified as ENABLED. Finally, to cause DFH$SDAP to be invoked, put an entry in the first part of the PLT that is named on the PLTSD system initialization parameter.

General considerations

The comments in the remainder of the chapter apply to both initialization and shutdown programs.

- It is recommended that you terminate all PLT programs with an EXEC CICS RETURN command.
- PLT programs receive control in primary-space translation mode. They must return control to CICS in the same mode, and must restore any general purpose registers or access registers that they use.

Storage keys for PLT programs

You need to consider the following (whether or not you are running CICS with the storage protection facility):

- The execution key in which your PLT programs are invoked
- The storage key of data storage obtained for your PLT programs.

Execution key for PLT programs

CICS always gives control to PLT programs in CICS key. Even if you specify EXECKEY(USER) on the program resource definition, CICS forces CICS key when it passes control to any PLT programs invoked during initialization or shutdown. However, if a PLT-defined *shutdown* program itself passes control to another program (via a link or transfer-control command), the program thus invoked executes according to the execution key (EXECKEY) defined in its program resource definition.

Important

You are strongly recommended to specify EXECKEY(CICS) when defining both PLT programs and programs to which a PLT program passes control.

Data storage key for PLT programs

The storage key of storage used by PLT programs depends on how the storage is obtained:

- Any working storage requested by the PLT program is in the key set by the TASKDATAKEY of the transaction under which the PLT program is invoked. In the case of those PLT programs that run during initialization (PLTPI programs), the transaction is always an internal CICS transaction, in which case the TASKDATAKEY is always CICS. In the case of those programs that run during shutdown (PLTSD programs), it depends on the transaction you use to issue the shutdown command. If you issue a CEMT PERFORM SHUTDOWN command, the TASKDATAKEY is always CICS. If you run a user-defined transaction, to invoke a program that issues an EXEC CICS PERFORM SHUTDOWN command, the TASKDATAKEY can be either USER or CICS.
- PLT programs can use EXEC CICS commands to obtain storage by issuing:
  - Explicit EXEC CICS GETMAIN commands
  - Implicit storage requests as a result of EXEC CICS commands that use the SET option

  The default storage key for storage obtained by EXEC CICS commands is set by the TASKDATAKEY of the transaction under which the PLT program is invoked, exactly as described for working storage.

  As an example, consider a transaction defined with TASKDATAKEY(USER) that causes a PLT shutdown program to be invoked. In this case, any implicit or explicit storage acquired by the PLT program by means of an EXEC CICS command is, by default, in user-key storage. However, on an EXEC CICS GETMAIN command, the PLT program can override the TASKDATAKEY option by specifying either CICSDATAKEY or USERDATAKEY.

Part 3. Customizing with user-replaceable programs

Table 107. User-replaceable programs road map

If you want to...	**Refer to...**
Study guidelines that apply to all user-replaceable programs	Chapter 5, "General notes about user-replaceable programs" on page 347
Customize the supplied error-handling program for user programs	Chapter 6, "Writing a program error program" on page 351
Customize the supplied program that decides whether failed transactions should be restarted	Chapter 7, "Writing a transaction restart program" on page 355
Customize the supplied error-handling program for sequential terminal devices	Chapter 8, "Writing a terminal error program" on page 359
Customize the supplied error-handling program for VTAM terminals	Chapter 9, "Writing a node error program" on page 391
Customize the supplied program that controls the autoinstall of VTAM terminals	Chapter 10, "Writing a program to control autoinstall of terminals" on page 425
Customize the supplied program that controls the autoinstall of APPC connections	Chapter 11, "Writing a program to control autoinstall of APPC connections" on page 445
Customize the supplied program that controls the autoinstall of shipped terminals and connections	Chapter 12, "Writing a program to control autoinstall of shipped terminals" on page 453
Customize the supplied program that controls the autoinstall of programs, mapsets, and partitionsets	Chapter 13, "Writing a program to control autoinstall of programs" on page 461
Customize the supplied program that controls the routing of dynamic transactions	Chapter 14, "Writing a dynamic transaction routing program" on page 471
Customize the supplied journaling programs, DFHXJCO and DFHXJCCC	Chapter 15, "The user-replaceable journaling programs" on page 487

Chapter 5. General notes about user-replaceable programs

The comments in this chapter apply to all the user-replaceable programs described in Part 3 of this book.

A user-replaceable program is a CICS-supplied program that is always invoked at a particular point in CICS processing, as if it were part of the CICS code. You can modify the supplied program by including your own logic, or replace it with a version that you write yourself.

The chapter is divided into the following sections:

Rewriting user-replaceable programs

There are some general considerations that you must bear in mind when creating your own versions of user-replaceable programs:

- User-replaceable programs are all command-level programs (not user exits).
- With the exception of the journaling programs, DFHXJCO and DFHXJCC, which must be written in assembler language, you can code user-replaceable programs in any of the languages supported by CICS (that is, in assembler language, COBOL, PL/I, or C). An assembler-language version of each program is provided, in source form, in the VSE/ESA sublibrary PRD1.BASE. In addition, COBOL, PL/I, or C versions are provided for some programs. The relevant chapter lists the sample programs, copy books, and macros supplied in each case.
- You can trap an abend in a user-replaceable program by making the program issue an EXEC CICS HANDLE ABEND command. However, if no HANDLE ABEND is issued, CICS does not abend the task but returns control to the CICS module that called the program. The action taken by the CICS module depends on the user-replaceable program concerned.
- User-replaceable programs, and any programs invoked by user-replaceable programs, can be RMODE ANY but **must** be AMODE 31.
- You must ensure that user-replaceable programs are defined as local. User-replaceable programs cannot be run in a remote region. This applies to all user-replaceable programs, including the autoinstall control program and the dynamic transaction routing program.
- User-replaceable programs produce only system dumps when a program check occurs; they do not produce transaction dumps.
- You can use the CICS Execution Diagnostic Facility (EDF) to test user-replaceable programs. However, EDF does not work if the initial transaction is a CICS-supplied transaction.

Assembling and link-editing user-replaceable programs

The source for the CICS-supplied user-replaceable programs is installed in the VSE/ESA sublibrary PRD1.BASE. If you intend changing any of these programs, take a copy of the supplied source file and update the copy only. If the original production sublibrary is serviced, and a user-replaceable program is modified, you may like to reflect the changes in your own version of the code.

To replace one of these CICS-supplied programs, assemble and link-edit your version of the program. All programs are supplied as command-level programs, and must be translated before assembly and link-edit. Note that the translator options NOPROLOG and NOEPILOG should be coded with your versions of DFHZNEP and DFHTEP.

If you have user-written versions of DFHZNEP, DFHPEP, DFHTEP, DFHXJCO, or DFHXJCC from an earlier release of CICS, and they use macros, recode the programs to use EXEC CICS commands.

When link-editing a user-replaceable program, you must link-edit it with the EXEC interface module (stub). This stub enables the program to communicate with the EXEC interface program (DFHEIP). For more information about the EXEC interface stub, see the *CICS System Definition Guide*.

User-replaceable programs and the CICS storage protection facility

When you are running CICS with the storage protection facility, there are two points you need to consider:

- The execution key in which your user-replaceable programs run
- The storage key of data storage obtained for your user-replaceable programs

Execution key for user-replaceable programs

When you are running with storage protection active, CICS always gives control to user-replaceable programs in CICS key. Even if you specify EXECKEY(USER) on the program resource definition, CICS forces CICS key when it invokes the program. However, if a user-replaceable program itself passes control to another program, the program thus invoked executes according to the execution key (EXECKEY) defined in its program resource definition.

Important

You are strongly recommended to specify EXECKEY(CICS) when defining both user-replaceable programs and programs to which a user-replaceable program passes control.

Data storage key for user-replaceable programs

The storage key of storage used by user-replaceable programs depends on how the storage is obtained:

- The communication area passed to the user-replaceable program by its caller is always in CICS key.
- Any working storage obtained for the user-replaceable program is in the key set by the TASKDATAKEY of the transaction under which the program is invoked.
- User-replaceable programs can use EXEC CICS commands to obtain storage, by issuing:
  - Explicit EXEC CICS GETMAIN commands
  - Implicit storage requests as a result of EXEC CICS commands that use the SET option

  The default storage key for storage obtained by EXEC CICS commands is set by the TASKDATAKEY of the transaction under which the user program is invoked.

  As an example, consider a transaction defined with TASKDATAKEY(USER) that causes a user-replaceable program to be invoked. In this case, any implicit or explicit storage acquired by the user program by means of an EXEC CICS command is, by default, in user-key storage. However, on an EXEC CICS GETMAIN command, the user program can override the TASKDATAKEY option by specifying either CICSDATAKEY or USERDATAKEY.

Chapter 6. Writing a program error program

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, “General notes about user-replaceable programs” on page 347 apply to this chapter.

The CICS-supplied default program error program (DFHPEP) contains code to:

- Obtain program addressability
- Access the communication area
- Return control to DFHACP through an EXEC CICS RETURN command

The source of DFHPEP is provided in assembler-language and C versions; you can modify one of these to include your own logic, or you can write your own program error program in any of the languages supported by CICS. There is a discussion of the reasons for using your own program error program in the *CICS Recovery and Restart Guide*. Note, however, that when writing a program error program you are subject to specific restrictions:

- Your program must be named DFHPEP.
- It must not issue any EXEC CICS commands that make use of MRO or ISC facilities (such as distributed transaction processing or function shipping).
- It must not issue any commands that access recoverable resources.
- It cannot influence the taking of a transaction dump.

The default DFHPEP module is a dummy module. If you want to customize it, you have to code the source yourself. To help you, a listing of DFHPEP is provided in Figure 12 on page 353. When you have written your program error program, translate and assemble it, and use it to replace the supplied dummy program. For information about the job control statements necessary to assemble and link-edit user-replaceable programs, refer to “Assembling and link-editing user-replaceable programs” on page 348.

Information available to DFHPEP in the communication area includes:

- The current abend code, at PEP_COM_CURRENT_ABEND_CODE.
- The original abend code, at PEP_COM_ORIGINAL_ABEND_CODE. The “original” and “current” abend codes are different if the transaction has suffered more than one abend—for example, if the failing program abended while handling a previous abend. In this case, the “original” abend is the first abend that the transaction suffered.
- The EIB at the time of the last EXEC CICS command, at PEP_COM_USERS_EIB.
- The name of the program that suffered the (current) abend, at PEP_COM_ABPROGRAM. PEP_COM_ABPROGRAM identifies the program as follows:
  - If the abend occurred in a distributed program link (DPL) server program running in a remote system, it identifies the server program.

  - If the abend is a local ‘ASRA’, ‘ASRB’, or ‘ASRD’, it identifies the program in which the program check or operating system abend occurred.
  - In all other cases, it identifies the current PPT entry.

- The program status word (PSW) at the time of the (current) abend, at PEP_COM_PSW. The full contents of PEP_COM_PSW are significant for abend codes ‘ASRA’, ‘ASRB’, and ‘ASRD’ only; the last four characters (the PSW address) apply also to code ‘AICA’.
- The general purpose (GP) registers (0–15) at the time of the (current) abend, at PEP_COM_REGISTERS.
- The execution key of the program at the time it suffered the (current) abend, at PEP_COM_KEY. The value of PEP_COM_KEY is significant for abend codes ‘ASRA’ and ‘ASRB’ only.
- Whether the (current) abend occurred as the result of a storage protection exception, at PEP_COM_STORAGE_HIT. The value of PEP_COM_STORAGE_HIT is significant for abend code ‘ASRA’ only, and indicates which of the protected dynamic storage areas (the CDSA, ECDSA, or ERDSA), if any, the failing program attempted to overwrite.
- Program status word interrupt information, at PEP_COM_INT.

Note that information about the PSW, registers, execution key, and type of storage “hit” is meaningful only if the abend occurred in the local system; these fields are set to zeros if the abend occurred in a DPL server program running in a remote system.

In order to disable the transaction, you should assign the value ‘PEP_COM_RETURN_DISABLE’ to the field PEP_COM_RETURN_CODE. Otherwise, you should allow the field to default to zero, or set it to the value ‘PEP_COM_RETURN_OK’. DFHACP does not allow CICS-supplied transactions to be disabled; you should not, therefore, attempt to disable transactions whose IDs begin with “C”.

The sample programs and copy books

Two source-level versions of the default program are provided: DFHPEP, coded in assembler language, and DFHPEPD, coded in C. There is an assembler-language macro, DFHPCOM, and a corresponding C copy book, DFHPCOMD, that you can use to define the communication area. All samples are in the VSE/ESA sublibrary PRD1.BASE.

You can code your program error program in any of the languages supported by CICS, but you must always name it DFHPEP.

The assembler-language source code of the default program error program is shown in Figure 12 on page 353.

```
DFHEISTG DSECT ,
*
*        Insert your own storage definitions here
*
         DFHPCOM TYPE=DSECT        GENERATE DFHPEP_COMMAREA
**********************************************************************
* * * * *             P R O G R A M   E R R O R             * * * * *
* * * * *                   P R O G R A M                   * * * * *
**********************************************************************
DFHPEP   CSECT                     PROGRAM ERROR PROGRAM CSECT
DFHPEP   RMODE ANY
         DFHREGS ,                 EQUATE REGISTERS
         XR    R1,R1
         ICM   R1,B'0011',EIBCALEN Get Commarea length
         BZ    RETURNX             ...no Commarea; exit
         EXEC CICS ADDRESS COMMAREA(R2) ,
         USING DFHPEP_COMMAREA,R2
*
*        Insert your own code here
*
         LA    R1,PEP_COM_RETURN_OK
         B     RETURN
         DFHEJECT
*
RETURNER DS    0H                  Return for error cases
         LA    R1,PEP_COM_RETURN_DISABLE
RETURN   DS    0H
         ST    R1,PEP_COM_RETURN_CODE
RETURNX  DS    0H
         EXEC CICS RETURN ,
         END   DFHPEP
```

Figure 12. Source code of the default program error program (DFHPEP)

The assembler-language version of the DFHPEP communication area is shown in Figure 13.

```
DFHPEP_COMMAREA DSECT
*
*                      Standard header section
*
PEP_COM_STANDARD              DS     0F
PEP_COM_FUNCTION              DS     CL1       Always '1'
PEP_COM_COMPONENT             DS     CL2       Always 'PC'
PEP_COM_RESERVED              DS     C         Reserved
*
```

Figure 13 (Part 1 of 2). Source of DFHPEP communication area (assembler-language)

```
*                     Abend codes and EIB
*
PEP_COM_CURRENT_ABEND_CODE    DS     CL4       Current abend code
PEP_COM_ORIGINAL_ABEND_CODE   DS     CL4       Original abend code
PEP_COM_USERS_EIB             DS     CL(EIBRLDBK-EIBTIME+L'EIBRLDBK)
*                                       EIB at last EXEC CICS command
*
*  Debugging information (program, PSW, registers and execution key at
*  time of abend, hit storage indicator).  If the abend occurred in a
*  DPL server program running remotely, only program is meaningful.
*
PEP_COM_DEBUG                 DS     0F
PEP_COM_ABPROGRAM             DS     CL8       Program causing abend
PEP_COM_PSW                   DS     CL8       PSW at abend
*                                              (codes ASRA, ASRB, AICA, ASRD)
PEP_COM_REGISTERS             DS     CL64      GP registers at abend
*                                              (registers 0-15)
PEP_COM_KEY                   DS     X         Execution key at abend
*                                              in form X'0n'
*                                              (ASRA and ASRB only)

When applicable (ASRA or ASRB), PEP_COM_KEY will contain the
execution key at the time of abend.
PEP_COM_USER_KEY              EQU    9         User key
*
PEP_COM_STORAGE_HIT           DS     X         Storage type hit by
*                                              protection exception
*                                              (ASRA only)
PEP_COM_NO_HIT                EQU    0         No hit, or not
*                                              protection exception
PEP_COM_CDSA_HIT              EQU    1         CDSA hit
PEP_COM_ECDSA_HIT             EQU    2         ECDSA hit
PEP_COM_ERDSA_HIT             EQU    3         ERDSA hit
PEP_COM_RDSA_HIT              EQU    4         RDSA hit
PEP_COM_EUDSA_HIT             EQU    5         EUDSA hit
PEP_COM_UDSA_HIT              EQU    6         EUDSA hit
*
PEP_COM_SPACE                 DS     X         Reserved
PEP_COM_PADDING               DS     X         Reserved
*
*                     Return code
*
PEP_COM_RETURN_CODE           DS     F
*
PEP_COM_RETURN_OK             EQU    0
PEP_COM_RETURN_DISABLE        EQU    4         Disable transaction
*
*       Additional Program status word information
*
PEP_COM_INT                   DS     CL8       PSW interrupt codes
*
*                             length of DFHPEP_COMMAREA
*
PEP_COM_LEN EQU *-PEP_COM_STANDARD
```

Figure 13 (Part 2 of 2). Source of DFHPEP communication area (assembler-language)

Chapter 7. Writing a transaction restart program

The transaction restart user-replaceable program (DFHREST) enables you to participate in the decision as to whether a transaction should be restarted or not. The default program requests restart under certain conditions; for example, in the event of a program isolation deadlock (that is, when two tasks each wait for the other to release a particular DL/I database segment), one of the tasks is backed out and automatically restarted, and the other is allowed to complete its update.

For general information about restarting transactions, see the *CICS Recovery and Restart Guide*.

Notes:

1. CICS invokes DFHREST only when RESTART(YES) is specified in an RDO TRANSACTION resource definition.
2. When transaction restart occurs, a new task is attached that invokes the initial program of the transaction. This is true even if the task abended in the second or subsequent LUW, and DFHREST requested a restart.
3. Statistics on the total number of restarts against each transaction are kept.
4. Emergency restart does not restart any tasks.
5. Making a transaction restartable involves slightly more overhead than dynamic transaction backout because more items are logged; such items are logged only on the dynamic log.
6. In some cases, the benefits of transaction restart can be obtained instead by using the EXEC CICS SYNCPOINT ROLLBACK command. Although use of the SYNCPOINT ROLLBACK command is not usually recommended, it does keep all the executable code in the application programs (except for DFHDBP exit code). For more information about the use of the ROLLBACK option when working in an ISC or MRO environment, see the *CICS Intercommunication Guide*.

When planning to replace the default DFHREST, check to see if the logic of any of your transactions is inappropriate for restart.

- Transactions that execute as a single logical unit of work are safe. Those that execute a loop, and on each pass reading one record from a recoverable destination, updating other recoverable resources, and closing with a syncpoint, are also safe.
- There are two types of transaction that need to be modified to avoid erroneously repeating work done in the logical units of work that precede an abend:
  1. A transaction in which the first and subsequent logical units of work change different resources
  2. A transaction where the contents of the input data area are used in several logical units of work

All the following conditions must be true for CICS to invoke the transaction restart program:

- A transaction must be terminating abnormally.
- The transaction abend which caused the transaction to be terminating abnormally must have been detected before the commit point of the implicit syncpoint at the end of the transaction has been reached.
- The transaction must be defined as restartable in its transaction definition.
- The transaction must be related to a principal facility.

If these conditions are satisfied, CICS invokes the transaction restart program, which then decides whether or not to request that the transaction be restarted. CICS can subsequently override the decision (for example, if dynamic backout fails). Also, if the transaction restart program abends, the transaction is not restarted.

If the above conditions are not satisfied, CICS does not invoke the transaction restart program and the transaction is not restarted.

The DFHREST communications area

The CICS-supplied default transaction restart program is written in assembler and contains logic to:

- Address the communications area passed to it by CICS
- Decide whether or not to request transaction restart
- Send a message to CSMT if restart is requested
- Return control to CICS using the EXEC CICS RETURN command

The communications area is mapped by the `XMRS_COMMAREA` DSECT, which is supplied in the DFHXMRSD copybook. The equivalent structures for C, COBOL, and PL/1 are contained in the copybooks DFHXMRSH, DFHXMRSO, and DFHXMRSP, respectively.

The information passed in the communications area is as follows:

XMRS_FUNCTION
Indicates, in a 1-byte field, the function code for this call to the restart program. This is always set to 1, which equates to `XMRS_TRANSACTION_RESTART`, which means that DFHREST is called to handle transaction restart.

XMRS_COMPONENT_CODE
Indicates, in a 2-byte field, the component code of the caller. This is always set to XM, which equates to `XMRS_TRANSACTION_MANAGER`. The transaction manager is the CICS component that coordinates the decision whether or not to restart a transaction.

XMRS_READ
Indicates, in a 1-byte field, whether the transaction has issued any terminal read requests, other than for initial input.

The equated values for this parameter are:

XMRS_READ_YES
Means a terminal read has been performed by the transaction.

XMRS_READ_NO
Means no terminal read has been performed.

XMRS_WRITE
Indicates, in a 1-byte field, whether the transaction has issued any terminal write requests.

The equated values for this parameter are:

XMRS_WRITE_YES
Means a terminal write has been performed by the transaction.

XMRS_WRITE_NO
Means a terminal write has not been performed by the transaction.

XMRS_SYNCPOINT
Indicates, in a 1-byte field, whether the transaction has performed any syncpoints.

The equated values for this parameter are:

XMRS_SYNCPOINT_YES
Means one or more syncpoints have been performed.

XMRS_SYNCPOINT_NO
Means no syncpoints have been performed.

XMRS_RESTART_COUNT
This indicates, as an unsigned, half-word binary value, the number of times the transaction has been restarted.

It is zero if the transaction has not been restarted. It is **not** the total number of restarts for the transaction definition. Rather it is the total number of restarts for transactions that are attempting, for example, to process a single piece of operator input.

XMRS_ORIGINAL_ABEND_CODE
Provides the first abend code recorded by the transaction.

XMRS_CURRENT_ABEND_CODE
Provides the current abend code. The values of the original abend code and the current abend code can be different if, for example, a transaction handles an abend and then abends later.

XMRS_RESTART
This is a 1-byte output field that the transaction restart program sets to indicate whether it wants CICS to restart the transaction.

The equated values for this field are:

XMRS_RESTART_YES	Requests a restart.
XMRS_RESTART_NO	Requests no restart.

The CICS-supplied default transaction restart program requests that the transaction be restarted if:

1. The transaction has not performed a terminal read (other than reading the initial input data), terminal write or syncpoint, **and**
2. The restart count is less than 20 (to limit the number of restarts), **and**
3. The current abend code is ADLD, indicating that the transaction was abended due to a program isolation deadlock.

The source of the CICS-supplied default transaction restart program, DFHREST, is supplied in assembler language only. It and the assembler copybook for mapping the communications area are in the VSE/ESA sublibrary PRD1.BASE.

Chapter 8. Writing a terminal error program

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, "General notes about user-replaceable programs" on page 347 apply to this chapter.

This chapter contains information about the CICS terminal error program (TEP), which handles error conditions for devices that use the sequential access method. **Note that node error programs, not terminal error programs, must be used for VTAM-supported devices**. The chapter is divided into three sections:

1. **"Background to error handling for sequential devices"** is an overview.
2. **"The sample terminal error program"** on page 361 describes the CICS-supplied sample TEP. It contains:
   - "Components of the sample terminal error program" on page 362
   - "Structure of the sample terminal error program" on page 363
   - "Sample terminal error program messages" on page 367
   - "Generating the sample terminal error program" on page 368
3. **"User-written terminal error programs"** on page 381 discusses factors you need to consider when writing your own terminal error program. It contains:
   - "Why write your own terminal error program?" on page 382
   - "Restrictions on the use of EXEC CICS commands" on page 382
   - "Addressing the contents of the communication area" on page 382
   - "Addressing the contents of the TACLE" on page 384
   - "Example of a user-written terminal error program" on page 388

Background to error handling for sequential devices

CICS terminal error handling is based on the assumption that most users want to modify CICS operations in response to terminal errors. Because CICS cannot anticipate all possible courses of action, the error-handling facilities have been designed to allow maximum freedom for users to create unique solutions for errors that occur within a terminal network.

The following CICS components are involved in the detection and correction of errors that occur when sequential devices are used:

- Terminal control program (DFHTCP)
- Terminal abnormal condition program (DFHTACP)
- Terminal error program (DFHTEP)

These components are discussed in the following sections. (The corresponding CICS components for logical units are discussed in Chapter 9, "Writing a node error program" on page 391.)

When an abnormal condition occurs

When an abnormal condition associated with a particular terminal or line occurs, the terminal control program puts the terminal out of service and passes control to the terminal abnormal condition program (DFHTACP) which, in turn, passes control to a version of the terminal error program (DFHTEP, either CICS-supplied or user-written), so that it can take the appropriate action.

Terminal control program

When the terminal from which the error was detected has been put out of service, the terminal control program creates a terminal abnormal condition line entry (TACLE), which is chained off the real entry, the terminal control table line entry (TCTLE) for the line on which the error occurred. The TACLE contains information about the error.

Terminal abnormal condition program

After the TACLE has been established, a task that executes DFHTACP is attached by the terminal control program and is provided with a pointer to the real line entry (TCTLE) on which the error occurred. After performing basic error analysis and establishing the default actions to be taken, DFHTACP gives control to DFHTEP, and passes a communication area (DFHTEPCA) so that DFHTEP can examine the error and provide an alternative course of action.

The communication area provides access to all the error information necessary for correct evaluation of the error; and contains special action flags that can be manipulated to alter the default actions previously set by DFHTACP.

After DFHTEP has performed the desired function, it returns control to DFHTACP by issuing an EXEC CICS RETURN command. DFHTACP then performs the actions dictated by the action flags within the communication area, and the error-handling task terminates.

Notes:

1. DFHTACP default actions, message codes, error codes, and conditions are listed in the *CICS Problem Determination Guide*.
2. If DFHTACP has more than eight errors on a line before action can be taken, the line is put out of service to avoid system degradation.

Terminal error program

The terminal error program analyzes the cause of the terminal or line error that has been detected by the terminal control program. The CICS-supplied version (the sample terminal error program, DFHXTEP) is designed to attempt basic and generalized recovery actions. A user-written version of this program can be provided to handle specific application-dependent recovery actions. The user-written terminal error program is linked-to in the same way as the CICS-supplied version, by the terminal abnormal condition program. Information relating to the error is carried in the communication area and the TACLE.

The macros that are provided for generating the sample terminal error program are described in the sections that follow. The main steps are generating the sample DFHTEP module and tables by means of the DFHTEPM and DFHTEPT macros, respectively. You can select the appropriate options in this sample program, and you can base your own version on it.

There is a description of the CICS-supplied sample terminal error program (DFHXTEP), and advice about how to generate a user-written version, later in this chapter.

Note: If DFHTEP abends, then the default actions specified in DFHTACP are reinstated.

The communication area

The communication area is the basic interface used by the sample DFHTEP, and should be used by a user-written DFHTEP to:

- Address the TACLE
- Indicate the course of action to be taken on return to DFHTACP

Before giving control to DFHTEP, DFHTACP establishes which default actions should be taken. This depends on the particular error condition that has been detected. The default actions are indicated by appropriate bit settings in the 1-byte communication area field TEPCAACT. For details about communication area fields, default actions, and bit settings, refer to “User-written terminal error programs” on page 381.

Terminal abnormal condition line entry (TACLE)

The TACLE contains further information about the type of error, and about the type of terminal that is in error.

The code indicating the detected error condition is passed to DFHTEP in the 1-byte field of the TACLE labeled TCTLEPFL. (These DFHTACP error codes, message codes, conditions, and default actions are also listed in the *CICS Problem Determination Guide*.)

A format description of the terminal abnormal condition line entry (TACLE) DSECT is provided under “User-written terminal error programs” on page 381.

The sample terminal error program

CICS provides a sample terminal error program that can be used as a generalized program structure for handling terminal errors. Note that, although the source code form of the sample TEP (DFHXTEP) is provided in assembler language only, you can write your own terminal error program in any of the languages supported by CICS.

After DFHXTEP has been assembled, it is link-edited as DFHTEP. For information about the job control statements necessary to assemble and link-edit user-replaceable programs, refer to “Assembling and link-editing user-replaceable programs” on page 348.

You can generate and use the sample terminal error program with the default options provided, or you can customize the terminal error support to the needs of the operating environment by selecting the appropriate generation options and variables. Because each error condition is processed by a separate routine, you can replace a CICS-provided routine with a user-written one when the sample TEP is generated.

Components of the sample terminal error program

The sample terminal error program consists of the terminal error program itself and two terminal error program tables:

- The TEP error table
- The TEP default table

Both tables contain “thresholds” defined for the various error conditions to be controlled and accounted for by the sample DFHTEP. A “threshold” may be thought of as the number of error occurrences that are permitted for a given type of error on a given terminal before the sample DFHTEP accepts the DFHTACP default actions. Optionally, the number of occurrences can be controlled and accounted for over prescribed time intervals (for example, if more than three of a given type of error occur in an hour, the terminal is put out of service).

TEP error table

The terminal error program (TEP) error table maintains information about errors that have occurred on a terminal. The table consists of two parts (shown in Figure 14):

- The TEP error table header (TETH), which contains addresses and constants related to the location and size of the TEP error table components
- Terminal error blocks (TEBs), which can be either:
  - Permanent (P-TEBs), each associated with a particular terminal
  - Reusable (R-TEBs), not permanently associated with any particular terminal

TEP error table header (TETH)
Terminal error blocks (P–TEBs and R–TEBs)

Figure 14. TEP error table

TEBs maintain error information associated with terminals. You must specify the total number of TEBs to be generated. The maximum number needed is one per terminal. In this case the TEBs are permanent.

You can reduce the total amount of storage used for TEBs by allocating a pool of reusable TEBs, that are not permanently associated with a particular terminal. Reusable TEBs are assigned dynamically on the first occurrence of an error associated with a terminal, and are released for reuse when the appropriate error processor places the terminal out of service.

Note: It is your responsibility to ensure that the pool is large enough to hold the maximum number of terminals for which errors are expected to be outstanding at any one time. If the pool limit is exceeded, handling of terminal errors may become intermittent. **No warning is given of this condition**.

You should assign permanent TEBs to terminals that are critical to the network. For the remainder of the network, you can generate a pool of reusable TEBs.

Each TEB currently in use or permanently assigned contains the symbolic terminal identifier of the terminal, and one or more error status elements (ESEs), as shown in Figure 15.

```
┌────────────────────────────────────────────┐
│            SYMBOLIC TERMINAL ID            │
│                                            │
│            ERROR STATUS ELEMENT            │
.                     .                      .
.                     .                      .
.                     .                      .
│                                            │
│            COMMON ERROR BUCKET             │
│                                            │
└────────────────────────────────────────────┘
```

Figure 15. Terminal error block (TEB)

An ESE records the occurrence of a particular type of error associated with the terminal. The contents of an error status element are described in the TEPCD DSECT (generated by the DFHTEPM TYPE=INITIAL macro) under the comment “ERROR STATUS ELEMENT FORMAT”. The number of ESEs per TEB remains constant for all TEBs. You specify the number when the TEP tables are generated. If fewer than the maximum number of error types recognized by DFHTACP (25) are specified, one additional ESE, referred to as the “common error bucket”, is generated for each TEB.

You can permanently reserve ESE space in each TEB for specific error types. Those not permanently reserved are considered reusable, and are assigned dynamically on the first occurrence of a particular error type associated with the terminal. If an error type occurs that is not currently represented by an ESE, and if all reusable ESEs are assigned to other error types, the occurrence of this error is recorded in the common error bucket. DFHTACP can recognize far more error types than can occur in a typical terminal network. By specifying less than the maximum and allowing the sample DFHTEP to assign ESEs dynamically, you can minimize the table size, and still control and account for the types of errors relevant to the network.

TEP default table

The terminal error program (TEP) default table contains the “number and time” thresholds for each type of error to be controlled and accounted for. An index array at the beginning of the default table serves a dual function. If the value in the index is positive, then the error code has a permanently defined ESE in each TEB and the index value is the displacement to the reserved ESE. If the index value is negative, then an ESE must be assigned dynamically from a reusable ESE if one has not already been created by a prior occurrence. The complement of the negative index value is the displacement to the thresholds for the error type retained in the TEP default table.

Structure of the sample terminal error program

The structure of the sample terminal error program (DFHXTEP) can be broken down into six major areas as follows:

1. Entry and initialization
2. Terminal identification and error code lookup
3. Error processor selection
4. Error processing execution

5. General exit
6. Common subroutines

These areas are described in detail in the sections that follow.

Figure 16 on page 366 gives an overview of the structure of the sample terminal error program.

Entry and initialization

On entry, the sample TEP uses DFHEIENT to establish base registers and addressability to EXEC Interface components. It obtains addressability to the communication area passed by DFHTACP by means of an EXEC CICS ADDRESS COMMAREA, and addressability to the EXEC interface block with an EXEC CICS ADDRESS EIB command. It gets the address of the TACLE from the communication area, and establishes access to the TEP tables with an EXEC CICS LOAD. If time support has been generated, the error is time-stamped for subsequent processing. (Current time of day is passed in the communication area.) The first entry into the sample TEP after the system is initialized causes the TEP tables to be initialized.

Terminal ID and error code lookup

After the general entry processing, the TEP error table is scanned for a terminal error block (TEB) entry for the terminal associated with the error. If no matching entry is found, a new TEB is created. If all TEBs are currently in use (if no reusable TEBs are available), the processing is terminated and a RETURN request is issued, giving control back to DFHTACP, where default actions are taken.

After the terminal's TEB has been located or created, a similar scan is made of the error status elements (ESEs) in the TEB to determine whether the type of error currently being processed has occurred before, or if it has permanently reserved ESE space. If an associated ESE is not found, an ESE is assigned for the error type from a reusable ESE. If a reusable ESE does not exist, the error is accounted for in the terminal's common error bucket. The addresses of the appropriate control areas (TEB and ESE) are placed in registers for use by the appropriate error processor.

Error processor selection

User-specified message options are selected and the messages are written to a specified transient data destination. The type of error code is used as an index to a table to determine the address of an error processor to handle this type of error. If the error code is invalid, or the sample TEP was not generated to process this type of error, the address points to a routine that optionally generates an error message and returns control to DFHTACP, where default actions are taken. If an address of a valid error processor is obtained from the table, control is passed to that routine.

Error processing execution

The function of each error processor is to determine whether the default actions established by DFHTACP for a given error, or the actions established by the error processor, are to be performed. The common error bucket is processed by the specific error processor. However, the thresholds of the common error bucket are used in determining whether the limit has been reached. Subroutines are provided in the sample TEP to maintain count and time threshold totals for each error associated with a particular terminal to assist the error processor to make its decision. Also available are subroutines for logging the status of the error and any recovery action taken by the error processor.

You can replace any of the error processors supplied in the sample TEP with user-written ones. Register linkage conventions, error conditions, DFHTACP default actions, and sample TEP error processor actions are described in comments given in the sample DFHXTEP source listing. However, sample DFHXTEP actions, in many cases, can be altered by changing the thresholds when generating the TEP tables.

General exit

Control is passed to a general exit routine from each error processor. This routine determines whether the terminal is to remain in service. If the terminal is to be put out of service, the terminal error block and all error status elements for that terminal are deleted from the TEP error table unless the terminal was defined as a permanent entry. When the terminal is placed back in service, a new terminal error block is assigned if a subsequent error occurs.

Common subroutines

A number of subroutines are provided in the sample DFHXTEP for use by the error processors. Each subroutine entry has a label of the form “TEPxxxxx” where “xxxxx” is the subroutine name. All labels within a subroutine start with TEPx where “x” is the first character of the subroutine name. All subroutines are arranged within the module in alphabetical order in the subroutine section. Register conventions and use of the subroutine are given as comments at the beginning of each subroutine in the source listing.

The following subroutines are available for writing your own error processors:

TEPACT
Used to output the names of the action bits set by DFHTACP and the sample DFHTEP in the communication area field **TEPCAACT** if appropriate PRINT options are selected when the program is generated.

TEPDEL
Used to delete the terminal error block and error status elements for a terminal from the TEP error table on exit from an error processor.

TEPHEXCN
Used by TEPPUTTD to convert a 4-bit hexadecimal value to its 8-bit printable equivalent.

TEPINCR
Used to update and test the count and time threshold totals maintained in the terminal’s error status element.

TEPLOC
Used to locate or assign terminal error blocks and error status elements for a terminal ID.

TEPPUTTD
Used to output character or hexadecimal data to a user-defined transient data destination.

TEPTMCHK
Used by TEPINCR to determine whether the time threshold has been passed.

TEPWGHT
Used to update the weight/time threshold values maintained in the terminal's error status elements.

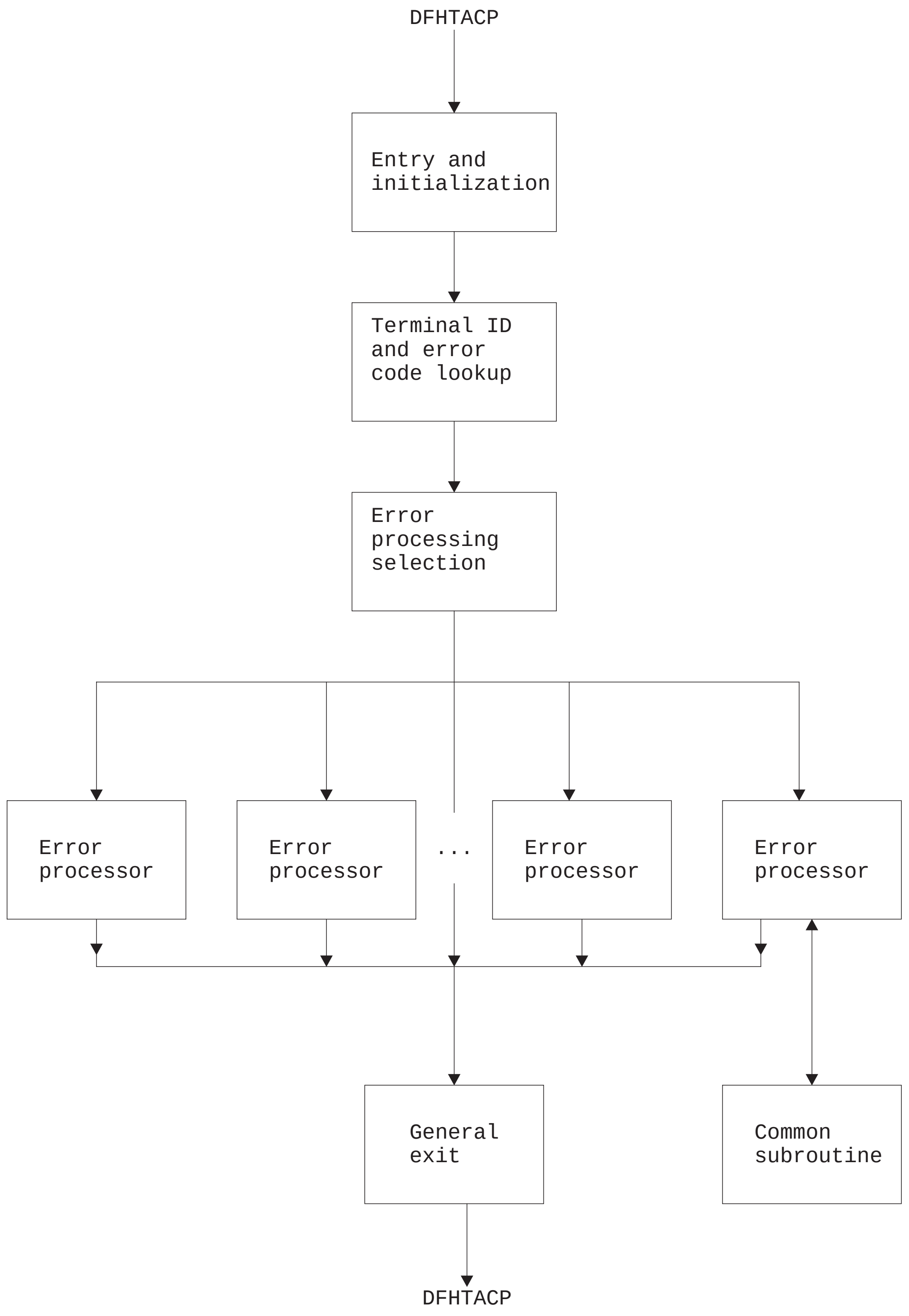


Figure 16. Overview of the sample terminal error program (DFHXTEP)

Sample terminal error program messages

The messages logged to the transient data destination CSMT (or, optionally, to the destination specified in the OPTIONS operand of DFHTEPM TYPE=INITIAL) are of six types, each identified by a unique message prefix. You can control the selection of each type of message by using the appropriate parameters specified on the PRINT operand of DFHTEPM TYPE=INITIAL.

These messages are:

DFHTEP, ERROR – error text

During DFHTEP module generation, the PRINT parameter specified ERRORS. This message can be suppressed by using the NOERRORS option. The error text is one of the following:

Unsupported error code, “xx”

The error code presented to DFHTEP by DFHTACP is unknown to DFHTEP.

“DFHTEPT” not defined in system

The DFHTEP table could not be loaded into storage.

Unknown error status message, “xxxx”

The error status message presented from a remote 3270 type device could not be decoded.

None of these errors should occur.

DFHTEP, ACTION – action flag names

During DFHTEP module generation, the PRINT parameter specified TACPACTION or TEPACTION or both. If both are specified, this message is logged twice each time DFHTEP is called. The first message indicates the action flags as set by DFHTACP on entry to DFHTEP. The second message indicates the action flags as returned to DFHTACP by DFHTEP after error processing. These messages can be suppressed by using the NOTACPACTION and NOTEPACTION options.

The action flag names and descriptions are listed below. For further information about the actions taken by DFHTACP, see the description of the TEPCAACT field in “Addressing the contents of the communication area” on page 382.

Flag name	Description
LINEOS	Place line out of service.
NONPRGT	Nonpurgeable task exists on terminal.
TERMOS	Place terminal out of service.
ABENDT	Abend task on terminal.
ABORTWR	Abort write, free terminal storage.
SIGNOFF	Sign off terminal.

DFHTEP, TID – tid

During the DFHTEP module generation, the PRINT parameter specified TID. This message contains the symbolic terminal ID of the device associated with the error. This message can be suppressed by using the NOTID option.

DFHTEP, DECB – DECB information

During the DFHTEP module generation, the PRINT parameter specified DECB. This two-line message contains the DECB (printed in hexadecimal format) of the terminal causing the error. The DECB is contained in the TACLE (displacement +16 [decimal]). See the TACLE DSECT described in “User-written terminal error programs” on page 381. This message can be suppressed by using the NODECB option.

DFHTEP, TACLE – TACLE information
During the DFHTEP module generation, the PRINT parameter specified TACLE. This message (printed in hexadecimal format) contains the first 16 bytes of the TACLE passed to DFHTEP by DFHTACP. See the TACLE DSECT described in “User-written terminal error programs” on page 381. This message can be suppressed by using the NOTACLE option.

DFHTEP, ESE – ESE information
During the DFHTEP module generation, the PRINT parameter specified ESE. This message contains the error status element. The message can be suppressed by using the NOESE option.

An ESE is either 6 bytes or 12 bytes long, depending on whether the TIME option was specified when generating the TEP tables. The formats are as follows:

Table 108. Format of error status element on DFHTEP, ESE messages—NOTIME specified

NOTIME	Display	Length (bytes)	Significance
	0	2	Error threshold counter or weight value in binary format
	2	2	Current error count or weight value in binary
	4	1	Error code
	5	1	Not used

Table 109. Format of error status element on DFHTEP, ESE messages—TIME specified

TIME	Display	Length (bytes)	Significance
	0	5	Error threshold counter or weight value in binary format
	5	3	Timed threshold value in hundredths of a second
	8	4	Time of first occurrence of this error. Time given as binary integer in hundredths of a second

Generating the sample terminal error program

For information about how to generate the sample terminal error program and the sample terminal error table, refer to “Assembling and link-editing user-replaceable programs” on page 348.

The sample program and tables provide you with default error processing for terminal errors. If you want to replace the supplied error processors with user-written error processors, you must use the DFHTEPM and DFHTEPT macros to generate a sample error program and tables that include your user-written routines. Some of the parameters specified in the DFHTEPM and DFHTEPT macros are related and care must be taken to ensure compatibility. The parameters concerned are identified in the descriptions of the macros later in this chapter.

If you use the sample terminal error program (DFHXTEP), you can generate the required program and transaction definitions by using the CEDA INSTALL GROUP(DFHSTAND) command.

Generating the sample terminal error program

The generation of the sample terminal error program consists of two separate assembly and link-edit steps, one to create the sample TEP module itself, and the other to create the TEP tables. The names under which the components must be link-edited are:

DFHTEP	Sample TEP module, assembled from DFHXTEP.
DFHTEPT	Sample TEPT table, assembled from DFHXTEPT.

For information about the job control statements necessary to assemble and link-edit user-replaceable programs, refer to “Assembling and link-editing user-replaceable programs” on page 348.

DFHTEPM–generating the sample DFHTEP module

The sample DFHTEP module is generated by the following macros:

- DFHTEPM TYPE=USTOR—to indicate the start of user storage definitions.
- DFHTEPM TYPE=USTOREND—to indicate the end of user storage definitions.
- DFHTEPM TYPE=INITIAL—to control the printing of CICS DSECTs, provide optional routines, and indicate the type of information to be logged when errors occur.
- DFHTEPM TYPE=ENTRY—to code a user “ENTRY” routine.
- DFHTEPM TYPE=EXIT—to code a user “EXIT” routine.
- DFHTEPM TYPE=ERRPROC—to allow you to replace the error processors supplied with the sample terminal error program with user-written versions.
- DFHTEPM TYPE=FINAL—to indicate the end of the sample DFHTEP module.

Note: You must code the translator options NOPROLOG and NOEPILOG in your error processors if you use these macros.

```
DFHTEPM  TYPE=USTOR
```

This macro indicates the start of user storage definitions. It must be followed by your storage definitions, and then by DFHTEPM TYPE=USTOREND. If you use DFHTEPM TYPE=USTOR to define storage, then both it and DFHTEPM TYPE=USTOREND must be coded **before** DFHTEPM TYPE=INITIAL.

```
DFHTEPM  TYPE=USTOREND
```

This macro indicates the end of user storage definitions. Its use is mandatory if DFHTEPM TYPE=USTOR has been coded. If you use DFHTEPM TYPE=USTOR to define storage, then both it and DFHTEPM TYPE=USTOREND must be coded **before** DFHTEPM TYPE=INITIAL.

```
DFHTEPM  TYPE=INITIAL
         [,DSECTPR={YES|NO}]
         [,OPTIONS=([TD|(TD,destid)|NOTD]
                    [,EXITS|,NOEXITS]
                    [,TIME|,NOTIME]
         [,PRINT=([ERRORS|NOERRORS]
                    [,TACPACTION|,NOTACPACTION]
                    [,TEPACTION|,NOTEPACTION]
                    [,TID|,NOTID]
                    [,DECB|,NODECB]
                    [,TACLE|,NOTACLE]
                    [,ESE|,NOESE]))]
```

TYPE=INITIAL
establishes the beginning of the generation of the sample DFHTEP module itself.

DSECTPR={YES|NO}
controls the printing of CICS DSECTs on the sample DFHTEP assembly listing. Its purpose is to reduce the size of the listing. The default is DSECTPR=YES.

YES
Printing of the DSECTs is allowed.

NO
Printing of selected CICS DSECTs is suppressed.

OPTIONS=optional-routines
includes or excludes optional routines in the DFHTEP module. The parentheses are required even when only one option is specified. If this operand is omitted, all default options are generated.

TD|(TD, destid)|NOTD
specifies whether information regarding the errors is to be written to a transient data destination.

TD
The transient data output routine is to be generated. The implied transient data destination is CSMT.

(TD, destid)
The transient data output routine is to be generated. The messages are sent to the destination specified by “destid”, which must be defined in the destination control table.

NOTD
No messages are to be written to a transient data destination.

EXITS|NOEXITS
specifies whether “ENTRY” and “EXIT” user routine support is to be included.

EXITS
Branches are taken to ENTRY and EXIT routines before and after error processing. Dummy routines are provided if user routines are not used.

NOEXITS
No branches are taken to user routines.

TIME|NOTIME
specifies whether threshold tests are to be controlled over prescribed time intervals. An example might be putting a terminal out of service if more than three instances of a given type of error occur in one hour. The parameter must be the same as the OPTIONS operand in the DFHTEPT TYPE=INITIAL macro.

TIME
This type of threshold testing is supported.

NOTIME
This type of threshold testing is not supported.

PRINT=print-information
specifies which types of information are to be logged to the transient data destination each time an error occurs. If NOTD is specified on the OPTIONS operand, all PRINT parameters default to NO. All PRINT parameters require the transient data output routine. The parentheses are required even when only one parameter is specified.

ERRORS|NOERRORS
specifies whether unprocessable conditions detected by the sample DFHTEP are to be recorded on the transient data destination.

ERRORS
Error messages are to be logged.

NOERRORS
No error messages are to be logged.

TACPACTION|NOTACPACTION
specifies whether DFHTACP default actions are to be recorded on the transient data destination.

TACPACTION
The default actions are logged.

NOTACPACTION
No default actions are logged.

TEPACTION|NOTEPACTION
specifies whether the actions selected as a result of sample DFHTEP processing are to be recorded on the transient data destination.

TEPACTION
The final actions are logged.

NOTEPACTION
No final actions are logged.

TID|NOTID
specifies whether the symbolic terminal ID of the terminal associated with an error is to be recorded on the transient data destination.

TID
The terminal ID is to be logged.

NOTID
No terminal IDs are to be logged.

DECB|NODECB
specifies whether the DECB of the line associated with error is to be recorded on the transient data destination.

DECB
The DECB is logged. The hexadecimal representation of the DECB is logged as two 24-byte messages.

NODECB
No DECB logging occurs.

TACLE|NOTACLE
specifies whether the TACLE prefix is to be recorded on the transient data destination.

TACLE
The 16-byte TACLE prefix as received from DFHTACP is logged.

NOTACLE
No TACLE prefix logging occurs.

ESE|NOESE
specifies whether the ESE associated with the error is to be recorded on the transient data destination.

ESE
The ESE, after being updated, and before being deleted (if the action puts the terminal out of service) is logged.

NOESE
No ESE logging occurs.

DFHTEPM TYPE=ENTRY and EXIT–for user entry and exit routines

The sample DFHTEP provides guidance about how to prepare error processor routines, particularly with regard to register and subroutine linkage conventions. The routines must also observe the following restrictions:

- The error processor must be coded in assembler language.
- The first executable statement in the routine must be labeled TEPCDxx, where “xx” is the error code specified in the DFHTEPM TYPE=ERRPROC,CODE=errcode macro, which follows.
- Register usage conventions and restrictions are stated in the sample DFHTEP source.
- The error processor must exit to the sample DFHTEP symbolic label TEPRET.

The macro required for a user “ENTRY” routine is:

```
DFHTEPM  TYPE=ENTRY
```

This macro must be immediately followed by user “ENTRY” routine code, starting with the label “TEPENTRY” and ending with a BR 14 instruction.

The macro required for a user “EXIT” routine is:

```
DFHTEPM  TYPE=EXIT
```

This macro must be immediately followed by user “EXIT” routine code, starting with the label “TEPEXIT” and ending with a BR 14 instruction.

DFHTEPM TYPE=ERRPROC–replacing error processors

The macro necessary to replace error processors supplied with the sample DFHTEP with user-written error processors is:

```
DFHTEPM  TYPE=ERRPROC
         ,CODE=errcode
         (followed by the appropriate error
          processor source statements)
```

TYPE=ERRPROC
indicates that a CICS-supplied error processor routine is to be replaced with the user-written error processor that immediately follows the macro. This macro is optional; if used, it must follow the DFHTEPM TYPE=INITIAL macro. One DFHTEPM TYPE=ERRPROC macro must precede each user-written error processor source routine.

CODE=errcode
is used to identify the error code assigned to the appropriate error condition. These codes are listed in Figure 20 on page 386.

DFHTEPM TYPE=FINAL–ending the sample DFHTEP module

The macro to terminate the sample DFHTEP module is:

```
DFHTEPM  TYPE=FINAL
```

This is followed by an END DFHTEPNA statement.

DFHTEPM macro examples

1. The following is an example of the minimum number of statements required to generate a sample DFHTEP module:

   ```
   DFHTEPM    TYPE=INITIAL
   DFHTEPM    TYPE=FINAL
   END DFHTEPNA
   ```

   This example generates a sample DFHTEP module with CICS-supplied error processors and all default options. This is equivalent to the CICS-supplied sample terminal error program, DFHXTEP.

2. Figure 17 on page 375 is an example of a more tailored sample DFHTEP module. In this example, all default types of information except for TACP and TEP actions are to be logged to the TEPQ transient data destination. The CICS DSECTs are not printed on the sample DFHTEP assembler-language listing. There are two error processor routines (codes ‘04’ and ‘81’ respectively).

```
* GENERATE USER STORAGE

   DFHTEPM     TYPE=USTOR
USORFLD    DS  F
   DFHTEPM     TYPE=USTOREND

* MODULE SPECIFICATIONS

   DFHTEPM     TYPE=INITIAL,                           *
               OPTIONS=((TD,TEPQ),EXITS),              *
               PRINT=(NOTEPACTION,NOTACPACTION),       *
               DSECTPR=NO

* USER-SUPPLIED ERROR PROCESSORS

   DFHTEPM     TYPE=ERRPROC,CODE=04
TEPCD81    DS  0H
           -
           -   error processor "04" source statements
           -
           B   TEPRET

   DFHTEPM     TYPE=ERRPROC,CODE=81
TEPCD9C    DS  0H
           -
           -   error processor "81" source statements
           -
           B   TEPRET

* USER "EXIT" EXIT CODE

   DFHTEPM     TYPE=EXIT
TEPEXIT    DS  0H
           -
           -
Additional user source statements to be executed after
error processing:
           -
           -
           BR  R14

* CONCLUDE MODULE GENERATION

   DFHTEPM     TYPE=FINAL
   END DFHTEPNA
```

Figure 17. Example of DFHTEPM macros used to generate a sample DFHTEP module

DFHTEPT–generating the sample DFHTEP tables

The following macros are required to generate the terminal error program tables:

- DFHTEPT TYPE=INITIAL—to establish the control section.
- DFHTEPT TYPE=PERMTID—to define permanently reserved terminal error blocks (TEBs) for specific terminals.
- DFHTEPT TYPE=PERMCODE|ERRCODE—to define permanently reserved error status elements (ESEs).
- DFHTEPT TYPE=BUCKET—to define specific error conditions to be accounted for in the common error bucket.
- DFHTEPT TYPE=FINAL—to end the set of DFHTEPT macros.

DFHTEPT TYPE=INITIAL–establishing the control section

The DFHTEPT TYPE=INITIAL macro necessary to establish the control section for the TEP tables is:

```
DFHTEPT  TYPE=INITIAL
         ,MAXTIDS=number
         [,MAXERRS={25|number}]
         [,OPTIONS={TIME|NOTIME}]
```

TYPE=INITIAL
establishes the beginning of the generation of the TEP tables.

MAXTIDS=number
specifies the total number of permanent and reusable terminal error blocks to be generated in the TEP error table. Permanent entries are defined by the DFHTEPT TYPE=PERMTID macro described later in this section. Any entries not defined as permanent are reused when the terminal is taken out of service, or are deleted at the request of an error processor. If an error occurs, and no TEB space is available, the error is not processed, and DFHTACP default actions are taken. The minimum number of blocks is 1. A maximum number is not checked for but should be no greater than the number of terminals in your network.

MAXERRS=25|number
specifies the number of errors to be recorded for each terminal. This value determines the number of permanent and reusable error status elements in each TEB. The maximum number that can be specified is 25 (the default value). If more are requested, only the maximum are generated. If fewer are requested, one extra ESE is generated for each TEB. The extra ESE is the common error bucket. Permanently reserved ESEs are defined by the DFHTEPT TYPE=PERMCODE macro described later in this section. Any ESEs not defined as permanent are dynamically assigned on the first occurrence of a nonpermanent error type associated with the terminal. By defining a number less than the maximum, and allowing the sample DFHTEP to assign ESEs dynamically, you can minimize the size of the table and still control and account for the error types relevant to the network. The minimum number that can be specified is zero. In this case only a common error bucket is generated.

OPTIONS={TIME|NOTIME}
specifies whether time threshold space is to be reserved in support of the TIME option specified in the DFHTEPM TYPE=INITIAL macro. The default is OPTIONS=TIME.

TIME
Time threshold space is reserved.

NOTIME
Time threshold space is not reserved.

DFHTEPT TYPE=PERMTID–assigning permanent terminal error blocks

The DFHTEPT TYPE=PERMTID macro to define permanently reserved terminal error blocks for specific terminals is:

```
DFHTEPT  TYPE=PERMTID
        ,TRMIDNT=name
```

TYPE=PERMTID
defines permanently reserved terminal error blocks for specific terminals. Permanent TEBs are defined for terminals that are critical to system operation to ensure that error processors are always executed in the event of errors associated with that terminal. If no permanent TEBs are to be defined, this macro is not required. A separate macro must be issued for each permanently reserved TEB. The maximum number of permanent TEBs is the number specified in the MAXTIDS operand of the DFHTEPT TYPE=INITIAL macro.

TRMIDNT=name
is used to provide the symbolic terminal ID (1–4 characters) for a permanently defined TEB. Only one terminal can be specified in each macro.

DFHTEPT TYPE=PERMCODE|ERRCODE–defining error status elements

The DFHTEPT TYPE=PERMCODE|ERRCODE macro is used to change the default threshold constants of the sample DFHTEP, and to define permanently reserved error status elements:

```
DFHTEPT  TYPE={PERMCODE|ERRCODE}
        ,CODE={errcode|BUCKET}
        [,COUNT=number]
        [,TIME=(number[,SEC|,MIN|,HRS])]
```

TYPE={PERMCODE|ERRCODE}
identifies whether the error code specified in the macro is to have a permanently reserved or a dynamically assigned ESE. These macros are required only if permanently reserved ESEs are to be defined, or if the sample DFHTEP default threshold constants are to be overridden. These are listed in Table 110 on page 379.

PERMCODE
Identifies the error code specified as having a permanently reserved ESE. Each permanently reserved ESE must be identified by a separate DFHTEPT TYPE=PERMCODE macro. All DFHTEPT TYPE=PERMCODE macros must precede all DFHTEPT TYPE=ERRCODE macros.

ERRCODE
Indicates that the error code specified does not require a permanently reserved ESE, but that the sample DFHTEP default threshold constants are to be changed. Each error code requiring a threshold constant change, other than those defined as permanently reserved, must be identified by a separate DFHTEPT TYPE=ERRCODE macro. All DFHTEPT TYPE=ERRCODE macros must follow all DFHTEPT TYPE=PERMCODE macros.

CODE={errcode|BUCKET}
identifies the error code referred to by the TYPE=PERMCODE|ERRCODE parameter. These codes are listed in Figure 20 on page 386. CODE=BUCKET is only applicable to the DFHTEPT TYPE=ERRCODE macro. It is used to override the default threshold constants established for the common error bucket.

COUNT=number
can be used in either the DFHTEPT TYPE=PERMCODE or TYPE=ERRCODE macro to override the sample DFHTEP default count threshold (see Table 110 on page 379). When the number of occurrences of the error type specified reaches the threshold, an error processor normally takes a logic path that causes DFHTACP default actions to be taken. If the number of occurrences is less than the threshold, the error processor normally takes a logic path that overrides the DFHTACP default actions. The updating and testing of the current threshold counts are normally performed by a DFHTEP subroutine that sets a condition code that the error processor can test to determine whether the limit has been reached. **If you specify 0 as the number in the COUNT operand, you are not told when the threshold is reached**.

TIME=(number[,SEC|,MIN|,HRS])
can be used in either the DFHTEPT TYPE=PERMCODE or TYPE=ERRCODE macros to override the sample DFHTEP default time threshold (see Table 110 on page 379). This operand is only applicable when OPTIONS=TIME is specified on both the DFHTEPM and DFHTEPT TYPE=INITIAL macros. When the number of occurrences reaches the threshold specified on the COUNT operand (above) within the interval specified on this parameter, an error processor normally takes a logic path that causes DFHTACP default actions to be taken. If the number of occurrences within the interval is less than the threshold, the error processor normally takes a logic path that overrides the DFHTACP default actions. If the time interval has expired, the sample DFHTEP subroutine that normally updates and tests the current threshold count resets the occurrence counts, and establishes a new expiration time. In this case, the condition code set by the subroutine indicates that the thresholds had not been reached.

Time control in the sample DFHTEP starts with the first occurrence of an error type. Subsequent occurrences of the same error type **do not** establish new starting times, but are accounted for as having occurred within the interval started by the first occurrence. This continues until an error count reaches the threshold within the interval started by the first occurrence, or until the interval has expired. In the latter case, the error being processed becomes a first occurrence, and a new interval is started. A time interval of 0 means that the number of occurrences is to be accounted for and controlled without regard to a time interval. Zero is the implied time interval if the value of the COUNT operand is 0 or 1. It is also the implied time interval if the time options are not generated.

The time interval can be expressed in any one of four units; hours, minutes, seconds, or hundredths of a second. The maximum interval must be the equivalent of less than 24 hours. A practical minimum would be 1 to 2 minutes. This allows for access method retries and the time required to create the task to service each error. The four methods of expressing the threshold time interval are:

number
The interval in units of one hundredth of a second. Parentheses are not required if this method is used. The maximum number must be less than 8 640 000 (24 hours).

(number,SEC)
The interval in whole seconds, which must be enclosed in parentheses. The maximum number must be less than 86 400 (24 hours).

(number,MIN)
The interval in whole minutes, which must be enclosed in parentheses. The maximum number must be less than 1440 (24 hours).

(number,HRS)
The interval in whole hours, which must be enclosed in parentheses. The maximum number must be less than 24.

Table 110 illustrates the default thresholds of the sample terminal error program, referred to in the TYPE, COUNT, and TIME operands of the DFHTEPT TYPE=PERMCODE|ERRCODE macro.

Table 110. Default thresholds of the sample TEP

CODE=	COUNT=	TIME=
81	3	(7,MIN)
85	1	0
88	1	0
8C	1	0
8D	1	0
8E	1	0
8F	1	0
BUCKET	5	(5,MIN)

DFHTEPT TYPE=BUCKET–using the error bucket for specific errors

The DFHTEPT TYPE=BUCKET macro is used to ensure that specific error conditions are always accounted for in the common error bucket:

```
DFHTEPT  TYPE=BUCKET
         ,CODE=errcode
```

TYPE=BUCKET
generates the macro to account for specific error conditions in the common error bucket. If MAXERR=25 on the DFHTEPT TYPE=INITIAL macro, this macro cannot be used. This macro is not required if no error codes are to be specifically accounted for in the common error bucket. Each error code must be identified by a separate DFHTEPT TYPE=BUCKET macro.

CODE=errcode
identifies the error code to be specifically accounted for in the common error bucket. The error code must not be specified in the DFHTEPT TYPE=PERMCODE or TYPE=ERRCODE macro.

DFHTEPT TYPE=FINAL–terminating DFHTEPT entries

The DFHTEPT TYPE=FINAL macro terminates the generation of the DFHTEP tables.

```
DFHTEPT  TYPE=FINAL
```

DFHTEPT–examples of how the macros are used

1. The following is an example of the minimum number of statements required to generate the TEP tables:

   ```
   DFHTEPT    TYPE=INITIAL,MAXTIDS=10
   DFHTEPT    TYPE=FINAL
   END
   ```

   This example generates 10 reusable terminal error blocks, each capable of accounting for the maximum number of error types. Time threshold control is supported, and all threshold values are the defaults supported by the sample DFHTEP. This is equivalent to the CICS-supplied sample terminal error program.

2. Figure 18 on page 381 is an example of a customized TEP table (continuation character omitted).

```
* TABLE SPECIFICATIONS

       DFHTEPT     TYPE=INITIAL,MAXTIDS=10,
                   MAXERRS=5

* PERMANENT TERMINAL DEFINITIONS

       DFHTEPT     TYPE=PERMTID,TRMIDNT=TM02

* PERMANENT ERROR CODE DEFINITIONS

       DFHTEPT     TYPE=PERMCODE,CODE=81
       DFHTEPT     TYPE=PERMCODE,CODE=87,
                   COUNT=2,TIME=(1,MIN)

* OTHER THRESHOLD OVERRIDES

       DFHTEPT     TYPE=ERRCODE,CODE=BUCKET,
                   COUNT=3,TIME=(3,MIN)

* CONCLUDE TABLE GENERATION

       DFHTEPT     TYPE=FINAL
       END
```

Figure 18. Example of the use of DFHTEPT macros to generate DFHTEP tables

This example generates 10 terminal error blocks, one of which is reserved for the terminal whose symbolic ID is TM02, and the other nine are reusable. Each TEB has space for five error status elements plus a common error bucket. Of the five ESEs, two are reserved for error codes ‘81’ and ‘87’; the remaining ESEs are available to be assigned dynamically. The thresholds for error code ‘87’ and the common error bucket are being changed. No specific error code is to be accounted for in the common error bucket.

User-written terminal error programs

You can write your own terminal error program in any of the languages supported by CICS. However, CICS-supplied code is provided in assembler language only, in the VSE/ESA sublibrary PRD1.BASE. The names of the supplied source files and macros are listed in Table 111.

Table 111. Supplied source files and macros

Name	Type	Description
DFHXTEP	Source	Sample terminal error program (assembler-language)
DFHXTEPT	CSECT	Sample terminal error tables (assembler-language)
DFHTEPM	Macro	Sample TEP program generator (assembler-language)
DFHTEPT	Macro	TEP table generator (assembler-language)
DFHTEPCA	Macro	Assembler-language communication area

The user-written DFHTEP receives control in the same manner as the CICS-supplied sample DFHTEP, described in “The communication area” on page 361. It should therefore use the communication area as its basic interface with DFHTACP.

Why write your own terminal error program?

- There are some situations in which CICS may try to send a message to an input-only terminal; for example, an ‘invalid transaction ID’ message, or a message wrongly sent by an application program. You should provide a terminal error program to reroute these messages to a system destination such as CSMT or CSTL or other destinations, by means of transient data or interval control facilities.
- There could be application-related activity to be carried out when a terminal error occurs. For example, if a message is not delivered to a terminal because of an error condition, it may be necessary to notify applications that the message needs to be redirected.
- Not all errors represent communication-system failures—for example, SAM end-of-data conditions.

Restrictions on the use of EXEC CICS commands

There are certain restrictions on the commands that a TEP can issue. **The use of any commands that require a principal facility causes unpredictable results, and should be avoided**. In particular, you should not use commands that invoke the following functions:

- Terminal control (“CEMT-type” commands, such as EXEC CICS INQUIRE TERMINAL, *are* permissible)
- BMS (except routing)
- ISC communication (including function shipping)

Addressing the contents of the communication area

After your terminal error program receives control from DFHTACP, it should obtain the address of the communication area by means of an EXEC CICS ADDRESS COMMAREA command.

You generate the communication area DSECT by coding DFHTEPCA TYPE=DSECT in your program. The layout of the communication area is as follows:

```
                                IN/OUT
                                 PARM

                       0XL4                Standard Header
TEPCALDS     DS        XL1         I       Function Code       Always '1'
TEPCAGDS     DS        XL2         I       Component Code      Always 'TC'
             DS        XL1                 Reserved
TEPCATCA     DS        A           I       Address of TACLE being processed
TEPCECIA     DS        A           I       Address of TCTUA
TEPCECIL     DS        H           I       Length of TCTUA
TEPCAACT     DS        XL1        I/O      User action byte
TEPCATID     DS        CL4         I       Terminal identity
TEPCATDB     DS        F           I       Current time of day binary
```

Figure 19. The DFHTACP/DFHTEP communication area

The parameter list contains the following information:

TEPCALDS Function Code. The function code is a printable character representing the identity of the task within the TCP which invoked DFHTEP. It always has the value ‘1’.

TEPCAGDS Component Code. This always has the value ‘TC’, representing a component of the TCP.

TEPCATCA Contains the address of the TACLE being processed.

TEPCECIA Contains the address of the terminal control table user area (TCTUA).

TEPCECIL Contains the length of the TCTUA.

TEPCAACT The User action byte. One of the main uses of the communication area is to transmit the actions that are to be taken for a terminal. TEPCAACT contains the following flags, which can be reset within DFHTEP:

LINEOS (X'80')	Place line out of service.
NONPRGT (X'40')	Nonpurgeable task exists on the terminal.
TERMOS (X'20')	Place terminal out of service.
ABENDT (X'10')	Abend the task on the terminal.
ABORTWR (X'08')	Abend write, free terminal storage.
SIGNOFF (X'02')	Call sign-off program.

On entry to DFHTEP, the above flags represent the default actions set by DFHTACP. The write-abend bit (communication area field **ABORTWR**) and the abend-task bit (communication area field **ABENDT**) are always set if the place-line-out-of-service bit (X'80') is set; but both bits are suppressed if “dummy terminal” is indicated (see Resetting the flags in the user action byte, TEPCAACT).

On return to DFHTACP, the flags represent the actions as modified by DFHTEP.

TEPCATID Contains the identity of the terminal in error.

TEPCATDB Contains the time of day when the error occurred, in binary format.

Resetting the flags in the user action byte, TEPCAACT

The following factors should be considered when altering the action bits in TEPCAACT:

- You should consider how to preserve data security. For example, if a terminal is put out of service for some time (until the cause of the failure is removed) the signon information is still in the TCTTE when the terminal is put back into service, although the original operator may no longer be present. To prevent a possible security violation, you can set the **SIGNOFF** bit to sign off the terminal.
- The dummy terminal indicator at TCTLEPF2 is set on errors from which no specific terminal is indicated. Therefore, if a dummy terminal is indicated, abend task and abend write are not set (see below). The dummy terminal is only used to identify the line.
- The abend-task bit (`X'10'` in TEPCAACT) is always associated with two other bits as part of TACP's abend transaction processing. These other bits are nonpurgeable task and abend write (`X'40'` and `X'08'` respectively, both in TEPCAACT).
- Abend write is always set on at the same time as abend task. It has the effect of clearing the TCTTE of the original write request indicators, if the error being processed occurred on a TC WRITE.
- Nonpurgeable task is set on if a transaction is currently associated with the terminal, and the transaction ID was specified with TPURGE=NO.

None of the abend-task, abend-write, or nonpurgeable-task bits is set if the dummy terminal indicator is on, even if DFHTACP would normally set abend task as the default for the error being processed. Therefore, the following remarks apply only to errors related to a real terminal.

- Abend task has no effect if no transaction is associated with the terminal; (except where a pseudoconversational task is associated with the terminal, in which case, the next transid is cleared). Otherwise, if nonpurgeable task is indicated, the transaction remains attached to the terminal (normally in SUSPEND state) and DFHTACP writes the 'DFHTC2522 INTERCEPT REQUIRED' message to CSMT; if the task is not marked nonpurgeable, it is abended with code 'AEXY' or, rarely, 'AEXZ'.
- Abend write has no effect if the TCTTE was associated with a READ request. In this case the normal result is that, if the line and terminal remain in service, the read is retried.

Addressing the contents of the TACLE

The TACLE is created by the terminal control program when the error occurs, and contains all the I/O error information provided by SAM.

To address the contents of the TACLE, the user-written terminal error program should contain the COPY DFHTACLE and COPY DFHTCTLE statements, in that order. These define the complete DFHTCTLE DSECT. The symbolic names in this DSECT are used to address fields in both the TACLE and the real line entry associated with the error.

The TACLE consists of a 16-byte prefix (defined by COPY DFHTACLE) and a further 48-byte section, which is a modified copy of the DECB of the real line entry at the time the TACLE was created.

To address the TACLE, the user-written terminal error program should therefore contain the statements:

```
COPY DFHTACLE
COPY DFHTCTLE

L TCTLEAR,TEPCATCA        POINT TO TACLE
USING DFHTCTLE,TCTLEAR
```

Note that fields normally part of the real line entry DECB have offsets increased by 16 in the TACLE.

The following fields in the DECB copy in the TACLE do **not** represent data copies from the real line entry:

```
TCTLEDCB                (Offset 24 in TACLE,
                         8 in real TCTLE)
```

This field in the TACLE points to the real line entry; in the real line entry, it points to the SAM DTF for the line group.

```
TCTLECSW                (Offsets 46, 48 in TACLE,
TCTLEALP                 30, 32 in real TCTLE)
```

These are used in the TACLE for SAM error information.

The following statements give direct addressability to the **real** line entry:

```
COPY DFHTCTLE
COPY DFHTCTTE

L      TCTLEAR,TEPCATCA        POINT TO TACLE
USING  DFHTCTLE,TCTLEAR
L      TCTTEAR,TCTLEPTE        POINT TO ERROR TCTTE
USING  DFHTCTTE,TCTTEAR
DROP   TCTLEAR
L      TCTLEAR,TCTTELEA        POINT TO TCTLE
USING  DFHTCTLE,TCTLEAR
```

After you have carried out the required functions and, optionally, altered the default actions scheduled by DFHTACP, the user-written DFHTEP must return control to DFHTACP by issuing the EXEC CICS RETURN command. DFHTACP then performs the actions specified in the TACLE and causes the error processing task to terminate.

The format of the TACLE DSECT is shown in Figure 20 on page 386.

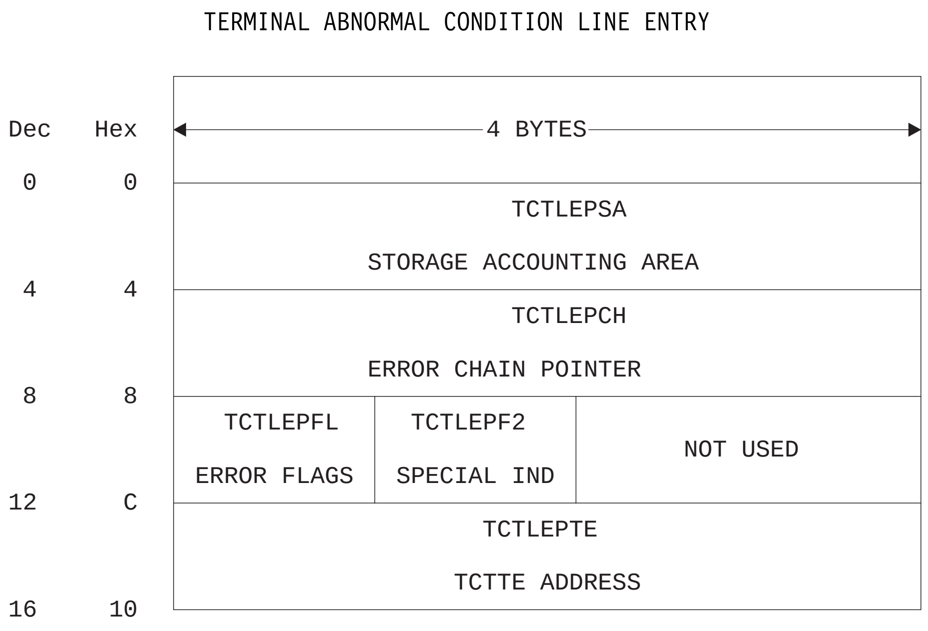


Figure 20 (Part 1 of 2). Format description of the TACLE DSECT

```
Displacement

Dec     Hex    Code     Bytes Label       Meaning


0       0               4     TCTLEPSA    Storage accounting

                              RESERVED

8       8               1     TCTLEPFL    Error flags
               01                         Terminal I/O error
               81                         Message too long
               85                         Write not valid
               88                         Input event rejected
               8C                         Output event rejected
               8D                         Output length of zero
               8E                         No output area
               8F                         Output area exceeded
               .
               .      (All codes not listed are reserved and are
               .       not intended for use by DFHTEP)
               .

9       9               1    TCTLEPF2     Special indicator flags
               01                         Dummy terminal
               02                         Repeating error
               04                         Control unit error
               08                         Non-process error
               10                         Error chain last entry
               20                         Last TEP call

12      C               4    TCTLEPTE     Address of terminal
                                          entry for terminal
                                          in error
```

Figure 20 (Part 2 of 2). Format description of the TACLE DSECT

Example of a user-written terminal error program

The “DFHTEP recursive retry routine” on page 389 is an example of the logic steps necessary to design a portion of the terminal error program. In Figure 21, 10 retries are provided for each terminal; however, the logic could be used for any number of retries. The following assumptions are made:

USER FIELD A
(PCISAVE)
represents a 6-byte field in the process control information (PCI) area of the TCTTE. This field is used to preserve the count of input and output from the TCTTE when the first error occurs. These counts are contained in 3-byte fields located at TCTTENI and TCTTENO within the TCTTE.

USER FIELD B
(PCICNT)
represents a user-defined field used to accumulate the count of recursive errors. It should be in the process control information (PCI) area of the TCTTE.

SYSTEM COUNT
(TCTTENI)
represents the 6-byte field in the TCTTE that contains the terminal input and output counts (TCTTENI+TCTTENO). In the example, these two adjacent fields are considered as one 6-byte field.

Because this example requires access to the TCT terminal entry (TCTTE) to examine the SYSTEM COUNT and to locate the process control information (PCI) area, the DFHTCTTE symbolic storage definition is included so that fields can be symbolically referenced.

Note that the code in Figure 21 is intended only as an illustration of a recursive error handling technique and of the steps necessary to establish addressability to the applicable control blocks.

DFHTEP recursive retry routine

```
*ASM     XOPTS(NOPROLOG NOEPILOG SP)
***********************************************************************
*                                                                     *
*                   DFHTEP RECURSIVE RETRY ROUTINE                    *
*                                                                     *
***********************************************************************
         DFHEISTG
         DFHEIEND
         DFHTEPCA TYPE=DSECT       COMMAREA passed by TACP
         COPY  DFHA06DS            Statistics DSECT
         USING DFHA06DS,STATBAR
PCIAREA  DSECT
PCISAVE  DS    XL6                 User Field A
PCICNT   DS    PL2                 User Field B
*
TCTLEAR  EQU   2                   Pointer to TACLE
STATBAR  EQU   4                   Pointer to statistics DSECT
TCTUABAR EQU   5                   Pointer to TCTUA
COMMABAR EQU   12                  Pointer to COMMAREA passed by TACP
         EJECT
DFHTEP   CSECT
**********************************************************************
*        Establish addressability                                    *
**********************************************************************
         DFHEIENT
*
         EXEC CICS ADDRESS EIB(11)
*
         EXEC CICS ADDRESS COMMAREA(COMMABAR)
*
         USING DFHTEPCA,COMMABAR
         L     TCTLEAR,TEPCATCA    Load TACLE address
*
         USING PCIAREA,TCTUABAR
         L     TCTUABAR,TEPCECIA   Load TCTUA address
*
**********************************************************************
*        Start processing                                            *
**********************************************************************
         TM    PCICNT+1,X'0C'      Has User Field B been initialized
*                                  to a packed decimal number?
         BO    CKCOUNT             YES .... so compare the system count
*                                  with the existing count in Field B
RESET    DS    0H
         MVC   PCICNT,=PL2'+0'     NO  .... so initialize field B to
*                                  packed zero.
*
```

Figure 21 (Part 1 of 2). DFHTEP recursive retry routine

```
         EXEC CICS COLLECT STATISTICS TERMINAL(TEPCATID) SET(STATBAR)
*                                  Get statistics for this terminal
*                                  using TERMID passed in Commarea
*
         MVC   PCISAVE,A06TENI     Save the current system counts. This
*                                  is a new error, or first time
*                                  through.
INCR     DS    0H
         AP    PCICNT,=P'1'        Increment the number of times this
*                                  error has occurred (recursive count)
*
         CP    PCICNT,=P'10'       Has the maximum recursive error
*                                  limit been reached?
         BNE   RETRY               NO .... set action
*
         ZAP   PCICNT,=P'0'        Clear and reset user fields for next
*                                  error set
         EXEC CICS COLLECT STATISTICS TERMINAL(TEPCATID) SET(STATBAR)
*                                  Get statistics for this terminal
*                                  using TERMID passed in COMMAREA
*
         MVC   PCISAVE,A06TENI     Get current system counts
         B     NORETRY             Action indicators for no retry
*
CKCOUNT  DS    0H
         EXEC CICS COLLECT STATISTICS TERMINAL(TEPCATID) SET(STATBAR)
*                                  Get statistics for this terminal
*                                  using TERMID passed in COMMAREA
*
         CLC   PCISAVE,A06TENI     Has system count changed since last
*                                  entry to TEP?
         BNE   RESET               YES .... this is a new error since
*                                  some I/O activity has occurred on
*                                  terminal.
         B     INCR                NO  .... this is a recursive error,
*                                  so increment the recursive count and
*                                  check for retry.
RETRY    DS    0H
*                                  The user would include here the code
*                                  necessary to alter the flags in the
*                                  COMMAREA so that a retry can be
*                                  performed on the terminal.
NORETRY  DS    0H
*                                  The user would include here the code
*                                  necessary to allow DFHTACP to take
*                                  final actions on the terminal; that
*                                  is, abend task, put line out of
*                                  service, and others.
         LTORG ,
         END
```

Figure 21 (Part 2 of 2). DFHTEP recursive retry routine

Chapter 9. Writing a node error program

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, “General notes about user-replaceable programs” on page 347 apply to this chapter.

This chapter contains information about the node error program (NEP) of CICS Transaction Server for VSE/ESA Release 1. Node error programs, not terminal error programs, must be used for terminals and logical units supported through VTAM.

The chapter is divided into the following sections:

1. **“Background to CICS-VTAM error handling”** is an overview. If you are not familiar with the node error program, you should read this section. If you are familiar with NEPs, you may be able to go straight to the detailed information in the following sections, and look at the subjects that particularly interest you.
2. **“When an abnormal condition occurs”** on page 399 describes the CICS components that are invoked when an abnormal condition is detected from a VTAM logical unit.
3. **“The sample node error program”** on page 407 describes the CICS-supplied sample NEP.
4. **“User-written node error programs”** on page 417 discusses the factors you need to consider when writing your own node error program.
5. **“Using the node error program with VTAM persistent sessions”** on page 423.

Notes:

1. Like the terminal error program for non-VTAM devices, the node error program for VTAM-attached terminals is available in three forms:
   a. The default node error program
   b. The CICS-supplied sample node error program
   c. User-written versions

   All three types are discussed in the following sections.
2. In this chapter, “VTAM 3270” refers to a non-SNA 3270 connected through VTAM, and “3270 compatibility mode” refers to an SNA 3270 connected through VTAM.
3. If you code an EXEC CICS HANDLE CONDITION TERMERR command in your application program, it is **sometimes** possible for the application program to handle exceptional cases, rather than using a node error program. The ‘TERMERR’ condition is driven if the node abnormal condition program (DFHZNAC) actions an ABTASK (‘ATNI’ abend). Note that ‘TERMERR’ is application-related, and is not an alternative to the node error program, which must be used for session-related problems. Dealing with errors in the application program is particularly useful in an intersystem communication (ISC) environment. For further information, refer to the *CICS Intercommunication Guide*.

Background to CICS-VTAM error handling

In general, errors detected by CICS-VTAM terminal control are queued for handling by a special task, the CICS node error handler (transid CSNE). (Note that CICS finds it convenient to use the same technique for some housekeeping work, such as sending "good morning" messages, and logging session starts and ends, which are not errors at all.)

In a few cases, exceptions signaled to CICS by VTAM are not treated as errors, and are not passed to the node error handler. For example, CICS often sends an SNA BID command as part of automatic transaction initiation. Rejection of the BID with exception code '0813' (wait) is a standard response, and CICS handles the retry in terminal control without calling this an error. In the rest of this description, only the errors are considered.

The CSNE task runs as a "background" task, meaning that it is not associated with any one CICS terminal. At any time, there is at most one such task, working on the single node error queue.

All node errors on the queue are analyzed in turn by a table-driven, CICS-supplied program called DFHZNAC (node abnormal condition program). It is not intended that you should ever modify this.

DFHZNAC links to a module called DFHZNEP (if present in the CICS system) when processing most node errors. (It does **not** link to DFHZNEP for errors that are not related to a specific node—for example, those caused by a VTAM shutdown.) The interface for this link is described in "When an abnormal condition occurs" on page 399. This formal DFHZNAC–DFHZNEP interface gives you the opportunity to supply your own code to analyze error conditions, change default actions by setting various "action flags", and take additional actions specific to your applications.

CICS supplies a pregenerated default DFHZNEP, which simply sets the "print TCTTE" action flag if a VTAM storage problem is detected, and returns control to DFHZNAC. Because it leaves all other action flags unchanged, DFHZNAC's default actions are not otherwise affected. (DFHZNAC's default actions for different error conditions are listed in Appendix B, "Default actions of the node abnormal condition program" on page 653.)

Why use a NEP to supplement CICS default actions?

The following list gives some of the reasons why you might want to write your own node error program to add to the default actions provided by CICS and VTAM.

- Not all errors represent communication system failures. Some errors (such as trying to write zero-length data) may reflect special situations in applications, needing special action.
- You might want to output extra data, in addition to the error messages sent by DFHZNAC. (Note that you cannot use the node error program to suppress messages from DFHZNAC.) All data output from DFHZNAC and DFHZNEP is written to the transient data queue CSNE.
- In other cases, you might want to change the amount of diagnostic information produced by CICS: the default varies with the error type. For example, the

VTAM RPL associated with an error may be printed when you do not want it, or not printed when you do.

- There could be application-related activity to be performed when a node error occurs. For example, if a message fails to be delivered to a terminal, it may need redirecting to another. With messages sent with exception-response only, CICS may not have the data available to send it again, but the requesting application might be able to re-create it. For example, if an error were signaled during the sending of a document to a printer, it might be able to restart from the beginning, or from a specific page.
- Some devices, such as the 3650 Retail Store System, return application-type data in “User Sense Data” fields. This can only be retrieved in a NEP. The NEP has to catch and save data for further application programs.

An overview of writing a NEP

Your DFHZNEP module must conform to the defined interface: that is, it must be a linked-to program that uses defined communication area fields to analyze an error and then returns to DFHZNAC. The source code of the default NEP provided by CICS can be used as a skeleton on which to build a single NEP.

CICS also provides macros to help you generate more complex sample NEPs. These are **aids** to help you develop your own NEPs; you do not have to use any of them.

Your error-handling logic can be written as a number of modules, but the one that receives control from DFHZNAC must be called DFHZNEP.

DFHZNEP code can use standard CICS functions (EXEC CICS LINK, XCTL) to invoke other user modules. Each module thus requested must, of course, have an installed CSD program definition. Installed definitions are also needed for DFHZNAC and DFHZNEP themselves; these are contained in the supplied CSD group DFHVTAM.

The key features of the DFHZNAC–DFHZNEP interface are as follows:

- DFHZNEP can be written in any of the CICS-supported languages.

  Note: CICS-supplied NEP code is provided in assembler language only. The communication area parameter list is supplied in assembler-language and C versions.
- DFHZNEP is linked-to separately for each node-related error on the queue. (Note that, because sense codes are always associated with an error, DFHZNEP is not linked-to separately for these.)
- Communication between the two modules is through a communication area (DFHNEPCA).

The structure of the communication area is described in “The communication area” on page 400.

On each DFHZNEP invocation, one field in the communication area contains a 1-byte internal error code, assigned by DFHZNAC, which identifies the type of error. Other fields identify the CICS TCTTE (LU) associated with the error, and any SNA sense codes. There are also fields for DFHZNEP to pass back user messages for subsequent logging by DFHZNAC.

Further fields contain “action flags”. Each flag represents an action that DFHZNAC may take when DFHZNEP returns control to it. These actions are of different types:

- Reporting (dumps of control blocks, actions taken)
- Status changes (for example, of TCTTE)
- Clean-up work (cancel any associated transaction, end the VTAM session)

The action flags can be set or reset within DFHZNEP.

The action flags set by DFHZNAC for specific error codes and sense codes are listed in Appendix B, “Default actions of the node abnormal condition program” on page 653.

The default NEP

The CICS-supplied default NEP, DFHZNEP, sets the “print TCTTE” action flag (TWAOTCTE in the user option byte TWAOPT1—see page 404) if a VTAM storage problem is detected; otherwise it performs no processing, leaves the action flags set by DFHZNAC unchanged, and returns control to DFHZNAC.

The sample NEP

The CICS sample node error program is a generalized program structure for handling errors detected from logical units. None of its components is generated as part of the standard CICS generation process, but instead may be optionally generated as described in this section and in “The sample node error program” on page 407.

The sample NEPs that CICS provides are designed with two main features:

- The samples assume that you want to invoke separate user-supplied error processors to handle different “groups” of error types. You specify which of the DFHZNAC internal error codes are to be regarded as a “group” for processing by any one routine, and then supply the code for that routine. CICS has some standard cases to help you. More information is given about them below.
- The samples may work in association with a separately generated module called a node error table. This can be used to build up statistics for each error group that the NEP processes. This table is analogous to the terminal error table, DFHTEPT, used by the CICS sample terminal error program.

  Some of the CICS-supplied error processors use the node error table—for example, that for errors affecting 3270 LUs (GROUP=1) (see “DFHSNEP TYPE=DEF3270—including error processors for 3270 LUs” on page 412).

The node error table

To understand the sample NEP, first look at the node error table structure in more detail.

Node error table is often abbreviated to NET. You should not confuse this acronym with “net” (as in “network”), or with a NETNAME.

You can generate a node error table using the CICS macro DFHSNET. See “Node error table” on page 409 and “DFHSNET—generating the sample node error table” on page 414. You choose how complex this table is to be.

The node error table must be defined as a RESIDENT program. This makes it easy for the NEP to find it (using a CICS LOAD request), and ensures that any counters are not reset by reloading. You can give the table any name you like. The default is DFHNET.

The table consists of sets of error-recording areas. Each set is called a node error block (NEB) and is used to count node errors relating to a single LU. You can dedicate specific NEBs to specific LUs throughout a CICS run; and you can leave other, reusable NEBs for general use. If you expect to accumulate error statistics about 10 LUs concurrently, you need 10–12 NEBs.

Each NEB may contain multiple recording areas, one being used for each group of errors you want to distinguish. The error groups correspond to those in the NEP. That is, they are groups of error types requiring separate processing logic.

Each recording area is known as an error status block (ESB). You specify the space reserved for each ESB, and it typically includes space to count the errors, or record when the first of the present series occurred. Note that in any one NEB the counting is for one LU only.

Finally, you can specify a threshold count and a time limit in the table. These are constants that can be used by code in the NEP to test an ESB, to see if a given type of error has occurred more than the threshold number of times in the stated interval. The time limit also affects the interval between using a general NEB for one LU and then reusing it for another.

A minimal NET would simply consist of a handful of NEBs, each with just one ESB, grouping together all types of error that are of interest.

Coding the sample NEP

The sample NEP is coded using the macro DFHSNEP. The basic form is as follows:

```
DFHSNEP TYPE=INITIAL

Specific error handling code. For example:

DFHSNEP TYPE=DEF3270

DFHSNEP TYPE=FINAL
END     DFHNEPNA
```

By default, this generates a module called DFHZNEP, which works with a node error table called DFHNET. If you want to use another table, you could code NETNAME=MYTABLE after TYPE=INITIAL. Details of the DFHSNEP macro are given in “Generating the sample node error program” on page 410.

To understand the sample code, generate a standard NEP, as with TYPE=DEF3270, shown in “DFHSNEP TYPE=DEF3270—including error processors for 3270 LUs” on page 412, and look at the resulting assembler-language listing. Here is a description of the code.

The INITIAL and FINAL macros generate the basic skeleton of the NEP. This comprises some initialization code and some common routines. All the code is built round the assumption that you have a node error table as previously described.

The initial code first tests the internal error code passed from DFHZNAC to see if it belongs to a group that the NEP needs to handle. (The groups are identified by the code you supply between the DFHSNEP INITIAL and FINAL macros. This is described in “Generating the sample node error program” on page 410.) If the particular error code is not of interest to the NEP, control is returned at once to DFHZNAC, to take default actions.

Otherwise, the relevant node error table is located by a CICS LOAD request. (As previously explained, this table should be resident in virtual storage.) The NEP code will then locate the correct ESB within a selected NEB. The latter may be permanently dedicated to the LU in error (a named NEB), or may be one taken from the general pool.

The initial code then invokes the appropriate user logic for that error group. The initial code also sets up pointers to the communication area, the NEB, and the ESB. For details, see “Generating the sample node error program” on page 410.

The common routines in the NEP provide common services for your own logic. They count and time stamp errors in the ESB, and test whether error thresholds have been exceeded. They are not documented outside the sample listings. You can generate a NEP without them if you prefer.

Your own code is inserted between the DFHSNEP TYPE=INITIAL and TYPE=FINAL macros.

Note: If the user code you insert between the DFHSNEP macros contains EXEC CICS commands, you must translate the commands, and enter the *translated code* between the DFHSNEP macros.

Each section of user logic, intended to handle a particular group of error types, is headed by a macro of the type:

```
DFHSNEP TYPE=ERRPROC,CODE=(ab,cd,...),GROUP=n
```

where X'ab', X'cd',... are the DFHZNAC internal error codes you want to process, and n is the number of the error group, and therefore also of the corresponding ESB, within a NEB, in the node error table. Successive DFHSNEP TYPE=ERRPROC macros should use groups 1, 2, 3, and so on.

The DFHSNEP TYPE=ERRPROC macros serve several purposes. They:

- Inform the NEP generation how many error groups there are
- Show which error types are to be included in each group
- Introduce the code for each group

Note that any one DFHZNAC error code should only figure in one error group, and that any code not mentioned is simply ignored by the NEP. You follow each DFHSNEP TYPE=ERRPROC macro with your own logic. This should begin with standard code to save registers, or set up addressability, which is best copied from sample NEP listings.

CICS provides some standard error processors to handle specific errors on two different types of LU. These are for non-SNA 3270s (BSC 3270s attached to CICS-VTAM), and for interactive SNA logical units like a 3767. More information is given in “When an abnormal condition occurs” on page 399.

The code for non-SNA 3270s can be generated by coding

```
DFHSNEP TYPE=DEF3270
```

where you would otherwise code a DFHSNEP TYPE=ERRPROC macro plus logic of your own. In effect, TYPE=DEF3270 defines two error groups, and associates each with an error processor. The first group comprises the four DFHZNAC error codes X'D9', X'DC', X'DD', and X'F2'. The second group contains only error code X'42', corresponding to the 'unavailable printer' condition, a specific exception condition signaled when CICS cannot allocate a printer in response to a 3270 print request.

The 3270 sample code is not intended to cover all error conditions. Note that the code is not suitable for SNA 3270s (LU session type 2). Error conditions arising from these result in different DFHZNAC error codes and may require different handling.

You may find that the CICS-supplied code is not sufficient for other, application-related, reasons. Perhaps you want to try to reacquire lost sessions after a time interval. The code supplied for the 3767 covers only one error group with one DFHZNAC error code, X'DC', which may occur under contention protocol.

You can use these CICS-supplied error processors to generate a valid DFHZNEP listing, for tutorial purposes, without having to write any user code.

You should be aware of the following limitations of this NEP design:

- Any error types you have not allowed for are ignored by the NEP, and not accumulated into error buckets.
- You may want to handle a particular situation whenever it arises, even though DFHZNAC may assign it different error codes in different situations. For example, on an SNA 3270, switching in and out of TEST state generates status X'082B' (presentation-space integrity lost). This might result in one of several DFHZNAC error codes.

In the sample NEP structure, you would need either to test for this last case in separate error processors, or group all the DFHZNAC error codes together. If you wrote your own NEP code from scratch, you would simply, on entry to your NEP, test the communication area field containing the status.

Multiple NEPs

CICS allows you to define a NEP transaction class that applies to every transaction that uses a particular profile, session, or terminal-type. To do this you use the NEPCLASS option of an RDO PROFILE, SESSIONS, or TYPETERM resource definition. (Note that any value of NEPCLASS that you specify on the RDO PROFILE definition overrides any specified on the corresponding RDO SESSIONS or TYPETERM definition.) NEPCLASS is a 1-byte binary field containing a value in the range 0–255. The purpose of NEPCLASS is that, while a transaction is running on the LU, you can obtain a special version of node error handling, suitable for that transaction. (This is sometimes called a "transaction-class error routine".) The default value NEPCLASS(0) indicates that no NEPCLASS is in effect.

The DFHZNEP that gets control from DFHZNAC must test the NEPCLASS in effect at that time for the LU associated with the error. Then it either transfers control to a suitable module (the actual NEP), or branches to a specific bit of code within itself.

The DFHZNEPI macros (see “DFHZNEPI macros” on page 420) generate a DFHZNEP module that is purely a routing module. This inspects the NEPCLASS in effect for the node error passed by DFHZNAC, and transfers control (links) to another module, the real NEP, according to a NEPCLASS/name routing table built up by the macros.

If no NEPCLASS is in effect (equivalent to RDO PROFILE NEPCLASS(0)), or the NEPCLASS is not in the routing table, a default module is invoked. You must specify the name of this in the DFHZNEPI TYPE=INITIAL macro. (See “DFHZNEPI TYPE=INITIAL—specifying the default routine” on page 421.) If you do not specify the name, no module is invoked.

You also have to provide the sub-NEPs for the various NEP transaction classes, including, of course, one for the default NEPCLASS(0). Each of these sub-NEPs needs a separate program definition. You have the same choice in coding each sub-NEP as you had when there was just one; you can code your own, or use the CICS sample macro DFHSNEP. If you use DFHSNEP, note that there is another operand on the DFHSNEP TYPE=INITIAL macro, NAME=, which means that the generated module can be given any name you choose (to match the DFHZNEPI routing). You can use a different node error table with each sub-NEP.

Before you start using NEP routing, consider the following:

- The association of an LU (TCTTE) with a transaction NEPCLASS is only valid for about the time that the CICS task exists. Errors detected after a CICS task has ended (for example, because of a problem with a delayed output message) may not be associated with the NEPCLASS of the creating transaction.

  Another problem can occur when CICS is about to start a new task for the LU as a result of an internal request from another CICS task (by an EXEC CICS START request, for example). This is usually called automatic transaction initiation. Before the task is started, CICS has to open a fresh session if none exists, by issuing a VTAM SIMLOGON request, and then, as mentioned earlier, send a BID command. The intended task is not attached until all this is completed successfully. The NEPCLASS is not picked up from the transaction definition until then. This means that any errors arising in the ATI process (perhaps an error on BIND or BID) occur before the NEPCLASS is correctly set, so they may get routed to the default NEP and not the one for the NEPCLASS. This complicates the total node error handling for the application.

  As an example, consider an application that contacts unattended programmable controllers overnight in order to read in the day’s input. Recovery design in such an application is fundamental, and has to allow for errors both in ATI and in file transmission. To separate these into two NEPs could be an unnecessary complication.

- The extra development effort for a NEP split on a NEPCLASS basis might not be justified. Generally, if logic is to be split, it is on an LU basis (programmable controllers may be running applications other than 3270).

To conclude this overview, remember that the CICS sample NEPs are a good source of ideas for you to write your own NEPs, but they might not be the ideal framework for your particular needs. It is recommended that you write straightforward NEPs at first.

When an abnormal condition occurs

The following CICS components are involved when an abnormal condition is detected from a logical unit:

- The terminal control program VTAM section: DFHZCA, DFHZCB, DFHZCC, DFHZCP, DFHZCQ, DFHZCW, DFHZCX, DFHZCY, and DFHZCZ.
- The node abnormal condition program, DFHZNAC.
- The CICS-supplied default node error program, DFHZNEP, or your own version of it.

For logical units, all information concerning the processing state of the terminal is contained in the TCTTE and the request parameter list (RPL). Consequently, when a terminal error must be handled for a logical unit, the TCTTE itself is placed onto the system error queue.

DFHZNAC assumes that system sense codes are available upon receipt of an exception response from the logical unit. Thus, analysis is performed to determine the reason for the response. Decisions, such as which action flags to set and which requests are needed, are made based upon the system sense codes received. If sense information is not available, default action flags are set, and DFHZEMW is scheduled to send a negative response, if a response is outstanding, with an error message to the terminal.

The action flags set by DFHZNAC on receipt of specific inbound system sense codes are listed in Appendix B, “Default actions of the node abnormal condition program” on page 653.

Before executing the specified routines, DFHZNAC links to DFHZNEP. You can use DFHZNEP to perform additional error processing beyond that performed by DFHZNAC; or to alter the default actions previously set by DFHZNAC. You need to code a node error program only if you want to do either of these things.

The action flags, set by DFHZNAC to assist the node error program, are in field TWAOPTL of the communication area.

If you want to modify DFHZNAC’s actions following an abnormal situation, DFHZNEP can interrogate field TWAOPTL and modify the bit settings. If you agree with DFHZNAC’s proposed actions, field TWAOPTL is left unaltered.

In most cases, DFHZNEP can modify DFHZNAC’s proposed actions. The only time that DFHZNAC overrides DFHZNEP’s modification of field TWAOPTL is when a logical unit is to be disconnected from CICS; that is, when DFHZNAC determines that the abnormal situation requires that CICS issue the VTAM CLSDST macro for a logical unit. In such a case, DFHZNAC disconnects the terminal and abnormally terminates the task, even if DFHZNEP tries to block such actions.

Resetting of the task termination flag by the node error program is also ignored if a negative response has been sent to a logical unit, or if DFHZEMW is to write an error message to the logical unit.

When the node error program has performed its functions, it returns control to DFHZNAC by an EXEC CICS RETURN command.

When control is returned from DFHZNEP, DFHZNAC performs the actions specified in field TWAOPTL (except when disconnecting logical units, as noted above), issuing messages and setting error codes, as necessary.

The communication area

After DFHZNEP receives control from DFHZNAC, it obtains the address of the communication area by means of an EXEC CICS ADDRESS COMMAREA command. Figure 22 illustrates the general structure of the communication area.

Header
Error_being_processed
User option bytes
VTAM information
Additional information for NEP
Additional system parameters
Persistent session parameters

Figure 22. General structure of the communication area

The significance of each section of the communication area is described below:

Header	A 4-byte header common to all user-replaceable programs.
Error_being_processed	Identifiers of the error code and the terminal associated with the error.
User option bytes	Flags that indicate the default actions set by DFHZNAC, and that may be reset within DFHZNEP.
VTAM information	Sense and RPL codes.
Additional info. for NEP	Other useful information for the NEP.
Additional system parameters	Locations of indirect parameters, such as the TCTTE, and other system information.
Persistent session parameters	Recovery notification data.

A detailed listing of the communication area is given in Figure 23 on page 401.

```
**********************************************************************
**                      Header                                      **
**              These fields are READ ONLY                          **
**********************************************************************
NEPCAHDR DS    0XL4                Standard Header
NEPCAFNC DS    XL1                 Function Code      Always '1'
NEPCACMP DS    XL2                 Component Code     Always 'ZC'
         DS    XL1                 Reserved
**********************************************************************
**                  Error_being_processed                           **
**    Identity of terminal and the error code associated with it    **
**              These fields are READ ONLY                          **
**********************************************************************
TWAEC    DS    XL1                 Error Code
         DS    CL3                 Reserved
TWANID   DS    CL4                 Terminal identity
TWANETN  DS    CL8                 Netname
**********************************************************************
**                  User option bytes                               **
**              Initially set to the default actions.               **
**              DFHZNEP can change the defaults.                    **
**********************************************************************
TWAOPTL  DS    0XL3                User option bytes
TWAOPT1  DS    XL1                 User option byte 1
TWAOPT2  DS    XL1                 User option byte 2
TWAOPT3  DS    XL1                 User option byte 3
         DS    XL1                 Reserved


**********************************************************************
**      VTAM information  -   Any VTAM sense and RPL codes          **
**              These fields are READ ONLY                          **
**********************************************************************
TWAVTAM  DS    0XL12               VTAM information
TWARPLCD DS    H                   VTAM RPL feedback codes
         DS    H                   Reserved
TWASENSS DS    0F                  Sense codes to be sent
TWASS1   DS    XL1                 System sense byte No 1
TWASS2   DS    XL1                 System sense byte No 2
TWAUS1   DS    XL1                 User sense byte No 1
TWAUS2   DS    XL1                 User sense byte No 2
*
TWASENSR DS    0F                  Sense codes received
TWASR1   DS    X                   System sense byte No 1
TWASR2   DS    X                   System sense byte No 2
TWAUR1   DS    X                   User sense byte No 1
TWAUR2   DS    X                   User sense byte No 2
*
```

Figure 23 (Part 1 of 3). The DFHZNAC/DFHZNEP communication area

```
**********************************************************************
**             Additional information for the NEP                  **
**Except for TWANPFW, TWANLD, and TWANLDL these fields are READ ONLY**
**********************************************************************
TWAADINF DS    0XL22
         DS    F                    Reserved
TWACTLB  DS    X                    General use control byte
*        EQU   X'80'                Reserved
*        EQU   X'40'                Reserved
TWACSC   EQU   X'20'                Clear sense code indicator
TWAPSC   EQU   X'10'                Print VTAM sense codes
TWATIOA  EQU   X'08'                Print portion of I/O area
*        EQU   X'04'                Reserved
TWAVTRTC EQU   X'02'                VTAM return code available
TWANEPR  DS    XL1                  NEP return code byte
TWANPFW  EQU   X'80'                Retry write with FORCE=YES
TWAREASN DS    XL1                  VTAM reason code
TWASTAT  DS    XL1                  VTAM status code
TWAXRSN  DS    H                    Exception response seq number recd
TWAR     EQU   *
TWAPFLG  DS    XL1                  CLSDST pass flag
TWAPIP   EQU   X'80'                CLSDST pass in progress
TWANEPC  DS    XL1                  NEP class flag
TWAEISAB DS    XL1                  Stand-alone begin bracket indicator
TWAESAB  EQU   X'04'                Stand-alone begin bracket
         DS    XL3                  Reserved
TWANLD   DS    A                    Address of data to be logged
TWANLDL  DS    H                    Length of data to be logged
```

Figure 23 (Part 2 of 3). The DFHZNAC/DFHZNEP communication area

```
*********************************************************************
**              Additional system parameters                       **
**Except for TWAPNETN, TWAPNTID, TWAUPRRC these fields are READ ONLY**
*********************************************************************
TWASYSPM DS    0XL68
TWATCTA  DS    AL4                 Address of TCTTE being processed
TWARPL   DS    AL4                 Address of VTAM RPL
TWATIOAA DS    AL4                 Address of data portion of TIOA
TWATIOAL DS    H                   Length of data portion of TIOA
TWACOMML DS    H                   Length of commarea data for TCTTE
TWACOMMA DS    CL4                 Address of commarea data for TCTTE
TWATECIA DS    AL4                 Address of TCTTE user area
TWATECIL DS    H                   Length of TCTTE user area
TWAPPNTN DS    CL8                 Primary 3270 printer netname
TWAPPTID DS    CL4                 Primary 3270 printer termid
TWAPPELG DS    X                   Primary printer eligible indicator
TWAPPELY EQU   X'01'               Primary printer is eligible flag
TWASPNTN DS    CL8                 Secondary 3270 printer netname
TWASPTID DS    CL4                 Secondary 3270 printer termid
TWASPELG DS    X                   Secondary printer eligible indicator
TWASPELY EQU   X'01'               Secondary printer is eligible flag
TWAPNETN DS    CL8                 Selected 3270 printer netname
TWAPNTID DS    CL4                 Selected 3270 printer termid
TWAUPRRC DS    B                   Unavailable Printer return code
TWAUPRNP EQU   X'00'               No printer selected
TWAUPRPS EQU   X'01'               Printer selected
TWAUPRDD EQU   X'FF'               Data disposal complete
TWAUPRPE EQU   X'FE'               Error on Put request
TWAERRF1 DS    B                   Error flag byte 1
TWALXS   EQU   X'80'               Logon crossed simlogon
         DS    XL2                 Reserved

*********************************************************************
**                Persistent session parameters                    **
**              Recovery notification data                         **
**          DFHZNEP can change these default actions               **
*********************************************************************
TWAXRNOT DS    X                   Recovery notification options
TWAXRNON EQU   X'80'               Recov notification = none
TWAXRMSG EQU   X'40'               Recov notification = message
TWAXRTRN EQU   X'20'               Recov notification = transact.
         DS    XL3                 Reserved
TWAXMSTN DS    CL8                 Recovery mapset name
TWAXMAPN DS    CL8                 Recovery map name
TWAXTRAN DS    CL4                 Recovery transaction ID
*
```

Figure 23 (Part 3 of 3). The DFHZNAC/DFHZNEP communication area

The next sections describe fields in the parameter list that can be reset within DFHZNEP. See also “Coding for the 3270 ‘unavailable printer’ condition” on page 418, which describes the use of the flags in the “unavailable printer return code” field.

The user option bytes (TWAOPTL)

TWAOPTL contains the user option bytes TWAOPT1, TWAOPT2, and TWAOPT3, each of which contains action flags. On entry to DFHZNEP, these flags represent the default actions previously set by DFHZNAC. They can be reset by DFHZNEP.

TWAOPT1

User option byte 1. TWAOPT1 contains flags which are principally debugging aids. The first five flags cause DFHZNAC to write the desired information to the CSNE log if the appropriate bit is set. Setting the sixth flag (TWAODNTA) on causes CICS to take a system dump when there is no task attached to the terminal at the time of error detection, if the flag TWAOAT in TWAOPT2 is also set on.

The flags are:

TWAOAF (X'80')	Print action flags.
TWAORPL (X'40')	Print VTAM RPL.
TWAOTCTE (X'20')	Print TCTTE.
TWAOTIOA (X'10')	Print TIOA.
TWAOBIND (X'08')	Print BIND area.
TWAODNTA (X'04')	System dump if no task attached.

TWAOPT2

User option byte 2. TWAOPT2 contains flags which are task-related.

The NEP can abend the task by setting TWAOAT, or cancel it by setting TWAOCT. The difference is that abend task does not take effect until the task requests or completes a terminal control operation: cancel task takes effect as soon as system and data integrity can be maintained. Setting TWAOAT to abend the task is normally sufficient, except where the task performs lengthy processing (such as a database browse) between terminal requests. If both TWAOAT and TWAOCT are set, TWAOCT (cancel task) takes priority.

If the task is to be abnormally terminated, sends and receives are purged. If TWAOGMM is set, the next transid is cleared and any communication area associated with the terminal is released—except in the case of permanent transids (specified on the TERMINAL definition as TRANSACTION(name)), when the communication area is not released. If the TYPETERM of the terminal indicates that the “good morning” message is supported (LOGONMSG(YES)), if TWAONINT is off, and if the terminal is not in a BMS paging session, then the “good morning” message transaction is initiated (the transaction specified by the system initialization parameter GMTRAN).

The flags are:

TWAOAS (X'80')	Abandon any SEND for this terminal.
TWAOAR (X'40')	Abandon any RECEIVE for this terminal.
TWAOAT (X'20')	Abend any task attached to TCTTE.
TWAOCT (X'10')	Cancel any task attached to TCTTE.
TWAOGMM (X'08')	“good morning” message to be sent.
TWAOPBP (X'04')	Purge any BMS pages for this session.
TWAOASM (X'02')	SIMLOGON required.

Notes:

1. If a definite response SEND has been performed, CICS has to issue a RECEIVE in order to obtain the response. If the response is negative, DFHZNAC is entered and sets flags TWAOAS (abandon the SEND) and TWAOAR (abandon the RECEIVE). TWAOAR must be left on to ensure that the RECEIVE for the response is abandoned.
2. If the request is to be retried, and the break connection action flag is off (that is, if TWAOCN in TWAOPT3 is off), then one or more of TWAOAS, TWAOAR, and TWAONEGR must be off as well as TWAOAT.
3. The abend code returned as a result of setting TWAOCT is unpredictable.
4. TWAOGMM forces TWAOAT only if set on by the node error program.
5. TWAOPBP forces TWAOAT to be set on.
6. For non-pipeline terminals, TWAOAT acts as a cancel request (TWAOCT) if the task has not yet been dispatched for the first time.

TWAOPT3

User option byte 3. TWAOPT3 contains flags which are node-related.

The flags are:

TWAOINT (X'80')	Internally generated logons (INTLOGs) allowed.
TWAONINT (X'40')	No internally generated logons allowed.[7]
TWAONCN (X'10')	Normal CLSDST (no reset allowed).
TWAOSCN (X'08')	Normal CLSDST (reset allowed).
TWAONEGR (X'04')	Send negative response.
TWAOOS (X'02')	Keep node out of service.
TWAOCN (X'01')	CLSDST node.[7]

TWAONINT forces TWAOCN.

TWAONEGR forces TWAOAR and TWAOAT.

TWAOOS forces TWAOCN.

TWAOCN forces TWAOAR, TWAOAS, and TWAOAT.

TWAOOS indicates that no further processing is to be done for this node. The node is logically out of service.

For an LU6.1 intersystem communication session, TWAOOS or TWAONINT causes the system entry to be put out of service if, as a result of the specified action, there are no allocatable sessions left. (A session can also be put out of service because of either an unknown modename being passed to VTAM during an attempt to bind an APPC session, or an invalid logmode name for a VTAM 3270-type terminal. However, the CICS default action resulting from this condition cannot be overridden in the NEP.)

If TWAOCN is set, the task is abnormally terminated and communication with the node is lost. Note that the NEP cannot reset this flag.

TWAOSCN provides the same function as TWAONCN, but the NEP can reset it if the session is not to be closed.

[7] Do not set this flag when processing error code X'49' (TCZCLSIN).

If DFHZNAC is scheduled because of the receipt of an exception response, the sense information in the TCTTE is available to DFHZNAC and DFHZNEP to determine any necessary actions.

If DFHZNAC is scheduled because of loss of the connection between CICS and a logical unit, DFHZNAC abnormally terminates any transaction in progress at the time of the failure. DFHZNEP and transaction-class error routine analysis and processing are permitted, but you should not attempt to retry the message.

However, if the application program handles the ‘TERMERR’ condition, the transaction is not abended. Control is returned to the program. In this circumstance, no further use can be made of the failed session.

Additional information for the NEP (TWAADINF)

Fields TWANPFW, TWANLD, and TWANLDL can be reset by the NEP. For information about the use of TWANPFW, see the supplied sample node error program, and “Optional error processor for interactive logical units” on page 410.

TWANLD and TWANLDL — using the DFHZNAC logging facility: You can use the logging facility available in DFHZNAC to aid in retrieving information. You specify the address of the data that you want to examine in field TWANLD of the communication area, and the length of the data in field TWANLDL. The data is logged to the CSNE transient data queue for future inspection.

Note: No data in excess of 220 bytes is logged.

You can also send user-written messages to the CSNE log using the transient data facility. To write your messages, you must code the EXEC CICS WRITEQ TD instruction directly into the node error program.

TWAPIP — and application routing failure: The EXEC CICS ISSUE PASS command passes control from CICS to another named VTAM application. For programming information about the EXEC CICS ISSUE PASS command, see the *CICS Application Programming Reference* manual. The ISSUE PASS command in turn invokes the VTAM macro CLSDST with OPTCD=PASS, and, in addition, if NOTIFY has been specified on the CLSDSTP system initialization parameter, with PARMS=(THRDPTY=NOTIFY). CICS is then notified of the outcome of any CLSDST request.

This notification results in an informative message being issued, and causes DFHZNAC to invoke your NEP, whether the CLSDST request has failed or succeeded. The NEP can discover that a CLSDST OPTCD=PASS request is in progress by examining field TWAPFLG for the pass-in-progress indicator, TWAPIP. The success or failure of the CLSDST OPTCD=PASS request can be determined by examining the error code at TWAEC.

If the pass operation fails, DFHZNAC sets up a default set of recovery actions that can be modified by your NEP. A possible recovery, when, for example, the target application program is not active, would be to reestablish the session with the initial application using a SIMLOGON request and for CICS to send its “good morning” message to the terminal. The default action is to leave the session disconnected and to make it NOCREATE.

If CLSDSTP=NONOTIFY has been specified, and autoinstall is being used, CICS takes no action, even if the ISSUE PASS fails.

If persistent sessions support is active, autoinstall terminals are deleted after the AIRDELAY, so any expected NEP processing as a result of CLSDSTP=NOTIFY being coded does not take place.

The additional system parameters (TWASYSPM)

If a data element referenced in this section of the parameter list (for example, the TIOA) does not exist when the NEP is driven, its address and length fields are set to zero.

Fields TWAPNETN, TWAPNTID, and TWAUPRRC can be reset by the NEP. The use of these fields is discussed in “Coding for the 3270 ‘unavailable printer’ condition” on page 418.

Persistent session parameters (TWAXRNOT)

These fields can be reset by the NEP.

The sample node error program

The sample node error program provides a general environment for the execution of error processing routines (error processors), each of which is specific to certain error codes generated by the node abnormal condition program. Sufficient optional error processors for normal operation of VTAM 3270 or interactive logical unit networks are provided; these can be easily supplemented or replaced by user-supplied error processors.

There are three types of error that may occur in a VTAM network:

- Errors in the host system
- Communication errors, such as session failures
- Abnormal conditions at the terminal, such as intervention required and invalid requests

A sample node error program is supplied with CICS, and can be used as the basis of each subsequent node error program that you write. This provides you with:

- A general environment within which your error processing programs can be added
- The default node error program in a system that has several node error programs

The CICS-supplied sample node error program is described in greater detail below.

Compatibility with the sample terminal error program

Receipt of sense or status codes corresponds to error codes X'D9', X'DC', X'DD', and X'F2'. Weighted counts of these messages are maintained against numeric and time thresholds. If the numeric threshold is exceeded, default actions are taken. If the time threshold is reached, the count is reset. This is equivalent to the function in the sample TEP, except that sense or status arising out of the “from” device on a COPY command is now presented to the node error program as an error on the “to” device, thus exceeding the threshold, which causes the request to be terminated, although the terminal remains in service. Some of the weights for errors that occur on the 3270 display device have been revised, but otherwise the weight and threshold values are the same as the defaults used in the sample TEP.

Time threshold maintenance for the sample NEP is mandatory, and not optional as in the sample TEP.

For further information about time and threshold count limits, see the information about the sample terminal error program in Chapter 8, “Writing a terminal error program” on page 359.

The 3270 message ‘unavailable printer’ corresponds to error code X'42' (interval control PUT request has failed). The algorithm used for printer selection differs in VTAM support. The retry algorithm in the sample node error program is similar to this new selection algorithm.

Components of the sample node error program

The sample node error program comprises the following components:

- An entry section.
- The routing mechanism.
- The node error table.
- Optional common subroutines.
- Optional error processors for 3270 or interactive logical units. A node error program cannot be generated with both 3270 and interactive logical unit error processors.

The components are described in the sections that follow.

Entry section

On entry, the sample NEP uses DFHEIENT to establish base registers and addressability to the EXEC interface. It uses an EXEC CICS LOAD PROGRAM command to establish addressability to the node error table (NET) and, if included, the common subroutine vector table (CSVT). It uses an EXEC CICS ADDRESS COMMAREA command to obtain addressability to the communication area passed by DFHZNAC, and an EXEC CICS ADDRESS EIB command to obtain addressability to the EXEC interface block. If time support has been generated, the error is time-stamped for subsequent processing.

Routing mechanism

The routing mechanism invokes the appropriate error processor depending on the error code provided by the node abnormal condition program.

Groups of one or more error codes are defined in the DFHSNEP macro (see below). Each group is associated with an index (in the range X'01' through X'FF') and an error processor. A translate table is generated and the group index is placed at the appropriate offset for each error code. Error codes not defined in groups have a zero value in the table. An error processor vector table (EPVT) contains the addresses of the error group processors, positioned according to their indexes. The vector table extends up to the maximum index defined; undefined intermediate values are represented by zero addresses.

The error code is translated to obtain the error group index. A zero value causes the node error program to take no further action; otherwise the index is used to obtain the address of the appropriate error processor from the EPVT. A zero address causes the node error program to take no further action; otherwise a call is made to the error processor. This is entered with direct addressability to the NET and CSVT areas. When the error processor has been executed, the node error program returns control to the node abnormal condition program.

Node error table

The node error program may use a node error table (NET) that comprises the node error blocks (NEBs) used to maintain error status information for individual nodes (see Figure 24). Some or all of the NEBs can be permanently reserved for specific nodes; others are dynamically assigned to nodes when errors occur. Dynamically assigned NEBs are used exclusively for the nodes to which they are assigned until they are explicitly released. All the NEBs have an identical structure of error status blocks (ESBs). Each ESB is reserved for one error processor and associated with it by means of the appropriate error group index. The ESB length and format can be customized to the particular error processor that it serves.

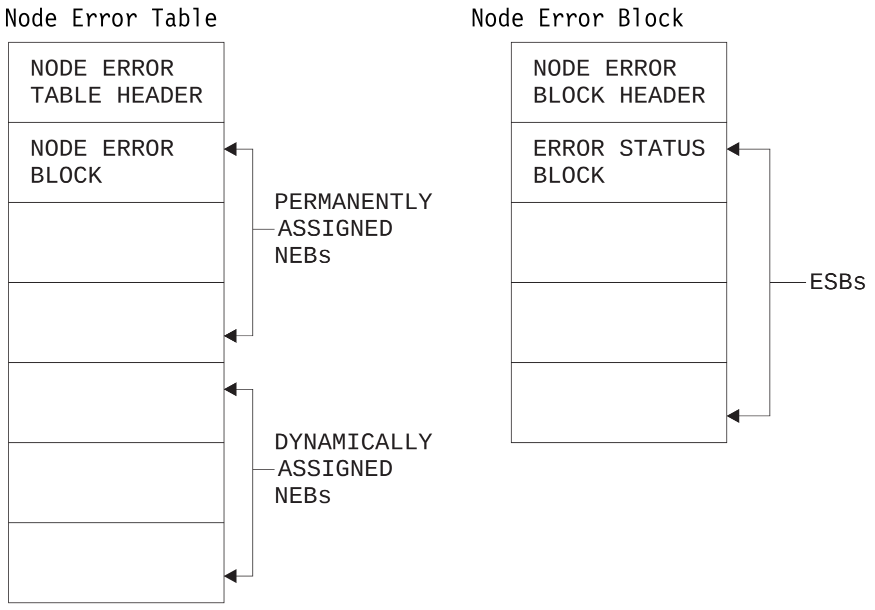


Figure 24. Format of node error table and node error block

Optional common subroutines

The common subroutines are addressed via the CSVT and provide error processors with the following functions:

- Locate or assign NEBs and ESBs on the basis of node ID and error group index.
- Time stamp an error, update an error count, and test an error count against numeric and time threshold values.
- Release a dynamically assigned NEB from a particular node.

Optional error processors for 3270 logical units

Two error processors are supplied for 3270 LUs, as follows:

1. Group index 1, error codes `X'D9'`, `X'DC'`, `X'DD'`, and `X'F2'`.

   These error codes correspond to the receipt of sense or status bytes in the user sense fields of the RPL. The error processor locates an ESB of the standard format and updates a weighted error count. The weight, threshold, and timer values are based on those used by the sample terminal error program 3270 except as noted in the previous section. If the threshold is not exceeded, the abend SEND, abend RECEIVE, abend transaction flags, and all the print action flags are turned off. Otherwise the default actions are taken and the NEB is released if it is reusable.

2. Group index 2, error code X'42'.

   This code means that no 3270 printer was available to satisfy a print request made at a 3270 screen. The error processor examines the printers defined for this screen to determine why they were unavailable. If either is busy on a previous PRINT or COPY request (that is, a task is attached with a transaction ID of CSPP or CSCY) or is no longer unavailable, that printer address is returned to the node abnormal condition program which retries the print request with an IC PUT command. Otherwise the default actions are taken. (For more details, see the section “Coding for the 3270 ‘unavailable printer’ condition” on page 418.)

Optional error processor for interactive logical units

Only one error processor is supplied for interactive LUs: group index 1, with error code X'DC'.

This error code, in combination with a user sense value of X'081B', indicates a ‘receiver in transmit mode’ condition. The action flags in TWANPFW are manipulated to allow the failing SEND request to be retried.

Generating the sample node error program

The routing mechanism, common subroutines, CICS-supplied error processors, and user-supplied error processors are generated by means of DFHSNEP macros.

The sample node error program and table need to be translated, assembled, and link-edited. For information about the job control statements required to assemble and link-edit user-replaceable programs, refer to “Assembling and link-editing user-replaceable programs” on page 348.

Note that you should code the translator options NOPROLOG and NOEPILOG in your node error program.

Note also that an extra 24 bytes are required for the common subroutines register save area, and further space is required for the error processor save area. The CICS sample processors use 4 bytes of this area.

The DFHSNEP macro to generate the sample node error program has seven types, as follows:

TYPE=USTOR
to indicate the start of user storage definitions.

TYPE=USTOREND
to indicate the end of user storage definitions.

TYPE=INITIAL
to generate the routing mechanism and, optionally, the common subroutines.

TYPE=DEF3270
to generate the default CICS-supplied error processors for 3270 devices.

TYPE=DEFILU
to generate the default CICS-supplied error processor for interactive logical units operating in contention mode.

TYPE=ERRPROC
to indicate the start of a user-supplied error processor.

TYPE=FINAL
to indicate the end of the sample node error program.

DFHSNEP TYPE=USTOR and USTOREND—defining user storage

The DFHSNEP TYPE=USTOR macro has the following format:

```
DFHSNEP  TYPE=USTOR
```

This macro indicates the start of user storage definitions. It must be followed by your storage definitions, and then by DFHSNEP TYPE=USTOREND. If you use DFHSNEP TYPE=USTOR to define storage, then both it and DFHSNEP TYPE=USTOREND must be coded **before** DFHSNEP TYPE=INITIAL.

The DFHSNEP TYPE=USTOREND macro has the following format:

```
DFHSNEP  TYPE=USTOREND
```

This macro indicates the end of user storage definitions. Its use is mandatory if DFHSNEP TYPE=USTOR has been coded. If you use DFHSNEP TYPE=USTOR to define storage, then both it and DFHSNEP TYPE=USTOREND must be coded **before** DFHSNEP TYPE=INITIAL.

DFHSNEP TYPE=INITIAL—generating the routing mechanism

One DFHSNEP TYPE=INITIAL macro must appear immediately **after** DFHSNEP TYPE=USTOR and DFHSNEP TYPE=USTOREND (if they are coded) and **before** the remaining macros.

```
DFHSNEP  TYPE=INITIAL
         [,CS=NO]
         [,NAME=name]
         [,NETNAME=netname]
```

TYPE=INITIAL
indicates the start of the sample node error program and causes the routing mechanism to be generated.

CS=NO
specifies that the generation of the common subroutines is to be suppressed.

NAME=name
specifies the name of the node error program module identifier. The name must be a string of 1 through 8 characters. This operand is optional, and the default is DFHZNEP0. If the interface module DFHZNEP (generated by the

DFHZNEPI macro) is used, this operand must be specified (with a name other than DFHZNEP).

NETNAME=netname
specifies the name of the node error table to be loaded at initialization. The name must be a string of 1 through 8 characters. This operand is optional, and the default is DFHNET.

DFHSNEP TYPE=DEF3270—including error processors for 3270 LUs

The DFHSNEP TYPE=DEF3270 macro has the following format:

```
DFHSNEP  TYPE=DEF3270
```

TYPE=DEF3270
specifies that the CICS-supplied error processors for 3270 logical units are to be included in the node error program. This macro causes the following source code to be generated:

```
DFHSNEP TYPE=ERRPROC,GROUP=1,CODE=(D9,DC,DD,F2)
Sense/status error processor code.

DFHSNEP TYPE=ERRPROC,GROUP=2,CODE=42
Unavailable printer error processor code.
```

DFHSNEP TYPE=DEFILU—including error processors for INTLUs

The DFHSNEP TYPE=DEFILU macro has the following format:

```
DFHSNEP  TYPE=DEFILU
```

TYPE=DEFILU
specifies that the CICS-supplied error processor for interactive logical units is to be included in the node error program. This macro causes the following source code to be generated:

```
DFHSNEP TYPE=ERRPROC,GROUP=1,CODE=DC
(receiver in transmit mode error processor code)
```

DFHSNEP TYPE=FINAL—terminating DFHSNEP entries

One DFHSNEP TYPE=FINAL macro must follow all the other DFHSNEP macros. It has the following format:

```
DFHSNEP  TYPE=FINAL
```

TYPE=FINAL
indicates the end of the node error program and causes the error processor vector table (EPVT) to be generated.

DFHSNEP TYPE=ERRPROC—specifying a user error processor

The DFHSNEP TYPE=ERRPROC macro is used to indicate the start of a user-supplied error processor. The actual error processor code should immediately follow this macro. The assembly should be terminated by the statement: END DFHNEPNA.

The following operands can be used on the DFHSNEP TYPE=ERRPROC macro:

```
DFHSNEP  TYPE=ERRPROC
         ,CODE=(error-code,...)
         ,GROUP=error-group-index
```

TYPE=ERRPROC
indicates the start of a user-supplied error processor.

CODE=(error-code,...)
specifies the error codes that make up the error group, and which are therefore handled by the error processor supplied. The operand is coded as a sublist of 2-character representations of 1-byte hexadecimal codes. (The parentheses can be omitted for a single code.) For each code specified, the error group index is placed at the equivalent offset in the translate table. Thus, when this code occurs, the appropriate error processor can be identified.

GROUP=error-group-index
specifies an error group index for the error processor. This index is used to name the error processor, locate its address from the error processor vector table (EPVT), and optionally associate it with an ESB in each NEB. The index specified must be a 2-character representation of a 1-byte hexadecimal number in the range `X'01'` through `X'FF'` (a leading zero can be omitted). The error processor name has the form NEPROCxx, where “xx” is the error group index. A CSECT statement of this name is generated, which causes the error processor code to be assembled at the end of the node error program module and to have its own addressability.

If you intend to add your own error processors to the sample node error program, you should consider the following factors:

- The layout of the communication area. The communication area is described in detail in Figure 23 on page 401.
- The fact that certain functions cannot be used within DFHZNEP. (See “Restrictions on the use of EXEC CICS commands” on page 417.)
- The register conventions used by the sample node error program. These are described in Table 112 on page 414.

Table 112. Register assignment

Register	Use
0	Work register
1	Address of the EXEC parameter list
2	NEB base register (DFHSNEP only)
3	ESB base register (DFHSNEP only) NEP error class register (DFHZNEPI only)
4	NEP name pointer register (DFHZNEPI only)
5	NEP interface base register (DFHZNEPI only)
6	Work register
7	Work register
8	Work register
9	Work register
10	Code base register
11	Address of the EIB
12	Address of the communication area
13	Address of DFHEISTG storage
14	CSVT base and error processor link register Common subroutine link register
15	Error processor branch register Common subroutine branch register

Notes:

1. Register 14 must be saved for return from error processors. The common subroutine vector table (CSVT) is coded after the BALR to the error processor and so this register is also the CSVT base.
2. Registers 1, 10, 12, 13, 14, and 15 are set up on entry to error processors.
3. Registers 14 through 11 can be saved by error processors in an area reserved in EXEC interface storage at label NEPEPRS. Registers 15 through 11 do not need to be restored before return from error processors.
4. Registers 4 through 9 can be saved by common subroutines in an area reserved in EXEC interface storage at label NEPCSRS. They must be restored before return from the subroutines.

DFHSNET—generating the sample node error table

The DFHSNET macro is used to generate a node error table. Each sample node error table that you generate must be defined to CICS.

```
DFHSNET  [NAME=DFHNET|name]
         [,COUNT=100|threshold]
         [,ESBS=1|(index,length,...)]
         [,NEBNAME=(name,...)]
         [,NEBS=10|number]
         [,TIME=(7,MIN)|(interval,units)]
```

NAME=DFHNET|name
specifies the identifier to be included in the NET header. It must be a 1–8 character string. This operand is optional, and the default is DFHNET.

COUNT=100|threshold
specifies the error count threshold that is to be stored in the NET header for use by the common subroutines to update standard ESBs. If the threshold is exceeded, the error processor that invoked the subroutine is informed by a return code. The maximum value is 32 767. This operand is optional, and the default is 100.

ESBS=1|(index,length,...)
specifies the ESB structure for each NEB. This operand is coded as a sublist. Each element of the sublist comprises two values: "index" specifies an error group index for which an ESB is to be included in the NEB; "length" specifies the status area length, in bytes, for that ESB. The parentheses can be omitted for a single element. The "index" must be specified as a 2-character representation of a 1-byte hexadecimal number in the range `X'01'` through `X'FF'` (a leading 0 can be omitted). The "length" is constrained only because an 8-byte NEB header plus a 4-byte header for each ESB must be contained within the maximum NEB length of 32 767 bytes. If a null value is specified, a standard ESB with a status area length of 10 bytes is assumed. This is suitable for use by the common subroutines in maintaining a time-stamped error count.

This operand is optional and defaults to 1. This causes each NEB to be generated with one ESB for error group 1 with a status area length of 6 bytes.

NEBNAME=(name,...)
specifies the names of nodes that are to have a permanently assigned NEB. The names specified are assigned, in the order specified, to the set of NEBs requested by the NEBS operand. Any remaining NEBs are available for dynamic allocation to other nodes as errors occur. Each name must be a 1–4 character string. The parentheses can be omitted for a single name. This operand is optional and has no default.

NEBS=10|number
specifies the number of NEBs required in the NET. The maximum valid number is 32 767; the default is 10.

TIME=(7,MIN)|(interval,units)
specifies the time interval that is to be stored in the NET header for use by the common subroutines to maintain error counts in standard ESBs. If the threshold specified in the COUNT operand is not exceeded before this time interval elapses, the error count is reset to 0. Specify "units" as SEC, MIN, or HRS. The maximum values for "interval" are as follows: (86400,SEC), (1440,MIN), or (24,HRS). This operand is optional, and the default is set to (7,MIN).

DSECTs

The following DSECTs are provided:

Node Error Table Header: This contains the table name and common information relevant for all the node error blocks (NEBs) in the table.

```
DFHNETH    DSECT
NETHNAM    DS      CL8         Table name
NETHNBN    DS      H           Number of NEBs in table
NETHNBL    DS      H           Length of NEBs in table
NETHTIM    DS      PL8         Error count time interval
NETHECT    DS      H           Error count threshold
NETHFLG    DS      X           Flag byte
NETHINI    EQU     X'01'       Table initialized
           DS      X           Reserved
NETHFNB    DS      0F          First NEB
```

Node Error Block: The table contains node error blocks that are used for recording error information for individual nodes. These can be permanently assigned to specific nodes or dynamically assigned at the request of error processors.

```
DFHNETB    DSECT
NEBNAM     DS      CL4         Node name
NEBFLG     DS      X           Flag byte
NEBPERM    EQU     X'01'       Permanently assigned NEB
           DS      XL3         Reserved
NEBFESB    DS      0X          First NEB
```

Error Status Block: The NEBs can contain error status blocks. These are reserved for specific error processors and are identified by the corresponding error group index. An ESB can have a format defined by you, or can have a standard format suitable for counting errors over a fixed time interval.

```
DFHNETE    DSECT
ESBEGI     DS      X           Error group index
ESBFLG     DS      X           Flag byte
ESBSTAN    EQU     X'01'       Standard format ESB
ESBTTE     EQU     X'02'       Time threshold exceeded
ESBCTE     EQU     X'04'       Count threshold exceeded
ESBSLEN    DS      XL2         Status area length
ESBHLEN    EQU     *-DFHNETE   ESB header length
ESBSTAT    DS      0X          Status area
```

The following fields apply to the standard format:

```
ESBTIM     DS      PL8         Time stamp
ESBEC      DS      XL2         Error count
```

Common Subroutine Vector Table: The CSVT provides error processors with addressability to the common subroutines. The error processor link register gives addressability to the CSVT and so the first section of the DSECT overlies the code required to branch around the actual table.

```
DFHNEPC    DSECT
           DS      F        Load instruction
           DS      F        Branch instruction
CSVTNEP    DS      A        Node error program base address
CSVTESBL   DS      A        NEPESBL - ESB locate routine
CSVTNEBD   DS      A        NEPNEBD - NEB delete routine
CSVTECUP   DS      A        NEPECUP - error count update
                            routine
```

User-written node error programs

You can write your own NEP in any of the CICS-supported languages. However, CICS-supplied NEP code is provided in assembler language only. The communication area parameter list is supplied in assembler-language and C versions. The names of the supplied source files, copy books, and macros, are listed in Table 113. All are supplied in the VSE/ESA sublibrary PRD1.BASE.

Table 113. Supplied source files, copy books, and macros

Name	Type	Description
DFHZNEP0	Program	Default node error program (assembler language)
DFHZNEPX	Source	Default NEP (embedded by DFHZNEP0 via COPY statement)
DFHSNEP	Macro	Sample NEP program generator (assembler language)
DFHZNEPI	Macro	NEP interface generator (for multiple NEPs)
DFHNEPCA	Macro	Assembler-language communication area
DFHNEPCA	Copy book	C-language communication area

If you code in assembler language, you can use the sample NEP as a framework on which to construct your own node error program.

Restrictions on the use of EXEC CICS commands

There are certain restrictions on the commands that a NEP can issue. **The use of any commands which require a principal facility causes unpredictable results, and should be avoided**. In particular, you should not use commands which invoke the following functions:

- Terminal control (“CEMT-type” commands, such as EXEC CICS INQUIRE TERMINAL, *are* permissible).
- BMS (except routing).
- ISC communication (including function shipping). This includes START requests for remote transactions. Such requests are not recommended because CSNE (Node Abnormal Condition task) might become suspended while doing an ALLOCATE to the remote system.

  If you need to start a remote transaction, start a local transaction which starts a remote one in turn.

You should also note that you cannot use the NEP to suppress DFHZNAC messages.

Entry and addressability

On entry, your NEP should issue the commands:

```
EXEC CICS ADDRESS COMMAREA
EXEC CICS ADDRESS EIB
```

These commands provide addressability to the communication area passed by DFHZNAC, and to the EXEC interface block, respectively.

If you write your node error program in assembler language, you generate the communication area DSECT by coding:

```
DFHNEPCA TYPE=DSECT
```

If you write your program in C, you include the communication area definitions by coding:

```
#include <dfhnepca>
```

Coding for the 3270 ‘unavailable printer’ condition

The ‘unavailable printer’ condition arises when a print request is made using the 3270 print request facility, and there are no printers on the control unit, or when the printers are in one of the following conditions:

- Out of service
- Not in TRANSCEIVE or RECEIVE status for automatic transaction initiation
- With a task currently attached
- Busy on a previous operation
- Requiring intervention

The procedure is applicable to 3270 logical units or to the 3270 compatibility mode logical unit when using the PRINTER and ALTPRINTER operands of the CEDA DEFINE TERMINAL command.

The terminal control program recognizes this condition, and issues a READ BUFFER request to collect the data into a terminal I/O area. The TIOA is of the same format as it is when an application program has issued a terminal control read buffer request.

The terminal control program VTAM section (DFHZCP) then queues the TCTTE to the node abnormal condition program with error code X'42' (TCZCUNPRT). The node abnormal condition program (DFHZNAC) writes to the CSNE transient data queue:

- DFHZC2497 UNAVAILABLE PRINTER (device types 3270P and LUTYPE3)
- DFHZC3493 INVALID DEVICE TYPE FOR A PRINT REQUEST (all other printer device types)

Before linking to the node error program, DFHZNAC inserts the primary and secondary printer netnames and terminal IDs into the communication area, indicating also whether either printer is eligible for a print request. DFHZNAC links to the node error program with no default actions set.

On return from the node error program, DFHZNAC checks the additional system parameter TWAUPRRC in the communication area (see Figure 23 on page 401) and, based on its contents, performs one of the following actions:

- If your NEP sets TWAUPRRC to `X'FF'` (−1), DFHZNAC assumes that the node error program has disposed of the data to be printed and therefore takes no further action.
- If your NEP sets TWAUPRRC to zero, DFHZNAC assumes that no printer is available and takes no further action.
- If your NEP sets TWAUPRRC to neither zero nor −1, DFHZNAC assumes that one of either field TWAPNETN or field TWAPNTID is set. (If both are set, TWAPNTID(termid) takes precedence.) An interval control PUT is performed to the provided terminal. The transaction to be initiated is CSPP (print program), and the time interval is zero.
  - If an error occurs on the interval control PUT, DFHZNAC writes the ‘DFHZC2496 IC FAILURE’ message to the destination CSNE. DFHZNAC then links to the node error program again with the TWAUPRRC field set to −2. This is done to give the node error program a last chance to dispose of the data. On the second return from the node error program to DFHZNAC, the latter reexamines TWAUPRRC. If TWAUPRRC is −1, then the node error program has disposed of the data.
  - If no error occurs on the interval control PUT, DFHZNAC checks for the following printer conditions:
    - ‘Out of service’
    - ‘Intervention required’
    - Any condition other than RECEIVE or TRANSCEIVE status

    If one of these conditions is true, DFHZNAC issues the ‘DFHZC2495 PRINTER OUTSERV/IR/INELIGIBLE-REQ QUEUED’ message to the destination CSNE.

Finally, DFHZNAC terminates any print requests on the originating terminal and performs normal action flag processing on that terminal.

Coding for session failures

Following some categories of error associated with logical unit or path failures, the session between CICS and the logical unit may be lost. The default action taken by DFHZNAC may be to put the TCTTE out of service.

A method of automatically reacquiring the session is for your node error program to alter the default DFHZNAC actions and to keep the TCTTE in service. Your node error program can then issue an EXEC CICS START TERMID(name) command against that TCTTE for a transaction written in a similar manner to the CICS “good morning” signon message (CSGM). When the transaction is initiated using automatic transaction initiation (ATI), CICS tries to reacquire the session. If the session fails again, DFHZNAC is reinvoked and the process is repeated.

The time specified on the EXEC CICS START command is determined by installation-dependent expected-mean-time-to values.

If used in this way, the initiated transaction can write an appropriate signon message when the session has been acquired. Note, however, that if LOGONMSG(YES) is specified on the RDO TYPETERM resource definition, the CICS “good morning” message is also initiated when the session is opened. Refer to “Restrictions on the use of EXEC CICS commands” on page 417.

Coding for specific VTAM sense codes

Figure 25 shows how your NEP error processors could test for the presence of specific VTAM sense codes.

```
TEST1   EQU   *
        CLC   TWASENSR(2),SNS1            SENSE CODE EQUAL TO NNNN
        BNE   TEST2                       NO, THEN NEXT TEST
        NI    TWAOPT1,TWAOAF              PRINT ACTION MESSAGES ONLY
        OI    TWAOPT2,TWAOAS+TWAOAR+TWAOAT  ABANDON SEND,RECEIVE AND TASK
        NI    TWAOPT2,255-TWAOASM         SET SIMLOGON OFF
        OI    TWAOPT3,TWAOINT             SET INTLOG NOW ALLOWED
        NI    TWAOPT3,255-TWAONINT        OR RESET NOINTLOG
        B     END
        .
        .
        .
SNS1    DC    X'NNNN'
```

Figure 25. Sample code, showing how your node error program could test for specific VTAM sense codes

Writing multiple NEPs

You can write several node error programs, as described in “Multiple NEPs” on page 397. When an error occurs, the node abnormal condition program passes control to an interface module, DFHZNEPI, which determines the transaction class and passes control to the appropriate node error program.

If only one node error program is used, the interface module (DFHZNEPI) is not required. If the node error program is named DFHZNEP, the node abnormal condition program branches directly to that. If more than one node error program is used, the interface module (DFHZNEPI) is required. In this case, the node error programs must be given names other than DFHZNEP. There must be an installed program definition for every node error program generated.

DFHZNEPI macros

The following macros are required to generate the node error program interface module (DFHZNEPI):

- DFHZNEPI TYPE=INITIAL to specify the name of the default transaction-class routine
- DFHZNEPI TYPE=ENTRY to associate a transaction-class with a transaction-class error handling routine
- DFHZNEPI TYPE=FINAL to end the DFHZNEPI entries

The DFHZNEPI interface module must be generated when you require the node abnormal condition program to pass control to the appropriate user-written node error program for resolution of the error.

DFHZNEPI TYPE=INITIAL—specifying the default routine

The DFHZNEPI TYPE=INITIAL macro specifies the name of the default transaction-class routine to be used for the DFNZNEPI module.

```
DFHZNEPI  TYPE=INITIAL
          [,DEFAULT=name]
```

DEFAULT=name
specifies the name of the default transaction-class routine to be used. A link is made to this default routine if you specify for the transaction (using the CEDA DEFINE PROFILE, CEDA DEFINE SESSIONS, or CEDA DEFINE TYPETERM command) a NEPCLASS value of 0 (the default) or higher than 255, or if you do not specify a transaction-class routine using the DFHZNEPI TYPE=ENTRY macro for the class specified on the NEPCLASS operand.

If either of the preceding conditions is true, but you do not code the DEFAULT operand, then no routine is invoked.

The DFHZNEPI TYPE=INITIAL macro must always be specified, and must be placed before any other forms of the DFHZNEPI macro. Only one TYPE=INITIAL macro can be specified.

DFHZNEPI TYPE=ENTRY—specifying a transaction-class routine

You use the DFHZNEPI TYPE=ENTRY macro to associate a transaction class (NEPCLASS) with a transaction-class error handling routine. The format of this macro is:

```
DFHZNEPI  TYPE=ENTRY
          ,NEPCLAS=integer
          ,NEPNAME=name
```

NEPCLAS=integer
specifies the transaction-class, and must be in the range 1 through 255. No value should be specified that has been specified in a previous DFHZNEPI TYPE=ENTRY instruction.

NEPNAME=name
specifies a name for the transaction-class routine to be associated with the specified transaction-class. An error condition results if the name is specified either as DFHZNEP, or is longer than 8 characters.

Note: You can use the sample node error program (with a name other than DFHZNEP) as a transaction-class routine for the interface module, DFHZNEPI.

DFHZNEPI TYPE=FINAL—terminating DFHZNEPI entries

```
DFHZNEPI  TYPE=FINAL
```

TYPE=FINAL
completes the definition of module DFHZNEPI and must be specified last. The assembly should be terminated by an END statement with no entry name specified, or by the statement: END DFHZNENA.

Handling shutdown hung terminals in the node error program

Error Code: X'6F'
Symbolic Name: TCZSDAS
Message Number: DFHZC2351

For error code X'6F', DFHZNAC passes the setting of TCSACTN and the DFHZC2351 reason code to DFHZNEP, and DFHZNEP can modify the force-close action for the current terminal.

How DFHZNAC passes the setting of TCSACTN to DFHZNEP

For error code X'6F', DFHZNAC passes the setting of the TCSACTN system initialization parameter to DFHZNEP by setting TWAOSCN. TWAOSCN off (B'0') indicates TCSACTN=NONE, and TWAOSCN on (B'1') indicates TCSACTN=UNBIND.

How DFHZNAC passes the DFHZC2351 reason code to DFHZNEP

For error code X'6F', the DFHZC2351 reason code is passed to DFHZNEP in the NEP communications area (NEPCA) field TWATRSN. TWATRSN is a 1-byte code field. Note that, currently, TWATRSN overlays TWAREASN (also a 1-byte field). The codes, and their meaning, are:

```
 01  Request in progress    06  Waiting for RTR
 02  Task still active      07  BID in progress
 03  Waiting for SHUTC      08  Other TC work pending
 04  Waiting for BIS        99  (X'63')  Undetermined
 05  Waiting for UNBIND
```

See Terminal Control message DFHZC2351 for further details.

How DFHZNEP can modify the force-close action for the current terminal

For error code X'6F', DFHZNEP can modify the force-close action, for the current terminal, by setting TWAOSCN. If DFHZNEP sets TWAOSCN off (B'0'), DFHZNAC will not attempt to force-close the terminal (TCSACTN=NONE), however, if DFHZNEP sets TWAOSCN on (B'1'), DFHZNAC will attempt to force-close the terminal (TCSACTN=UNBIND). Internally, DFHZNAC achieves this by converting the TWAOSCN normal close to a TWAOCN forced close. DFHZNEP cannot modify either of the system initialization parameters TCSWAIT or TCSACTN.

Using the node error program with VTAM persistent sessions

Persistent session support is described in the *CICS Recovery and Restart Guide*.

One of the steps in the conversation-restart process is to link to the node error program with error code `X'FD'`. If you want to be able to change any of the system-wide recovery notification options (whether terminal users are notified of a recovery, the recovery message, or the recovery transaction) for some terminals, you should write your own error processor to handle code `X'FD'`.

When using persistent sessions, note the following:

- When a session has been recovered, it may be a good idea to run NEP processing equivalent to your normal “session started” (code `X'48'`) processing, because code `X'48'` is not passed on session recovery when persistent sessions are used.
- In certain situations where sessions have persisted over a failure but have been unbound on restart (for example, a COLD start occurs after a CICS failure), the NEP is not driven. (In systems without persistent session support, the NEP is always driven with code `X'49'`, “session terminated”, when a VTAM session terminates.) Conditions leading to the issuing of the following messages do not drive the NEP. The messages appear on the system console:

  ```
  DFHZC0120    DFHZC0124
  DFHZC0121    DFHZC0129
  DFHZC0122    DFHZC0130
  DFHZC0123
  ```

  Conditions leading to the issuing of messages `DFHZC0125` and `DFHZC0131` drive the NEP with codes `X'FB'` and `X'FC'` respectively. It is recommended that you run NEP processing equivalent to your normal “session terminated” NEP processing for these conditions.
- If zero is specified on the AIRDELAY system initialization parameter, autoinstalled terminals are not recovered after a restart. Similarly, if the delay period specified on AIRDELAY expires before an autoinstalled terminal is used after a restart, the terminal definition is deleted. In these circumstances, any expected NEP processing as a result of CLSDSTP=NOTIFY being coded does not take place.

Changing the recovery notification

The method of recovery notification for a terminal is defined using the RECOVNOTIFY option of the RDO TYPETERM resource definition, which is described in the *CICS Resource Definition Guide*. This is the most efficient way to specify the recovery notification method for the whole network, because CICS initiates the notification procedure during the early stages of takeover.

You can use the node error program to change the recovery notification method for some of the switched terminals. For example, you may want most terminals of a particular type to receive the recovery message at takeover, but the rest to get no notification that service has been restored. To achieve this, you could code RECOVNOTIFY(MESSAGE) in the RDO TYPETERM resource definition, and then use the node error program to change the recovery notification to NONE for the relatively few terminals that are not to be notified.

Changing the recovery message

If you define a terminal with RECOVNOTIFY(MESSAGE) in its RDO TYPETERM definition, a recovery message is sent to the terminal after takeover. By default, for a persistent session recovery, this is the following CICS-supplied message in BMS map DFHXRC1 of map set DFHXMSG:

```
DFHZC0199  CICS has recovered after a system failure.
           Execute recovery procedures.
```

You can specify your own map set in the node error program if you want to change the recovery message for some of the switched terminals. This could be useful, for example, if signon security is in force and you want to tell terminal users to sign on again. The map set that you specify must have an installed program definition. If you choose to change the recovery message for all terminals, it would be more efficient to replace the CICS-supplied map with your own.

Changing the recovery transaction

The recovery transaction, to be started at a terminal after takeover, is specified using the RMTRAN system initialization parameter. This is the most efficient way of specifying a recovery transaction for the network. You can specify a different transaction for some of the switched terminals by overwriting field TWAXTRAN in the communication area. The transaction that you specify must have an installed transaction definition, and the terminal must be defined with the option ATI(YES).

If the transaction specified in TWAXTRAN does not exist, CICS tries to start the CSGM transaction. If this also fails, CICS terminates the session.

Chapter 10. Writing a program to control autoinstall of terminals

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, “General notes about user-replaceable programs” on page 347 apply to this chapter.

This chapter describes the user-replaceable program that controls the automatic installation of locally-attached VTAM terminals (including APPC single-session devices). For information about controlling the automatic installation of local APPC connections that are initiated by BIND requests, see Chapter 11. For information about controlling the installation of shipped terminals and connections, see Chapter 12.

The chapter is divided into the following sections:

Preliminary considerations

You use DFHCSDUP or CEDA DEFINE command to define VTAM-connected resources to your CICS system. This command puts your definitions onto the CICS system definition file (CSD). Having defined your resources, you can allow CICS to create entries in the TCT automatically, whenever VTAM resources request connection to CICS. A particular advantage of automatic installation (autoinstall) is that the resource occupies storage in the TCT only while it is connected to CICS.

You use the autoinstall control program to select some of the data needed to automatically install your terminals—notably the CICS terminal name and the model name to be used in each instance. You can use the CICS-supplied autoinstall program, or extend it to suit your own purposes.

For an overview of autoinstall, see the *CICS Resource Definition Guide*. You should also read the sections in the same manual that describe the CEDA commands that create the environment in which your control program can work.

If you choose automatic installation for some or all of your terminals, you must:

- Create some model TERMINAL definitions.

- Define the terminals to VTAM, so that their definitions in VTAM match the model TERMINAL definitions in CICS.
- If you are using VTAM model terminal support (MTS), define the MTS tables to VTAM.
- Use the default autoinstall control program for terminals (DFHZATDX), or write your own program, using the source-code of the default program and the customization examples in this chapter as a basis. (You can write an entirely new program if the default program does not meet your needs, but you are recommended to try a default-based program first.) You can write your program in any of the languages supported by CICS—the source of the default program is provided in assembler language, COBOL, PL/I, and C in the VSE/ESA sublibrary PRD1.BASE. You can rename your user-written program.

  Note: You can have only one active autoinstall control program for terminals and connections. You specify the name of the active program on the AIEXIT system initialization parameter. The DFHZATDY program described in Chapter 11 provides the same function for terminal autoinstall as DFHZATDX, but in addition provides function to autoinstall APPC connections initiated by BIND requests. Thus, if you want to autoinstall APPC connections as well as terminals, you should use a customized version of DFHZATDY, rather than DFHZATDX.

Coding entries in the VTAM LOGON mode table

CICS uses the logmode data in the VTAM LOGON mode table when processing an autoinstall request. Autoinstall functions properly only if the logmode entries that you define to VTAM have matches among the model TERMINAL definitions that you specify to CICS.

The tables in Appendix A, “Coding entries in the VTAM LOGON mode table” on page 627 show, for a variety of possible terminal devices, what you must have coded on the VTAM MODEENT macros that define, in your logmode table, the terminals that you want to install automatically. Between them, the tables show the values that must be specified for each of the operands of the MODEENT macro.

Some of the examples in the appendix correspond exactly to entries in the IBM-supplied logon mode table called ISTINCLM. Where this is so, the table gives the name of the entry in ISTINCLM.

Using model terminal support (MTS)

CICS Transaction Server for VSE/ESA supports the model terminal support (MTS) function of VTAM.

Using MTS, you can define the model name, the printer (PRINTER), and the alternate printer (ALTPRINTER) for each terminal in a VTAM table. This information is sent by VTAM in an extended CINIT RU. CICS captures it as part of autoinstall processing at logon, and uses it to create a TCTTE for the terminal.

If you are using MTS, you must use the CICS Transaction Server for VSE/ESA Release 1 version of DFHZATDX. If you write your own autoinstall control program, you must ensure that it takes account of the extended data pointed to in the communication area. (See “The autoinstall control program at INSTALL” on page 427.)

Coding entries for MTS

You need to define model names (MDLTAB, MDLENT, and MDLPLU macros) and printer and associated printer names (ASLTAB, ASLENT, and ASLPLU macros) to VTAM.

The autoinstall control program for terminals, DFHZATDX

In addition to managing your resource definition, your autoinstall control program can perform any other processes that you want at this time. Its access to the command-level interface is that of a normal, nonterminal user task. Some possible uses are listed on page 438.

The control program is invoked when:

1. An autoinstall INSTALL request is being processed
2. An autoinstall DELETE request has just been completed
3. An autoinstall request has previously been accepted by the user program, but the subsequent INSTALL process has failed

On each invocation of the autoinstall control program, a parameter list is passed (using a communication area), describing the function being performed (INSTALL or DELETE), and providing data relevant to the particular event. (In case 3 above, the control program is invoked as if for DELETE).

The INSTALL and DELETE events are now described in detail.

The autoinstall control program at INSTALL

If autoinstall is operative, the autoinstall control program is invoked at INSTALL for:

- Local VTAM terminals
- Local APPC single-session connections initiated by a CINIT
- Local APPC parallel-session connections initiated by a BIND
- Local APPC single-session connections initiated by a BIND
- Shipped terminals and connections

On each invocation, CICS passes a parameter list to the control program by means of a communication area addressed by DFHEICAP. The parameter list passed at INSTALL of APPC connections initiated by BIND requests is described in “The communication area at INSTALL for APPC connections” on page 447. The parameter list passed at INSTALL of shipped terminals and connections is described in “The communications area at INSTALL for shipped terminals” on page 456.

The control program is invoked at INSTALL for terminals (and APPC single-session connections initiated by a CINIT) when both:

- A VTAM logon request has been received from a resource eligible for automatic installation whose NETNAME is not in the TCT.
- Autoinstall processing has been completed to a point where information (a terminal identifier and autoinstall model name) from the control program is required to proceed.

The communication area at INSTALL for terminals

The layout of the communication area is shown in Figure 26.

```
Fullword 1          Standard Header
  Byte  1           Function Code          (X'F0' for INSTALL)
  Bytes 2 - 3       Component Code         Always 'ZC'
  Byte  4           Reserved               Always X'00'
Fullword 2          Pointer to NETNAME_FIELD
Fullword 3          Pointer to MODELNAME_LIST
Fullword 4          Pointer to SELECTED_PARMS
Fullword 5          Pointer to CINIT_RU
```

Figure 26. Autoinstall control program's communication area at INSTALL

The parameter list contains the following information:

1. Standard Header. Byte 1 indicates the request type (this is character '0' for INSTALL).
2. Pointer to a 2-byte length field, followed by the NETNAME of the resource requesting LOGON.
3. Pointer to an array of names of eligible autoinstall models. The array is preceded by a 2-byte field describing the number of 8-byte name elements in the array. If there are no elements in the array, the number field is set to zero.
4. Pointer to the area of storage that you use to return information to CICS, and where the MTS information from the VTAM CINIT is stored.
5. Pointer to VTAM LOGON data (the CINIT request unit). The data is preceded by a 2-byte length field, indicating the length of the CINIT request unit, and includes the 3-character NS header. The format of the CINIT request unit is described in the *SNA Network Product Formats* manual.

CICS passes a list of eligible autoinstall models in the area addressed by fullword 3 of the parameter list.

If the model name is not supplied by MTS, the control program must select a model from this list that is suitable for the device logging on, and move the model name to the first 8 bytes of the area addressed by fullword 4 of the parameter list.

For example, if a 3270 printer attempts to autoinstall, the subset of matching models includes all the types in VTAM category 2 that you have defined as models. This subset could include any of the following:

- DEVICE(3270) TERMMODEL(2)
- DEVICE(3270) TERMMODEL(1)
- DEVICE(3270P) TERMMODEL(2)
- DEVICE(3270P) TERMMODEL(1)
- DEVICE(3275) TERMMODEL(2)
- DEVICE(3275) TERMMODEL(1)

The control program selects one model from this list, and CICS uses this model to build the TCTTE for the device. The default autoinstall control program, DFHZATDX, always selects the first model name in the list.

If you are not using MTS but need a printer ID or NETNAME (or an alternative printer ID or NETNAME) associated with this terminal, then your control program can supply this in the area addressed by fullword 4.

If you are using MTS, CICS passes the control program the printer and alternative printer NETNAMEs specified on the VTAM ASLTAB macro.

Before returning to CICS, the control program must supply a CICS terminal name for the device logging on, and must set the return code field to X'00' if the autoinstall request is to be allowed.

Figure 27 shows all of these fields in their required order.

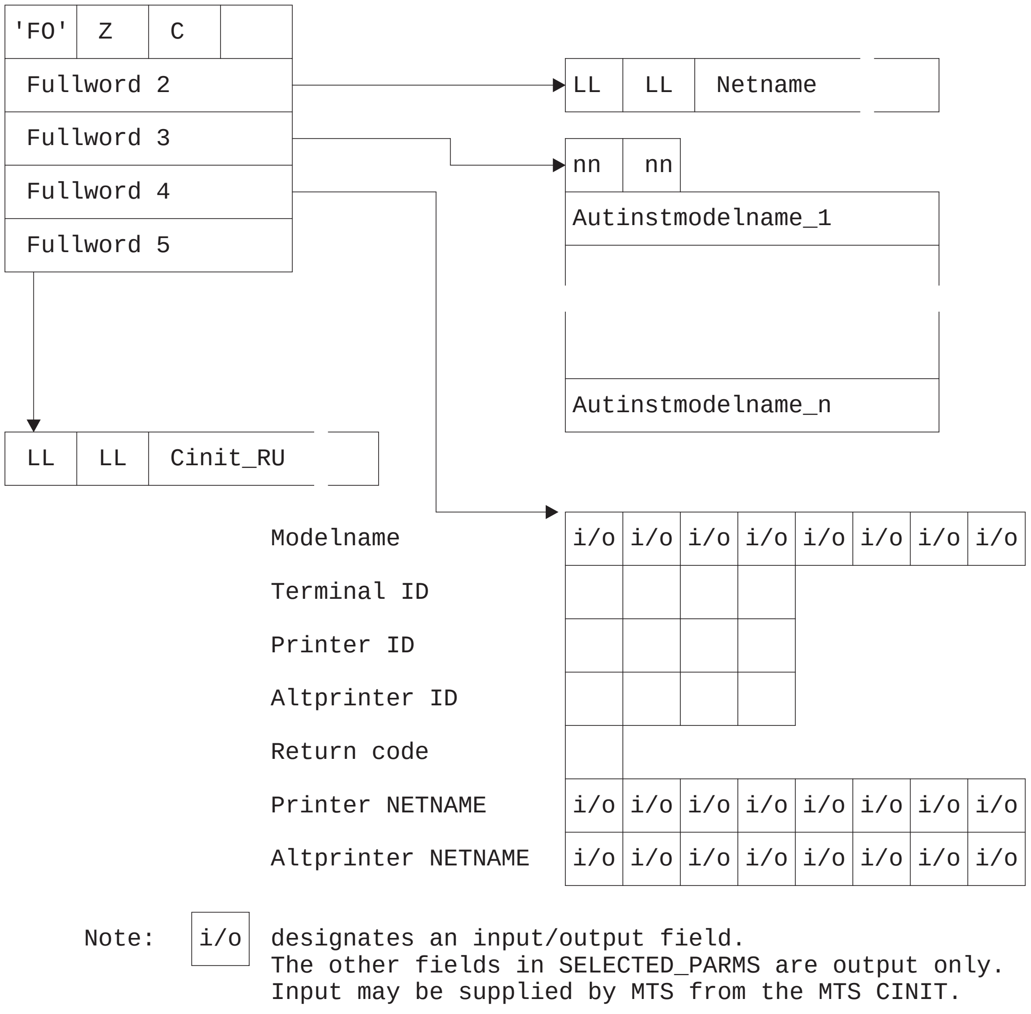


Figure 27. Autoinstall control program's parameter list at INSTALL

How CICS builds the list of autoinstall models

If CICS finds an MTS model name (and the model is defined to CICS and is compatible with the VTAM information describing the resource), it puts the model name into the model name list (Autinstmodelname_1), and also into the model name field (Modelname) in the selection list addressed by fullword 4 of the parameter list.

If CICS is unable to find an MTS model name in the MTS Control Vector, or the named model does not exist or is invalid, it builds the list of autoinstall models by selecting from the complete list of terminal models those models that are compatible with the VTAM information describing the resource. The complete list of autoinstall models available to CICS at any time comprises all the definitions with AUTINSTMODEL(YES) and AUTINSTMODEL(ONLY) that have been installed, both by the GRPLIST on CICS cold start, and by INSTALL GROUP commands issued by CEDA. The *CICS Resource Definition Guide* describes the definition of models.

Table 146 on page 629 gives you the information to work out which model types could be included in the subset of models passed to the autoinstall control program when a particular terminal attempts to install. The subset is determined by the VTAM characteristics of the device attempting to log on. The number in the right-hand column of the figure indicates the selection of the subset from the full list. When a terminal with a given combination of DEVICE, SESSIONTYPE, and TERMMODEL values attempts to logon, the subset of matching models passed to the control program includes all the models with DEVICE, SESSIONTYPE, and TERMMODEL values that have a corresponding VTAM category number in the right-hand column of the table.

If CICS finds no model that exactly matches the BIND, and if the return code in the area addressed by fullword 4 of the parameter list is nonzero, then CICS issues error message ‘DFHZC6987’. This message contains a “best failure” model name, which is provided for diagnostic purposes only. It is described in detail in “CICS action on return from the control program” on page 433, and in the *VSE/ESA Messages and Codes Volume 3* manual.

Returning information to CICS

At the INSTALL event, the autoinstall control program is responsible for allowing or denying the connection of a new terminal resource to the CICS system. This decision can be based on a number of installation-dependent factors, such as security, or the total number of connected terminals. CICS takes no part in any such checking. You decide whether any such checking takes place, and how it is done.

If the INSTALL request is to proceed, the control program **must** do the following:

- Return an autoinstall model name in the first 8 bytes of the area addressed by fullword 4 of the parameter list, unless this has already been set by MTS support.

  If the control program returns a model name not in the subset passed to it by CICS, CICS cannot guarantee what will happen when further processing takes place. It is the user’s responsibility to determine the effect of associating any particular logon request with a particular model name, because no interface is provided to the in-storage “model” objects.

- Supply a CICS terminal name (TERMID) in the next four bytes of the return area.

  DFHZATDX takes the last four nonblank characters of the NETNAME (addressed by fullword 2 of the parameter list) as the terminal name, so you must code your own autoinstall program if this does not match your installation’s naming conventions. See “Setting the TERMINAL name” on page 432 for information on this.

Note that when processing an AUTOINSTALL request for an LU6.2 single session terminal the four byte terminal identifier returned by the user program is used to name a CONNECTION. It should therefore conform to the naming standards for a CONNECTION (rather than a TERMINAL) as defined in the *CICS Resource Definition Guide*. The user program could identify an LU6.2 AUTOINSTALL request in one of the following ways:

  – Use a MODEL naming convention and examine the model name pointed to by fullword 3.
  – Test bytes 14 and 15 of the CINIT BIND which is pointed to by fullword 5 for X'0602' (LU6.2).

- Set the return code to X'00'.

  On entry to the autoinstall control program, the return code always has a nonzero value. If you do not change this, the autoinstall request is rejected.

If you are not using MTS, your control program can also supply or change any of the optional values, such as PRINTER and ALTPRINTER IDs or NETNAMEs, before returning to CICS. If you need information about the formats and acceptable character ranges for any of the return values, refer to the *CICS Resource Definition Guide*.

If you are using MTS, then VTAM supplies the PRINTER and ALTPRINTER NETNAMEs, if specified.

The printers need not be installed at this stage; however, they must be installed before you use print key support. PRINTER and ALTPRINTER IDs override PRINTER and ALTPRINTER NETNAMEs.

Note that TERMID, PRINTER, and ALTPRINTER are the only attributes of the TERMINAL definition that can be set by the autoinstall control program; all other attributes must come from one of these sources:

- The VTAM LOGMODE entry (MODEENT)
- The autoinstall model TERMINAL definition
- The TYPETERM definition that it refers to
- The QUERY function
- Model names from VTAM MDLTAB MDLENT and printers' NETNAMEs from VTAM ASLTAB ASLENT (if you are using MTS)

Notes:

1. The QUERY function overrides any extended attributes specified in the TYPETERM definition.
2. You cannot override information in the LOGMODE entry, with the model TERMINAL and TYPETERM; they must match.

If your control program decides to reject the INSTALL request, it should return to CICS with a nonzero value in the return code.

Having completed processing, the control program must return to CICS by issuing an EXEC CICS RETURN command.

Selecting the autoinstall model

If you are using model terminal support to supply the model name (and the named model exists and is valid), CICS passes the model name to your autoinstall control program—you do not need to make any further selection.

As a general rule, all the models in the list passed to your program match the VTAM data for the terminal. That is to say, a viable TCT entry usually results from the use of any one of them. (The exception to this rule involves the VTAM RUSIZE; if this value is incompatible, CICS issues an error message.) The default autoinstall control program merely picks the first model in the list. However, this model may not provide the attributes required in all cases. For instance, you do not want a 3270 display device definition for a 3270 printer. Your control program must be able to select the model that provides the characteristics you require for this terminal—for example, security characteristics.

To save on storage, you should try to minimize the number of different models available to the control program, and the number of different TYPETERM definitions referenced by those models. If you are migrating your definitions from DFHTCT macros, look carefully at them and eliminate those that are unnecessarily different from others. Use the QUERY function for all devices that can support it. For bisynchronous devices, which do not support QUERY, one approach is to make the definition as straightforward as possible, with no special features.

If you need special models for special cases, you can use a simple mapping of, for example, NETNAME (generic or specific) to AUTINSTNAME. Your control program could go through a table of special case NETNAMEs, choosing the specified model for each. The default model would be used for any terminal not in the table. (Note that the list of models presented to the control program is in alphabetical order with one exception which is described in the notes to Table 147 on page 631.)

Setting the TERMINAL name

The TERMINAL name must be unique, and one through four characters long. For a list of the acceptable characters, see the *CICS Resource Definition Guide*. (The TERMINAL name is the identifier CICS uses for the terminal. The NETNAME is the identifier VTAM uses for the terminal.)

You may have transactions that depend on the terminals from which they are initiated, or to which they will be attached, having particular TERMINAL names. Some transactions are restricted to particular terminals and others behave in different ways, depending on the terminal. In some cases, the transaction may gather statistics about terminal use, using the TERMINAL name as a reference. The TERMINAL name may have meaning to those managing, using, or maintaining the network: it may, for instance, denote geographical location or departmental function.

The NETNAME is really more suitable for these purposes than the TERMINAL name, because it is eight characters in length. If you can use the NETNAME, the TERMINAL name can be randomly assigned by the autoinstall control program, and it does not matter if a terminal has a different TERMINAL name every time the user logs on. The control program is required, in this case, only to make the TERMINAL name unique within the system in which the terminal is to be autoinstalled. If the control program attempts to install a TCT entry for a TERMINAL name that already has a TCT entry, the installation is rejected, despite the fact that the terminal is eligible and a suitable model has been found. (By contrast, if the NETNAME already has a TCT entry, the terminal uses it and autoinstall can never be invoked.)

The default autoinstall control program creates the TERMINAL name from the last four nonblank characters of the NETNAME. This may not satisfy the requirement for uniqueness. One way of overcoming this problem is to use the EXEC CICS INQUIRE command from the control program, to determine whether the TERMINAL name is already in use. If it is, modify the last character and check again.

However, you may be in a situation where you must continue to use unique and predictable TERMINAL names for your terminals. Your control program must be able to assign the right TERMINAL name to each terminal, every time the user logs on. Two possible approaches to this problem are:

- Devise another algorithm to generate predictable TERMINAL names from NETNAMEs
- Use a table or file to map TERMINAL names to NETNAMEs.

Devising an algorithm avoids the disadvantages of using a table or a file, but it might be difficult to ensure both uniqueness and predictability. If some of the information in the NETNAME is not needed by CICS, it can be omitted from the TERMINAL name. An algorithm is probably most appropriate in this situation.

Using a table has two disadvantages, each of which loses you some of the benefits of autoinstall: it takes up storage and it must be maintained. You could create a table in main temporary storage, so that it is placed in extended storage, above the 16MB line. You could use a **VSAM file** rather than a table, to avoid the storage problem. However, this might be slower, because of the I/O associated with a file. The table or file can contain information such as PRINTER and ALTPRINTER, and you can add information such as AUTINSTNAME for devices that need particular autoinstall models. (See “Selecting the autoinstall model” on page 432.)

CICS action on return from the control program

When CICS receives control back from the autoinstall control program, it examines the return code field. If this is zero, and if the other required information supplied is satisfactory, CICS schedules the new resource for OPNDST in order to complete the logon request. If the installation process fails, then the control program is driven again, as though a DELETE had occurred. (See the section “The autoinstall control program at DELETE” on page 435 for details.) This is necessary to allow the program to free any allocations (for example, terminal identifiers) made on the assumption that this INSTALL request would succeed.

If the return code is not zero, then CICS rejects the connection request in the same way as it rejects an attempt by an unknown terminal to log on to CICS when autoinstall is not enabled.

For all autoinstall activity, messages are written to the transient data destination CADL. If an INSTALL fails, a message is sent to CADL, with a reason code. You can therefore check the output from CADL to find out why an autoinstall request failed.

If an autoinstall attempt fails for lack of an exact match, then details of the “best failure” match between a model and the BIND image are written to the CADL transient data destination.

The message takes the following form:

```
DFHZC6987 BEST FAILURE FOR NETNAME: nnnnnnnn,
          WAS MODEL_NAME: mmmmmmmm,
          CINIT BIND: cccccccc...,
          MODEL BIND: bbbbbbbb...,
          MISMATCH BITS: xxxxxxxx...
```

where

- ‘nnnnnnnn’ is the netname of the LU which failed to log on.
- ‘mmmmmmmm’ is the name of model that gave the best failure. (That is, the one that had the fewest bits different from the BIND image supplied by VTAM.)
- ‘cccccccc...’ is the CINIT BIND image.
- ‘bbbbbbbb...’ is the model BIND image.
- ‘xxxxxxxx...’ is a string of hexadecimal digits, where ‘xx’ represents one byte, and each byte position represents the corresponding byte position in the BIND image. A bit set to ‘1’ indicates a mismatch in that position between the BIND image from VTAM and the BIND image associated with the model.

A suggested course of action is as follows :

1. Determine whether a model such as ‘mmmmmmmm’ is suitable. If there are several models that have identical BIND images, differing only in end-user options, then only the first such model is named in the above message. It will be up to your control program to make the choice, when the logmode table entry is corrected.
2. Identify the VTAM logmode table entry that is being used.
3. Check that this logmode table entry is not successfully in use with other applications, so that to change it might cause this other use of it to fail.
4. Amend the logmode table entry by switching the bits corresponding to 1-bits in the mismatch string. That is, if the bit in the VTAM BIND image corresponding to the bit position set to ‘1’ in ‘xxxxxxxx...’ above is ‘1’, set it to ‘0’; if it is ‘0’, set it to ‘1’.

More information about the meaning of the bits in a BIND image, and some more references, may be found in the *VTAM Programming* manual.

The autoinstall control program at DELETE

To provide symmetry of control over the autoinstall process, the autoinstall control program is also invoked when:

- A session with a previously automatically-installed resource has been ended
- An autoinstall request was accepted by the user program, but the subsequent INSTALL process failed for some reason

To make it easier for you to write your control program, these two events can be considered to be identical. (There is no difference in the environment that exists, or in the actions that might need to be performed.)

Invoking the control program at DELETE enables you to reverse the processes carried out at the INSTALL event. For example, if the control program at INSTALL incremented a count of the total number of automatically installed resources, then the control program at DELETE would decrement that count.

The communication area at DELETE for terminals

Input to the program is via a communication area, addressed by DFHEICAP. The layout of the communication area is shown in Figure 28.

Figure 28. Autoinstall control program's communication area at DELETE. For terminals (including APPC single-session devices).

```
Fullword 1             Standard Header
  Byte  1              Function Code          (X'F1' for DELETE)
  Bytes 2 - 3          Component Code         Always 'ZC'
  Byte  4              Reserved               Always X'00'
Fullword 2             Terminal ID of terminal to be deleted
Fullword 3             NETNAME of terminal to be deleted
  Bytes 1-2            Delete netname length
  Bytes 3-4            Start of Delete netname ID
Next 15 bytes          Remainder of Delete netname ID
```

The parameter list contains the following information:

1. Standard Header. Byte 1 indicates the request type. For deletion of local terminals (including APPC single-session devices installed via CINIT requests) the value is X'F1'.

   Note: A value of X'FA' or X'FB' represents the deletion of a shipped terminal or connection—see page 458.

2. The terminal identifier of the deleted resource, as shown in Table 114 on page 436.

Table 114. Autoinstall control program's parameter list at DELETE

	1st byte	2nd byte	3rd byte	4th byte
First fullword	`'F1'`	`'Z'`	`'C'`	Reserved
Second fullword	ID of terminal to be deleted			
Third fullword	Length of netname to be deleted		First two bytes of netname	
Next 15 bytes	Remainder of netname			

Note that the named resource has been deleted by the time the control program is invoked, and is not therefore found by EXEC CICS INQUIRE commands.

Naming, testing, and debugging your autoinstall control program

Naming

The supplied, user-replaceable autoinstall control program for terminals and APPC single-session connections initiated by CINIT is named DFHZATDX. If you write your own version, you can name it differently.

After the system has been loaded, to find the name of the autoinstall control program currently identified to CICS, use either the EXEC CICS INQUIRE AUTOINSTALL command or the CEMT INQUIRE AUTOINSTALL command.

The default is DFHZATDX.

To change the current program:

- Use the AIEXIT system initialization parameter. For guidance information about how to do this, refer to the *CICS System Definition Guide*.
- Make the change online using either the EXEC CICS SET AUTOINSTALL command or the CEMT SET AUTOINSTALL command. For further information about these commands, refer to the *CICS System Programming Reference* manual, and the *CICS-Supplied Transactions* manual, respectively.

Testing and debugging

To help you test the operation of your autoinstall control program, you can run the program as a normal terminal-related application. Define your program and initiate it from a terminal. The parameter list passed to the program is described in "The autoinstall control program at INSTALL" on page 427. You can construct a dummy parameter list in your test program, upon which operations can be performed. Running your program on a terminal before you use it properly means that you can use the EDF transaction to help debug your program. You can also make the program interactive, sending and receiving data from the terminal.

If you find that CICS does not offer any autoinstall models to your program, you can create a test autoinstall program that forces the model name (AUTINSTNAME) you want. With a VTAM buffer trace running, try to log the device on to CICS. If CICS does not attempt to send a BIND, check the following:

- Does the model TERMINAL refer to the correct TYPETERM? (Or alternatively, is the TYPETERM in question referred to by the correct TERMINAL definition?)

- Is the TERMINAL definition AUTINSTMODEL(YES or ONLY)?
- Have you installed the group containing the autoinstall models (TERMINAL and TYPETERM definitions)?

If CICS attempts to BIND, compare the device's CINIT RU to the CICS BIND, and make corrections accordingly.

It is very important that you ensure that the VTAM LOGMODE table entries for your terminals are correct, rather than defining new autoinstall models to fit incorrectly coded entries. Bear in mind, while you are testing, that CICS autoinstall does not work if a LOGMODE entry is incorrectly coded.

Note that you cannot **force** device attributes by specifying them in the TYPETERM definition. For autoinstall, the attributes defined in the LOGMODE entry must **match** those defined in the model; otherwise the model will not be selected. You cannot define a terminal in one way to VTAM and in another way to CICS.

If your control program abends, CICS does not, by default, cause a transaction dump to be written. To cause a dump to be taken after an abend, your program must issue an EXEC CICS HANDLE ABEND command.

The sample programs and copy books

The CICS-supplied default autoinstall program is an assembler-language command-level program, named DFHZATDX. The source of the default program is provided in COBOL, PL/I, and C, as well as in assembler language. The names of the supplied programs and their associated copy books are summarized in Table 115. All the programs and copy books are in the VSE/ESA sublibrary PRD1.BASE.

Table 115. Autoinstall programs and copy books

Language	PRD1.BASE member name
Programs:	
Assembler	DFHZATDX.A
COBOL	DFHZCTDX.C
PL/I	DFHZPTDX.P
C	DFHZDTDX.H
Copy books:	
Assembler	DFHTCUDS.A
COBOL	DFHTCUDS.C
PL/I	DFHTCUDS.P
C	DFHTCUDS.H

The module generated from the assembler-language source program is shipped in the VSE/ESA sublibrary PRD1.BASE. You can use it without modification, or you can customize it according to your own requirements. If you choose to alter the code in the sample program, take a copy of the sample and modify it. After modification, translate, assemble, and link-edit your module. Then put the load module into a user library that is concatenated before PRD1.BASE in the LIBDEF PHASE search statement for the CICS job. (This applies to completely new modules as well as modified sample modules.) For more guidance information about this procedure, refer to the *CICS System Definition Guide*. Do not overwrite the sample with your customized module, because subsequent service may overwrite your module. You must install a new resource definition for a customized user program.

The default action of the sample program, on INSTALL, is to select the first model in the list, and derive the terminal identifier from the last four nonblank characters of the NETNAME, set the status byte, and return to CICS. If there are no models in the list, it returns with no action.

The default action, on DELETE, is to address the passed parameter list, and return to CICS with no action.

You can customize the sample program to carry out any processing that suits your installation. Examples of customization are given in “Customizing the sample program” on page 439. Generally, your user program could:

- Count and limit the total number of logged-on terminals.
- Count and limit the number of automatically installed terminals.
- Keep utilization information about specific terminals.
- Map TERMINAL name and NETNAME.
- Do general logging.
- Handle special cases (for example, always allow specific terminals or users to log on).
- Send messages to the operator.
- Exercise network-wide control over autoinstall. A network-wide, global autoinstall control program can reside on one CICS system. When an autoinstall request is received by a control program on a remote CICS system, this global control program can be invoked and data transferred from one control program to another.

Customizing the sample program

Here are three pieces of code that customize the sample program.

Assembler language

Figure 29, in assembler language, limits logon to netnames L77A and L77B. The model names utilized are known in advance. A logon request from any other terminal, or a request for a model which cannot be found, is rejected.

```
*    REGISTER CONVENTIONS =                                          *
*      R0  used by DFHEICAL expansion                                *
*      R1  -------"-------"------"----                               *
*      R2  Base for Input parameters                                 *
*      R3  Base for code addressability                              *
*      R4  Base for model name list                                  *
*      R5  Base for output parameter list                            *
*      R6  Work register                                             *
*      R7  -----"-------                                             *
*      R8  -----"-------                                             *
*      R9  free                                                      *
*      R10 Internal subroutine linkage return                        *
*      R11 Base for EIB                                              *
*      R12 free                                                      *
*      R13 Base for dynamic storage                                  *
*      R14 used by DFHEICAL expansion                                *
*      R15 -------"-------"------"----                               *
                                                                     *
* SELECT MODEL
*
         LH    R6,TABLEN                   Number of valid netnames
         LA    R7,TABLE                    Address the table
*
LOOP1    CLC   NETNAME(4),0(R7)            Is this netname in table?
         BE    VALIDT
*
         LA    R7,16(R7)                   Next table entry
         BCT   R6,LOOP1
*
*        Now we know its not a valid netname
*        simply return and the logon is rejected
*
         B     RETURN
*
```

Figure 29 (Part 1 of 2). Example of how to customize the DFHZATDX sample program

```
*                                          R7 now points to model name
VALIDT   CLI   SELECTED_MODELNAME,C' '     MTS model name supplied?
         BNE   VALIDM1                     Yes
         LH    R6,MODELNAME_COUNT          Count of models
         LTR   R6,R6                       Were any presented?
         BZ    RETURN                      No
         LA    R8,MODELNAME                First model name
*
LOOP2    CLC   8(8,R7),0(R8)               Is this model name here?
         BE    VALIDM
*
         LA    R8,L'MODELNAME(R8)          Next model name
         BCT   R6,LOOP2
*
*        Now we know the required model name was not presented
*        to this exit by CICS, a return rejects the logon
*
         B     RETURN
*
*        At this point the model name was found in those presented
*        It is given to CICS and the new termid is
*        the netname
*
VALIDM   MVC   SELECTED_MODELNAME,0(R8)    R8 was left pointing at
*                                          model name
VALIDM1  DS    0H
         MVC   SELECTED_TERM_ID,NETNAME    Use netname for termid
*                                          (4 chars)
*
*
* SELECTIONS COMPLETE, RETURN
*
         MVI   SELECTED_RETURN_CODE,X'00'  Indicate all OK
         B     RETURN                      Exit program
*
*        Table of netnames allowed to log on and the model name
*        necessary for the logon to be successful
*
*        Format of table :
*            Bytes 1  to  8     Netname allowed to log on
*                  9  to  16    Model required for netname
*
         DS    0D
TABLE    DC    CL8'L77A',CL8'3270064'
         DC    CL8'L77B',CL8'3270065'
TABLEN   DC    Y((*-TABLE)/16)
*
```

Figure 29 (Part 2 of 2). Example of how to customize the DFHZATDX sample program

COBOL

Figure 30, in COBOL, redefines the NETNAME, so that the last four characters are used to select a more suitable model than that selected in the sample control program.

```
               .
 *
 * Redefine the netname so that the last 4 characters (of 7)
 * can be used to select the autoinstall model to be used.
 *
 * The netnames to be supplied are known to be of the form:
 *
 *      HVMXNNN
 *
 * HVM is the prefix
 * X   is the system name
 * NNN is the address of the terminal
 *
   01  NETNAME-BITS.
       02  FIRST-CHRS PIC X(3).
       02  NEXT-CHRS.
           03 NODE-LETTER PIC X(1).
           03 NODE-ADDRESS PIC X(3).
       02  LAST-CHR PIC X(1).
               .
               .
  PROCEDURE DIVISION.
               .
               .
 *
 * Select the autoinstall model to be used according to the
 * node letter (see above). The models to be used are user
 * defined.
 *
 * (It is assumed that the netname supplied in the commarea by CICS
 * has been moved to NETNAME-BITS).
 *
 * If the node letter is C then use model AUTO2
 * If the terminal netname is HVMC289 (a special case) then use
 * model AUTO1.
 * Otherwise (node letters A,B,D...) use model AUTO3.
 *
      IF NODE-LETTER = 'C' THEN MOVE 'AUTO2' TO SELECTED-MODELNAME.
      IF NEXT-CHRS = 'C289' THEN MOVE 'AUTO1' TO SELECTED-MODELNAME.
      IF NODE-LETTER = 'A' THEN MOVE 'AUTO3' TO SELECTED-MODELNAME.
      IF NODE-LETTER = 'B' THEN MOVE 'AUTO3' TO SELECTED-MODELNAME.
      IF NODE-LETTER = 'D' THEN MOVE 'AUTO3' TO SELECTED-MODELNAME.
                .
                .
```

Figure 30. Example of how to customize the DFHZCTDX sample program

PL/I

Figure 31, in PL/I, extracts information from the VTAM CINIT RU, which carries the BIND image. Part of this information is the screen presentation services information, such as the default screen size and alternate screen size. The alternate screen size is used to determine the model of terminal that is requesting logon. The presented models are searched for a match, and if there is no match, the first model from those presented is used.

```
DCL 1 CINIT                    BASED(INSTALL_CINIT_PTR),
      2 CINIT_LENG              FIXED BIN(15),
      2 CINIT_RU                CHAR(256);
DCL   SAVE_CINIT               CHAR(256);
                              /* Temp save area for CINIT RU */
DCL 1 SCRNSZ                   BASED(ADDR(SAVE_CINIT)),
      2 SPARE                   CHAR(31),
                     /* Bypass first part of CINIT and reach */
                         /* into BIND image carried in CINIT */
      2 DHGT                    BIT(8),
                    /* Screen default height in BIND PS area */
      2 DWID                    BIT(8),
                     /* Screen default width in BIND PS area */
      2 AHGT                    BIT(8),
                  /* Screen alternate height in BIND PS area */
      2 AWID                    BIT(8);
                   /* Screen alternate width in BIND PS area */
DCL   NAME                     CHAR(2);
                      /* Used to work up a screen model type */
DCL   TERMID                   PIC'9999' INIT(1) STATIC;
                          /* Used to work up a unique termid */
DCL   ENQ                      CHAR(8) INIT('AUTOPRG');
                /* Used to prevent multiple access to termid */
/* If model name supplied by MTS, bypass model name selection */
IF SELECTED_MODELNAME ¬= '        '
  THEN GO TO MODEL_EXIT;
  /* Clear the CINIT save area and move in the VTAM CINIT RU.*/
        /* This is useful if you fail to recognize the model */
        /* of terminal; provide a dump and analyze this data */
SAVE_CINIT = LOW(256);
SUBSTR(SAVE_CINIT,1,CINIT_LEN) = SUBSTR(CINIT_RU,1,CINIT_LEN);
```

Figure 31 (Part 1 of 2). Example of how to customize the DFHZPTDX sample program

```
        /* Now access the screen PS area in the portion of the BIND
           image presented in the CINIT RU */
        /* using the screen alternate height as a guide to the model
           of terminal attempting logon. If this cannot be determined
           then default to the first model in the table */
        SELECT (AHGT);               /* NOW GET SCRN ALTERNATE HEIGHT */
          WHEN (12)  NAME = 'M1';        /* MODEL 1 */
          WHEN (32)  NAME = 'M3';        /*       3 */
          WHEN (43)  NAME = 'M4';        /*       4 */
          WHEN (27)  NAME = 'M5';        /*       5 */
          OTHERWISE  NAME = 'M2';        /*       2 */
         END;
         /* Search the model entries for a matching entry.      */
         /* The criterion here is that a model definition should*/
         /* contain the chars M2 for a model 2, and so on.      */
         /* For example, L3270M2, L3270M5                       */
         /*     TERMM2,  TERMM5                                 */
         IF MODELNAME_COUNT = 0
         THEN GO TO EXIT;
         DO I = 1 TO MODELNAME_COUNT;
          IF INDEX(MODELNAME(I),NAME)
          THEN GO TO FOUND_MODEL;
         END;
NO_MODEL: /* Matching entry was not found, default to first model*/
         SELECTED_MODELNAME = MODELNAME(1);
         GO TO MODEL_EXIT;
FOUND_MODEL: /* Move the selected model name to the return area */
          SELECTED_MODELNAME = MODELNAME(I);
MODEL_EXIT: /* ENQ to stop multiple updates of counter.     */
            /* A simple counter is used to generate unique  */
            /* terminal identities, so concurrent access to */
            /* this counter is denied to ensure no two get  */
            /* the same identifier or update the counter.   */

  /* To use this method the program must be defined as resident.*/
          EXEC CICS ENQ RESOURCE(ENQ);
          SELECTED_TERMID = TERMID; /* Set SELECTED_TERMID to
                                       count value  */
          TERMID = TERMID + 1; /* Increase the count value by 1  */
          IF TERMID = 9999 THEN TERMID = 1;     /* Reset if too large*/
          EXEC CICS DEQ RESOURCE(ENQ);
NAME_EXIT:
          INSTALL_RETURN_CODE = LOW(1);
                              /* Set stat field to X'00' to allow
                                 logon to be processed */
          GO TO EXIT;
END INSTALL;
```

Figure 31 (Part 2 of 2). Example of how to customize the DFHZPTDX sample program

Chapter 11. Writing a program to control autoinstall of APPC connections

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, “General notes about user-replaceable programs” on page 347 apply to this chapter.

This chapter describes the user-replaceable program that controls the automatic installation of local APPC connections. For information about controlling the automatic installation of local VTAM terminals, see Chapter 10. For information about controlling the installation of shipped terminals and connections, see Chapter 12.

The chapter is divided into the following sections:

1. **“Preliminary considerations”**
2. **“The autoinstall control program at INSTALL”** on page 447
3. **“The autoinstall control program at DELETE”** on page 450
4. **“The sample autoinstall control program for APPC connections”** on page 450

Note: In this chapter, “connection” and “session” are used as general terms when explaining autoinstall. The names “CONNECTION” and “SESSIONS” are used to indicate the CICS resource types used to create the definitions.

Preliminary considerations

In considering the autoinstall of local APPC connections, we need to distinguish between the following:

- Local APPC single-sessions connections initiated by CINIT requests
- Local APPC parallel- and single-session connections initiated by bind requests

Local APPC single-session connections initiated by a CINIT

Autoinstall of local APPC single-session connections that are initiated by CINIT requests works in the same way as autoinstall for terminals. You must provide a TERMINAL—TYPETERM model pair, and a customized version of one of the supplied autoinstall control programs, DFHZATDX or DFHZATDY. See Chapter 10, “Writing a program to control autoinstall of terminals” on page 425.

Local APPC parallel-session and single-session connections initiated by a BIND

If autoinstall is enabled, and an APPC BIND request is received for an APPC service manager (SNASVCMG) session (or for the only session of a single-session connection), and there is no matching CICS CONNECTION definition, a new connection is created and installed automatically.

Like autoinstall for other resources, autoinstall for APPC connections requires model definitions. However, unlike the model definitions used to autoinstall terminals, those used to autoinstall APPC links do not need to be defined explicitly as models. Instead, CICS can use any previously-installed connection definition as a “template” for a new definition. In order for autoinstall to work, you must have a template for each kind of connection you want to be autoinstalled.

Autoinstall templates for APPC connections

The purpose of a template is to provide CICS with a definition that can be used for all connections with the same properties. You customize the supplied autoinstall control program, DFHZATDY, to select an appropriate template for each new connection, depending on the information it receives from VTAM.

A template consists of a CONNECTION definition and its associated SESSIONS definitions. You should have a definition installed for each different set of session properties you are going to need.

Any installed connection definition can be used as a template, but for performance reasons, your template should be an installed connection definition that you do not actually use. The definition is locked while CICS is copying it, and if you have a very large number of sessions autoinstalling, the delay may be noticeable.

Benefits of autoinstall

Autoinstall support is likely to be beneficial if you have large numbers of APPC parallel session devices with identical characteristics. For example, if you had 1000 PS/2s, all with the same characteristics, you would set up one template to autoinstall all of them. If 500 of your PS/2s had one set of characteristics, and 500 had another set, you would set up two templates to autoinstall them.

Restart of any kind should be noticeably faster, especially when large numbers of terminals are involved.

Savings can also be made on systems management overheads, and on storage, as autoinstalled resources do not occupy space before they are used.

Requirements for autoinstall

You can have only one active autoinstall control program for terminals and connections. You must specify the name of the active program on the AIEXIT system initialization parameter. As well as providing function to autoinstall APPC connections initiated by BIND requests, the sample program, DFHZATDY, provides the same function for terminal autoinstall as the default DFHZATDX control program described in Chapter 10. Thus, you can use a customized version of DFHZATDY to autoinstall both terminals and APPC connections.

Note: Both DFHZATDX and DFHZATDY provide function to install shipped terminals and connections.

You may find the supplied version of DFHZATDY adequate for your purposes. If not, you can write a customized version of the supplied program, or create your own program to provide enhanced function.

The autoinstall control program for APPC connections

The purpose of the autoinstall control program is to provide CICS with any extra information it needs to complete an autoinstall request. For APPC connections, the control program selects the template to be used, and provides a name for the new connection.

If autoinstall is enabled, when CICS receives an APPC BIND request for an SNASVCMG session (or for the only session of a single-session connection), if there is no matching CONNECTION definition, CICS passes the partner’s VTAM NETNAME to the autoinstall control program. The control program uses information from the BIND, which is passed in the communications area, to select the most appropriate template on which to base a new connection.

The control program needs to know the NETNAME or SYSID of all the templates, in order to return the name of the most suitable one. If it attempts to use an unsuitable template, message DFHZC6922 is issued, explaining why the template is unusable.

If the template is usable, CICS makes a copy of the definitions within it and attempts to install the new CONNECTION definition. If the installation is not successful, message DFHZC6903 is issued.

Recovery and restart

Autoinstalled connections are not cataloged in CICS Transaction Server for VSE/ESA Release 1, so they are not recovered at an emergency restart or a warm restart.

The autoinstall control program at INSTALL

The autoinstall control program is invoked at INSTALL for:

- Local VTAM terminals
- Local APPC single-session connections initiated by a CINIT
- Local APPC parallel-session connections initiated by a BIND
- Local APPC single-session connections initiated by a BIND
- Shipped terminals and connections

On each invocation, CICS passes a parameter list to the control program by means of a communication area addressed by DFHEICAP. The parameter list passed at INSTALL of local terminals and APPC single-session connections initiated by CINIT is described in “The communication area at INSTALL for terminals” on page 428. The parameter list passed at INSTALL of shipped terminals and connections is described in “The communications area at INSTALL for shipped terminals” on page 456. This section describes only INSTALL of local APPC connections initiated by BIND requests.

The communication area at INSTALL for APPC connections

The communications area is mapped by the DSECT for the assembler version of DFHZATDY, which is supplied in the VSE/ESA sublibrary PRD1.BASE.

```
*-------------------------------------------------------------------*
* APPC Install parameter list - Functions 2, 3, and 4               *
*-------------------------------------------------------------------*
INSTALL_APPC_COMMAREA       DSECT       Install Parameter List
*
INSTALL_APPC_STANDARD       DS  F       Standard field
                            ORG INSTALL_APPC_STANDARD
INSTALL_APPC_EXIT_FUNCTION  DS  XL1     Install request type
INSTALL_APPC_PS_CINIT       EQU X'F2'   Install PS via CINIT
INSTALL_APPC_PS_BIND        EQU X'F3'   Install PS via BIND
INSTALL_APPC_SS_BIND        EQU X'F4'   Install SS via BIND
INSTALL_APPC_EXIT_COMPONENT DS  CL2     Component ID 'ZC'
                            DS  XL1     Reserved
*
                            ORG ,
INSTALL_APPC_NETNAME_PTR    DS  A       -> NETNAME          Input
INSTALL_APPC_CINIT_PTR      DS  0A      -> CINIT_RU         Input
INSTALL_APPC_BIND_PTR       DS  A       -> BIND             Input
INSTALL_APPC_SELECTED_PTR   DS  A       -> Return fields    Output
INSTALL_APPC_SYNCLEVEL_PTR  DS  A       -> Sync level       Input
*
INSTALL_APPC_TEMPLATE_NETNAME_PTR DS A  -> Template NETNAME Output
INSTALL_APPC_TEMPLATE_SYSID_PTR DS A    -> Template SYSID   Output
INSTALL_APPC_SYSID_PTR      DS A        -> New SYSID        Output
*
TEMPLATE_NETNAME            DS CL8      Put netname here
TEMPLATE_SYSID              DS CL4      Put sysid here
SYSID                       DS CL4      Put new name here
SYNCLEVEL                   DS XL2      Synclevel of new connection
```

Figure 32. Autoinstall control program's communications area at INSTALL. For APPC connections initiated by BIND requests.

INSTALL_APPC_STANDARD header

A fullword input field comprising the following information:

INSTALL_APPC_EXIT_FUNCTION

A 1-byte field that defines the install request type. The equated values are:

INSTALL_APPC_PS_CINIT

X'F2' represents an install request for an APPC parallel-session connection from a secondary node via a CINIT request.

Note: These requests cannot be received by CICS Transaction Server for VSE/ESA Release 1.

INSTALL_APPC_PS_BIND

X'F3' represents an install request for an APPC parallel-session connection via a BIND.

INSTALL_APPC_SS_BIND

X'F4' represents an install request for an APPC single-session connection via a BIND.

Note: The values X'F0' and X'F1' represent, respectively, install and delete requests for terminals (including APPC single-session devices).

INSTALL_APPC_EXIT_COMPONENT
A 2-byte component code, which is set to ‘ZC’.

INSTALL_APPC_NETNAME_PTR
A fullword pointer to a 2-byte length field, followed by the NETNAME to be installed (input field).

INSTALL_APPC_CINIT_PTR
A fullword pointer to an input field containing the incoming CINIT, if the incoming session is a secondary.

Note: Not applicable to CICS Transaction Server for VSE/ESA Release 1.

INSTALL_APPC_BIND_PTR
A fullword pointer to an input field containing the incoming BIND.

INSTALL_APPC_SELECTED_PTR
A fullword pointer to the return fields. These are in the same format as those for autoinstall of terminals.

Note that for APPC autoinstall (functions X'F3' and X'F4') only the return code is used. You return other information for APPC in other fields defined in the communications area.

INSTALL_APPC_SYNCLEVEL_PTR
A fullword pointer to a 2-byte input field specifying the syncpoint level for the connection, which is extracted from the BIND. The possible values are:

X'0000'	Synclevel 0.
X'0001'	Synclevel 1.
X'0002'	Synclevel 2.

INSTALL_APPC_TEMPLATE_NETNAME_PTR
A fullword pointer to an 8-byte output area that your control program can use to specify the NETNAME of the template. If the name is less than 8 bytes, it must be padded with trailing blanks. If, alternatively, you specify a CONNECTION name (in the SYSID field), the 8-byte area should be filled with zeros.

INSTALL_APPC_TEMPLATE_SYSID_PTR
A fullword pointer to a 4-byte output area that your control program can use to specify the SYSID (connection name) of the template. If the name is less than 4 bytes, it must be padded with trailing blanks. If, alternatively, you specify a NETNAME, the 4-byte area should be filled with blanks.

INSTALL_APPC_SYSID_PTR
A fullword pointer to a 4-byte output area in which your program must put the SYSID for the new autoinstalled connection. The name you supply must be unique. You can use the same or similar logic to create it that you use for creating a terminal ID. If the name is less than 4 bytes, it must be padded with trailing blanks.

If you are using recoverable resources, the SYSID chosen for a connection after a restart must be the same as that chosen in the previous CICS run.

The autoinstall control program at DELETE

There is no delete function for APPC connections equivalent to that for autoinstalled terminals.

The sample autoinstall control program for APPC connections

The sample control program for autoinstall of local APPC connections is DFHZATDY. The source code, in assembler-language only, is in library PRD1.BASE.

As well as providing function to autoinstall APPC connections initiated by BIND requests, DFHZATDY provides the same function for terminal autoinstall as the DFHZATDX program described in Chapter 10. Thus, you can use a customized version of DFHZATDY to autoinstall both terminals and APPC connections.

Default actions of the sample program

The role of DFHZATDY in installing APPC connections is to choose the template to be used (by supplying its NETNAME or SYSID), and to supply the name (SYSID) of the new connection. The actions taken by the supplied version of the program are to:

1. Examine the request type passed in the INSTALL_APPC_EXIT_FUNCTION field:

   X'F0'
   An incoming CINIT for a terminal or APPC single-session device. Proceed as for DFHZATDX. See Chapter 10, “Writing a program to control autoinstall of terminals” on page 425.

   X'F1'
   A delete request for a terminal or APPC single-session device. Proceed as for DFHZATDX. See Chapter 10, “Writing a program to control autoinstall of terminals” on page 425.

   INSTALL_APPC_PS_CINIT (X'F2')
   An incoming CINIT for an APPC parallel-session connection. Specify a template by setting the field pointed to by INSTALL_APPC_TEMPLATE_SYSID to 'CCPS'.

   Note: This type of request cannot be received by CICS Transaction Server for VSE/ESA Release 1.

   INSTALL_APPC_PS_BIND (X'F3')
   An incoming BIND for an APPC parallel-session connection. Specify a template by setting the field pointed to by INSTALL_APPC_TEMPLATE_SYSID to 'CBPS'.

   INSTALL_APPC_SS_BIND (X'F3')
   An incoming BIND for an APPC single-session connection. Specify a template by setting the field pointed to by INSTALL_APPC_TEMPLATE_SYSID to 'CBSS'.

2. Specify a name for the new connection by copying the last 4 non-blank characters of the input NETNAME pointed to by INSTALL_APPPC_NETNAME_PTR to the field pointed to by INSTALL_APPC_SYSID_PTR.

3. Indicate that a selection has been made by setting the return code to RETURN_OK.

Resource definitions

CICS supplies a resource definition group called DFHAI62, which defines DFHZATDY, and contains CONNECTION definitions for CCPS, CBPS, and CBSS. If you want to use the supplied version of DFHZATDY, you should append DFHAI62 to your CICS startup grouplist. However, if you customize DFHZATDY you will probably need to create your own definitions.

DFHZATDY is defined as follows in DFHAI62:

```
DEFINE PROGRAM(DFHZATDY)
DESCRIPTION(Assembler definition for sessions autoinstall control program)
GROUP(DFHAI62)
LANGUAGE(ASSEMBLER) RELOAD(NO)          RESIDENT(NO)
USAGE(NORMAL)       STATUS(ENABLED)     CEDF(NO)
DATALOCATION(ANY)   EXECKEY(CICS)       EXECUTIONSET(FULLAPI)
```

Chapter 12. Writing a program to control autoinstall of shipped terminals

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, “General notes about user-replaceable programs” on page 347 apply to this chapter.

This chapter describes how to write a program to control the installation of shipped terminals and connections. Both the supplied autoinstall control programs, DFHZATDX and DFHZATDY, provide function to install shipped definitions of remote terminals and connections. You can therefore base your customized control program on either DFHZATDX or DFHZATDY.

Just as you can use an autoinstall user program in a terminal-owning region (TOR) to control the automatic installation of *local* terminals and connections, so you can use a similar program in an application-owning region (AOR) to control the installation of shipped terminals and connections. (Bear in mind when reading this chapter that it assumes that your user program is installed in an AOR—or in a combined AOR/TOR—rather than in a TOR.)

The chapter is divided into the following sections:

1. **“Installing shipped terminals and connections”**
2. **“The autoinstall control program at INSTALL”** on page 455
3. **“The autoinstall control program at DELETE”** on page 458
4. **“Default actions of the sample programs”** on page 459

Installing shipped terminals and connections

In releases of CICS before CICS Transaction Server for VSE/ESA Release 1, the terminal identifiers (TERMIDs) of shippable terminals had to be unique in the transaction routing network. That is, you could not ship a terminal definition to an AOR on which a remote terminal of the same name was already installed. This restriction no longer applies. Because your autoinstall control program is invoked for shipped terminals and connections, you can use it to reset the TERMINAL (or CONNECTION) attribute of a shipped definition to an **alias**, thereby avoiding conflicts with names of remote terminals and connections already installed in the AOR. There is no need to reset the REMOTENAME attribute, which remains set to the name by which the terminal is known in the TOR; and autoinstall model names are not applicable to shipped definitions.

Note: If the name of a shipped definition clashes with the name of a *local* terminal or connection installed in the AOR, the install is rejected, and the autoinstall control program is not invoked.

For more information about using aliases on remote definitions, see the *CICS Intercommunication Guide*.

CICS-generated aliases

The autoinstall control program is invoked once for each shipped terminal or connection definition to be installed.

If CICS detects that the name on a shipped definition clashes with the name of a remote terminal or connection already installed in the AOR, it generates an alias TERMID and passes it to the control program in field SELECTED_SHIPPED_TERMID of the communications area.

If CICS detects that there is no clash of names, it passes in SELECTED_SHIPPED_TERMID the name by which the terminal or connection is known in the TOR—that is, the value of the TERMINAL or CONNECTION attribute on the shipped definition.

Your control program can accept the passed TERMID, change it, or reject the installation of the shipped definition.

CICS-generated aliases consist of a 1-character prefix and a 3-character suffix. The prefix is always `'{'`. The suffix can have the values `'AAA'` through `'999'`. That is, each character in the suffix can have the value `'A'` through `'Z'` or `'0'` through `'9'`. The first suffix generated by CICS has the value `'AAA'`. This is followed by `'AAB'`, `'AAC'`, ... `'AAZ'`, `'AA0'`, `'AA1'`, and so on, up to `'999'`.

Each time that it needs to create an alias, CICS generates a 3-character suffix that it has not recorded as being in use. If your autoinstall control program overrides a CICS-generated TERMID, CICS does not record the suffix as being in use, and supplies the same suffix for the next alias.

Resetting the terminal identifier

You need to think about the algorithm by which your control program allocates alias TERMIDs.

You must consider the consequences of a definition being deleted by the CICS Transaction Server for VSE/ESA Release 1 timeout delete mechanism, and subsequently being re-shipped and re-installed. You must decide whether your autoinstall program should allocate the *same* TERMID as before (which implies a file mapping the name by which the terminal is known in the TOR to the alias allocated by the AOR), or whether allocation of a different TERMID is acceptable—in which case you could use the default aliases generated by CICS. This decision may depend on several factors. For example:

- How your application programs allocate temporary storage queue names. If they derive them from the TERMID (so as to associate the queue with a particular end-user), problems of data mismatch could occur if the queue is not emptied by transaction end (possibly due to a failure), and TERMIDs are not allocated to the same terminals consistently.

  The best solution is for your application programs always to check before creating a temporary storage queue whether a queue of the same name already exists, and, if so, to delete it. This dispenses with the need for your autoinstall program to allocate TERMIDs consistently.

  However, if your application programs do not already implement this check, it may not be possible to correct them all. In this case, your autoinstall program may need to use a mapping file, as described above.

- Whether your application programs record TERMIDs for later use. For example, an application might issue an EXEC CICS START TERMID command, with a time interval after which the transaction is to be initiated against the named terminal. If, during the delay interval, the terminal definition is deleted, re-shipped, and re-installed with a different local TERMID, the started transaction could fail because the TERMID no longer exists.

  If your application programs record TERMIDs in this way, your autoinstall program may need to use a mapping file.

Example: Assume that you have two terminal-owning regions, TORA and TORB, and that they use the same set of terminal idenfifiers, T001 through T500. TORA and TORB route transactions to the same application-owning region, AOR1. To prevent naming conflicts when terminals are shipped to AOR1, your control program in AOR1 could:

- Accept the TERMIDs allocated by TORA. That is, leave the TERMINAL attribute of the remote definition set to the same as the REMOTENAME attribute.
- Create aliases for the TERMIDs allocated by TORB. That is, reset the TERMINAL attribute of the remote definition, using a mapping file as described above. For example, TERMIDs of T001 through T500 could be mapped to aliases of A001 through A500.

This solution allows two TORs using the same set of TERMIDs to access the same AOR. However, even though the aliases created in the AOR are mapped consistently to TERMIDs in the TOR, the solution does not *guarantee* that data mismatch problems cannot occur if terminals are re-shipped. This is because it relies on TERMIDs being allocated consistently *in the TOR*—that is, on specific TERMIDs always being assigned to the same physical devices.

Note: Your control program could use the correlation identifier contained in each terminal and connection definition to check whether a definition has been re-installed in the TOR—see the description of the INSTALL_SHIPPED_CORRID_PTR parameter on page 458.

A better solution might be to map the terminal alias in the AOR to the **netname** of the terminal. This would at least guarantee that a specific alias always relates to the same physical device. But it would still require TERMIDs for which aliases are *not* created to be consistently allocated in the TOR.

The autoinstall control program at INSTALL

The autoinstall control program is invoked at INSTALL for:

- Local VTAM terminals
- Local APPC single-session connections initiated by a CINIT
- Local APPC parallel-session connections initiated by a BIND
- Local APPC single-session connections initiated by a BIND
- Remote shipped terminals and connections, including shipped definitions of Client virtual terminals

On each invocation, CICS passes a parameter list to the control program by means of a communication area addressed by DFHEICAP. The parameter list passed at INSTALL of local terminals and APPC single-session connections initiated by CINIT is described in “The communication area at INSTALL for terminals” on page 428. The parameter list passed at INSTALL of local APPC connections initiated by BIND requests is described in “The communication area at INSTALL for APPC connections” on page 447. This section describes only INSTALL of shipped terminals and connections.

The communications area at INSTALL for shipped terminals

The communications area is mapped by the DSECT for the assembler version of DFHZATDX, which is supplied in PRD1.BASE.

```
*---------------------------------------------------------------------------*
* Remote install parameter list - Shipped definition Functions  7 & 8      *
*---------------------------------------------------------------------------*
INSTALL_SHIPPED_COMMAREA        DSECT          Install Parameter List
*
INSTALL_SHIPPED_STANDARD        DS  F          Standard field
                                ORG INSTALL_SHIPPED_STANDARD
INSTALL_SHIPPED_EXIT_FUNCTION   DS  XL1        Install type
INSTALL_SHIPPED_TERM            EQU X'F7'      Install terminal
INSTALL_SHIPPED_RSE             EQU X'F8'      Install remote system entry
INSTALL_SHIPPED_EXIT_COMPONENT  DS CL2         Component ID 'ZC'
INSTALL_SHIPPED_CLASH           DS  CL1        Install clash Y/N
                                ORG ,
INSTALL_SHIPPED_NETNAME_PTR     DS  A          Pointer to netname
INSTALL_SHIPPED_SELECTED_PTR    DS  A          Pointer to return fields
INSTALL_SHIPPED_TERMID_PTR      DS  A          Pointer to incoming TERMID
INSTALL_SHIPPED_APPLID_PTR      DS  A          Pointer to applid of TOR
INSTALL_SHIPPED_SYSID_PTR       DS  A          Pointer to sysid
INSTALL_SHIPPED_CORRID_PTR      DS  A          Pointer to correlation ID
INSTALL_SHIPPED_SELECTED_PARMS  DSECT ,
                                DS  CL8        Reserved
SELECTED_SHIPPED_TERMID         DS  CL4        Selected TERMID
SELECTED_SHIPPED_RETURN_CODE    DS  CL1        Selected return code
RETURN_OK                       EQU X'00'      Accept request
REJECT                          EQU X'01'      Reject request
*
```

Figure 33. Autoinstall control program’s communications area at INSTALL. For shipped terminals and connections.

INSTALL_SHIPPED_STANDARD
A fullword input field containing the following information:

INSTALL_SHIPPED_EXIT_FUNCTION
A 1-byte field that indicates the type of resource being installed. For install of remote terminals and connections the equated values are:

INSTALL_SHIPPED_TERM (X'F7')	A shipped terminal
INSTALL_SHIPPED_RSE (X'F8')	A shipped connection (remote system entry).

INSTALL_SHIPPED_EXIT_COMPONENT
A 2-byte component code, which is set to ‘ZC’.

INSTALL_SHIPPED_CLASH
A 1-character input field that indicates whether the TERMID of the shipped definition is already in use in the AOR.

Y The name by which the terminal or connection is known in the TOR (the value of the TERMINAL or CONNECTION attribute on the shipped definition) is already in use in the AOR to identify an installed remote terminal or connection.

N The name by which the terminal or connection is known in the TOR is not in use in the AOR to identify a remote terminal or connection.

INSTALLED_SHIPPED_NETNAME_PTR
A fullword pointer to an 8-character input field containing the netname of the terminal or connection to be installed.

INSTALL_SHIPPED_SELECTED_PTR
A fullword pointer to the return fields. The output fields, for use by your program, are:

SELECTED_SHIPPED_TERMID
A 4-character field used to specify the name by which the remote terminal or connection is to be known to this system. If the name is less than 4 characters long, it must be padded with trailing blanks. For a list of the characters you can use in terminal names, see the *CICS Resource Definition Guide*.

On invocation, if INSTALL_SHIPPED_CLASH is set to `'N'` (indicating no conflict of terminal names), SELECTED_SHIPPED_TERMID contains the same value as the field pointed to by INSTALL_SHIPPED_TERMID_PTR (the value of the TERMINAL or CONNECTION attribute on the shipped definition). If INSTALL_SHIPPED_CLASH is set to `'Y'`, SELECTED_SHIPPED_TERMID contains a CICS-generated alias.

Your user program can use this field to override a CICS-generated alias. For advice on choosing terminal and connection names, see “Resetting the terminal identifier” on page 454.

SELECTED_SHIPPED_RETURN_CODE
The 1-character return code field. The equated values are:

RETURN_OK (X'00')	Install the remote terminal or connection. Your user program must return this value if the resource is to be autoinstalled.
REJECT (X'01')	Do not install the remote terminal or connection. This is the default value.

INSTALL_SHIPPED_TERMID_PTR
A fullword pointer to a 4-character input field containing the name by which the terminal or connection is known in the TOR. (This is the value of the TERMINAL or CONNECTION attribute on the shipped definition.)

INSTALL_SHIPPED_APPLID_PTR
A fullword pointer to an 8-character input field containing the netname (applid) of the TOR.

INSTALL_SHIPPED_SYSID_PTR
A fullword pointer to a 4-character input field containing the name (sysid) of the connection to the TOR.

INSTALL_SHIPPED_CORRID_PTR
A fullword pointer to an 8-character input field containing the shipped definition's *correlation identifier*. A correlation identifier is a unique "instance token" that is created when a CICS Transaction Server for VSE/ESA Release 1 terminal or connection definition is installed, and stored within the definition. Thus, if the definition is shipped to another region, the value of the token is shipped too. The correlation ID is used by CICS during attach processing, to check whether existing shipped definitions in an AOR are up-to-date, or whether they need to be deleted and reshipped because the terminal has been re-installed in the TOR. For further information about instance tokens, see the *CICS Intercommunication Guide*.

If your control program maps TOR-allocated TERMIDs to the aliases that it assigns in the AOR, by recording correlation IDs it could check whether a terminal has been re-installed in the TOR. If the terminal *has* been re-installed, it is possible that the TOR-allocated TERMID relates to a *different* physical device from that last installed under this TERMID.

The autoinstall control program at DELETE

The autoinstall control program is reinvoked when an autoinstalled resource is deleted. (The resources that can be autoinstalled are listed under "The autoinstall control program at INSTALL" on page 455.) Invoking the user program at DELETE enables you to reverse the processes carried out at INSTALL.

The parameter list passed to your user program at DELETE of local terminals is described on page 435. This section describes only DELETE of shipped terminals and connections.

Shipped terminal and connection definitions are deleted by the CICS Transaction Server for VSE/ESA Release 1 timeout delete mechanism. For details of the timeout delete mechanism, see the *CICS Intercommunication Guide*.

Figure 34 shows the communications area passed to the autoinstall user program at DELETE.

```
DELETE_SHIPPED_COMMAREA         DSECT ,        Delete parameter list
DELETE_SHIPPED_STANDARD         DS  F          Standard field
DELETE_SHIPPED_EXIT_FUNCTION    DS  XL1        Delete  type
DELETE_SHIPPED_TERM             EQU X'FA'      Delete terminal
DELETE_SHIPPED_RSE              EQU X'FB'      Delete remote system entry
DELETE_SHIPPED_EXIT_COMPONENT   DS  CL2        Component ID 'ZC'
                                DS  CL1        Reserved
DELETE_SHIPPED_TERMID           DS  CL4        TERMID in TOR
DELETE_SHIPPED_APPLID           DS  CL8        Applid of TOR
DELETE_SHIPPED_LTERMID          DS  CL4        TERMID in AOR
```

Figure 34. Autoinstall control program's communications area at DELETE. For shipped terminals and connections.

At DELETE, all fields in the communications area are input only. Fields not listed below are as described for INSTALL.

DELETE_SHIPPED_EXIT_FUNCTION
A 1-byte field that indicates the type of resource being deleted. The equated values are:

DELETE_SHIPPED_TERM (X'FA')	A shipped terminal.
DELETE_SHIPPED_RSE (X'FB')	A shipped connection (remote system entry).

Note: A value of X'F1' represents the deletion of a local terminal, or an APPC single-session device that was autoinstalled via a CINIT request—see page 435.

DELETE_SHIPPED_TERMID
A 4-character field containing the identifier (TERMID) of the terminal or connection in the TOR.

DELETE_SHIPPED_APPLID
An 8-character field containing the netname (applid) of the TOR.

DELETE_SHIPPED_LTERMID
A 4-character field containing the name by which the terminal or connection is known in the AOR. This may or may not be the same as DELETE_SHIPPED_TERMID, depending on whether an alias has been used in the AOR.

Default actions of the sample programs

When DFHZATDX or DFHZATDY is invoked at INSTALL of a shipped terminal or connection, it:

1. Updates, if necessary, the SELECTED_SHIPPED_TERMID field, so that it contains the name by which the terminal or connection is known in the TOR.

   Notes:

   a. If CICS detected a conflict with a currently-installed remote TERMID, on invocation of the sample programs SELECTED_SHIPPED_TERMID contains a CICS-generated alias. The sample programs overwrite this value.

   b. If CICS detected no conflict with a currently-installed remote TERMID, on invocation of the sample programs SELECTED_SHIPPED_TERMID contains the value of the TERMINAL attribute on the shipped definition (the value pointed to by INSTALL_SHIPPED_TERMID_PTR). The sample programs accept this value.

2. Permits the remote definition to be installed by setting the return code field to RETURN_OK, and returning.

When DFHZATDX or DFHZATDY is invoked at DELETE of a shipped terminal or connection, it takes no action and returns.

Chapter 13. Writing a program to control autoinstall of programs

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, "General notes about user-replaceable programs" on page 347 apply to this chapter.

This chapter describes the user-replaceable program that controls the automatic installation of programs, mapsets, and partitionsets.

Note: In this chapter, the term "program autoinstall" is used to mean autoinstall of all three program types (program, mapset, and partitionset) unless otherwise specified.

The chapter is divided into the following sections:

1. **"Preliminary considerations"**
2. **"Benefits of autoinstall"** on page 463
3. **"Requirements for autoinstall"** on page 463
4. **"The autoinstall control program at INSTALL"** on page 464
5. **"The sample autoinstall control program for programs, DFHPGADX"** on page 466

Preliminary considerations

As well as terminals and APPC connections, you can autoinstall:

- User programs
- Mapsets
- Partitionsets

If the autoinstall program function is enabled, and an implicit or explicit load request is issued for a previously undefined program, mapset, or partitionset, CICS dynamically creates a definition, and installs and catalogs it, as appropriate. An implicit or explicit load occurs when:

- CICS starts a transaction.
- An application program issues one of the following commands:

  EXEC CICS LINK
  EXEC CICS XCTL
  EXEC CICS LOAD
  EXEC CICS ENABLE (for a global user exit, or task-related user exit, program)
  EXEC CICS RECEIVE or SEND MAP
  EXEC CICS SEND PARTNSET
  EXEC CICS RECEIVE PARTN

- A program abend occurs, and CICS transfers control to the program named on an EXEC CICS HANDLE ABEND command.
- CICS calls any user-replaceable program other than the program or terminal autoinstall program.

- A program is named in the PLTPI or PLTSD list.

Autoinstall model definitions

Like autoinstall for terminals, program autoinstall uses model definitions, together with a user-replaceable control program, to create explicit definitions for resources that need to be autoinstalled. The purpose of a model is to provide CICS with a definition that can be used for all programs with the same properties. CICS calls the autoinstall control program with a parameter list that includes the name of a CICS-supplied, default model definition appropriate to the program type (program, mapset, or partitionset). Your autoinstall control program can accept the default model, or specify another (any installed program definition can be used as a model). It can also specify explicitly any properties that are unique to a program, thus overriding those specified on the model definition.

On return from the control program, CICS creates a resource definition from the model and properties returned in the parameter list.

Note that CICS does not call your control program for CICS programs, mapsets, or partitionsets—that is, for any objects that begin with the letters “DFH”.

Autoinstall processing of mapsets

Table 116 shows the differences in mapset processing between CICS regions with program autoinstall active and inactive.

Table 116. Differences in mapset processing between autoinstall and non-autoinstall

Program autoinstall INACTIVE	**Program autoinstall ACTIVE**
CSD definition is required. CICS attempts to load a referenced mapset with a suffix. If this fails, CICS tries an unsuffixed version. If that is unsuccessful, abend APCT is issued.	CSD definition is not required. Using autoinstall, CICS attempts to load the referenced suffixed mapset or partitionset, then the unsuffixed one. (In each case, a definition is autoinstalled.) The transaction requesting the resource abends only if no version of the resource exists in the library, either suffixed or unsuffixed. If the suffixed mapset is not found in the library, the definition is marked ‘not loadable’.

System autoinstall

Some programs are autoinstalled automatically (if they have not been statically defined) by the CICS **system autoinstall** function, which does not require model definitions or the support of the autoinstall control program. Programs in this category include:

- First phase program list table post initialization (PLTPI) programs (that is, PLTPI programs that are defined *before* the PLT table delimiter DFHDELIM).
- Second phase program list table shutdown (PLTSD) programs (that is, PLTSD programs that are defined *after* the PLT table delimiter DFHDELIM).

Note: PLTPI programs that are defined *after* DFHDELIM, and PLTSD programs that are defined *before* DFHDELIM, are treated like any other user programs—they are eligible for program autoinstall.

Benefits of autoinstall

Program autoinstall reduces system administration, virtual storage usage, and, potentially, restart times.

Reduced system administration costs

Without autoinstall, you have to define all new programs, mapsets, and partitionsets to CICS before they can be used. Autoinstall eliminates this requirement, enabling these resources to be used without prior definition. Furthermore, the need to maintain predefined definitions also disappears, leading to a significant saving in system administration effort.

Saving in virtual storage

There is a saving in virtual storage within the CICS address space, as the definitions of autoinstalled resources do not occupy table space until they are generated.

Faster startup times

Warm and emergency starts: If you are using program autoinstall *with cataloging*, restart times are similar to those of restarting a CICS region that is not using program autoinstall. This is because, in both cases, resource definitions are reinstalled from the catalog during the restart. The definitions after the restart are those that existed before the system was terminated.

If you are using autoinstall *without cataloging*, CICS restart times are improved because CICS does **not** install definitions from the CICS global catalog. Instead, definitions are autoinstalled as required whenever programs, mapsets, and partitionsets are referenced following the restart.

See the *CICS Recovery and Restart Guide* for information on cataloging.

Cold starts: Startup times are faster than for a region that does not use program autoinstall, because program definitions are installed singly, as required, rather than all together at startup.

Requirements for autoinstall

To use autoinstall with programs, mapsets, and partitionsets, you must:

1. Write a customized version of the autoinstall control program for programs, DFHPGADX (unless the supplied version is entirely suitable for your purposes).
2. Specify the name of your control program on the PGAIEXIT system initialization parameter (the default name is DFHPGADX), or on a CEMT or EXEC CICS SET SYSTEM PROGAUTOEXIT command.
3. Make program autoinstall active by specifying `'ACTIVE'` on the PGAIPGM system initialization parameter (or by issuing a SET SYSTEM PROGAUTOINST(AUTOACTIVE) command).

4. Specify whether you want autoinstalled program definitions to be recorded on the CICS global catalog, on the PGAICTLG system initialization parameter (or on a SET SYSTEM PROGAUTOCTLG command).
5. Include the DFHPGAIP resource definition group in your CICS startup grouplist. DFHPGAIP (which is already included in the CICS-supplied startup list, DFHLIST) contains the default program, mapset, and partitionset model definitions passed to the autoinstall control program, and a definition of DFHPGADX (that you may need to amend).
6. Create any additional program, mapset, and partitionset model definitions that you need, and add this group to your startup grouplist.
7. If you want to log messages associated with program autoinstall, define the CSPL transient data (TD) queue.

For information about coding system initialization parameters, see the *CICS System Definition Guide*. For information about defining programs, mapsets, partitionsets, and TD queues, see the *CICS Resource Definition Guide*.

The autoinstall control program at INSTALL

On invocation, CICS passes a parameter list to the autoinstall control program by means of a communication area addressed by DFHEICAP. The communications area is mapped by a copybook that is supplied in each of the languages supported by CICS.

The assembler form of the parameter list is as follows:

PGAC_PROGRAM
passes the 8-byte name of the object to be autoinstalled. This is an input-only field, which your user-replaceable program must not alter.

PGAC_MODULE_TYPE
passes a 1-byte indicator of the type of object to be installed. The equated values are:

PGAC_TYPE_PROGRAM	A program.
PGAC_TYPE_MAPSET	A mapset.
PGAC_TYPE_PARTITIONSET	A partitionset.

This is an input-only field, which your user-replaceable program must not alter.

PGAC_MODEL_NAME
allows your control program to specify the 8-byte autoinstall model name to be used. If you do not set this field, CICS uses the default model name for the type of object:

DFHPGAPG	For a program.
DFHPGAMP	For a mapset.
DFHPGAPT	For a partitionset.

PGAC_LANGUAGE
allows your control program to specify, in a 1-byte field, the language of the program to be autoinstalled. The equated values are:

PGAC_ASSEMBLER	Assembler.
PGAC_COBOL	COBOL.

PGAC_C	C.
PGAC_PLI	PL/I.

If you do not set this field, the autoinstall routine uses the language defined in the model, if one is specified. However, when control is passed to the program, CICS determines the language from the program itself, and overrides any specification provided.

You should not need to specify the language of executable programs that have been translated using the EXEC CICS translator before compiling.

PGAC_CEDF_STATUS
allows you to specify, in a 1-byte field, the execution diagnostic facility (EDF) status of the program to be autoinstalled. The equated values are:

PGAC_CEDF_YES	EDF can be used with this program.
PGAC_CEDF_NO	EDF cannot be used with this program.

PGAC_DATA_LOCATION
allows you to specify, in a 1-byte field, the data location for task-lifetime storage. The equated values are:

PGAC_LOCATION_BELOW
Task-lifetime storage must be located below 16MB.

PGAC_LOCATION_ANY
Task-lifetime storage can be below or above 16MB.

PGAC_EXECUTION_KEY
allows you to specify, in a 1-byte field, the execution key for the program. The equated values are:

PGAC_CICS_KEY	The program is to execute in CICS key.
PGAC_USER_KEY	The program is to execute in user key.

PGAC_LOAD_ATTRIBUTE
allows you to specify, in a 1-byte field, the load attributes for the object. The equated values are:

PGAC_RELOAD	CICS is to load a fresh copy of the object for each request.
PGAC_RESIDENT	CICS is to make the object permanently resident.
PGAC_TRANSIENT	The storage for this object is to be released whenever the use count reaches zero.
PGAC_REUSABLE	CICS can use any copy of the object currently in storage.

PGAC_USE_SVA_COPY
allows you to specify, in a 1-byte field, whether CICS is to use an SVA-resident copy of the program. The equated values are:

PGAC_SVA_YES	CICS is to use a copy in the SVA.
PGAC_SVA_NO	CICS is to load a private copy using the LIBDEF SEARCH library definition for the CICS job.

PGAC_EXECUTION_SET
allows you to specify, in a 1-byte field, whether or not the program is restricted to using the distributed program link (DPL) subset of the CICS API. The equated values are:

PGAC_DPLSUBSET	The program is to be restricted to the DPL subset of the EXEC CICS API.
PGAC_FULLAPI	The program can use the full API.

PGAC_REMOTE_SYSID
allows you to specify, in a 4-byte field, the name of the remote system where the program is to execute. CICS function ships any request for this program to the specified remote CICS.

PGAC_REMOTE_PROGID
allows you to specify, in an 8-byte field, the name by which the program is known in the remote CICS region. For a remote program, the remote name defaults to the local name if you set this field to blank.

PGAC_REMOTE_TRANSID
allows you to specify, in a 4-byte field, the name of the CICS mirror transaction under which the program, if remote, is to run. By default, this is set to the name of the CICS mirror transaction, CSMI.

PGAC_RETURN_CODE
allows you to specify, in a 1-byte field, the autoinstall control program's return code to CICS. The equated values are:

PGAC_RETURN_OK
Install the program definition using the values returned in the communications area parameter list.

PGAC_RETURN_DONT_DEFINE_PROGRAM
Do not define the program.

The sample autoinstall control program for programs, DFHPGADX

The CICS-supplied default autoinstall program is an assembler-language command-level program, named DFHPGADX. The source of the default program is provided in COBOL, PL/I, and C, as well as in assembler language. The names of the supplied programs and their associated copy books are summarized in Table 117 on page 467. All the supplied programs and copy books are in the VSE/ESA sublibrary PRD1.BASE.

Table 117. Sample programs and copy books for program autoinstall

Language	PRD1.BASE member name
Executable file:	
Assembler only	DFHPGADX.A
Program source:	
Assembler	DFHPGADX.A
COBOL	DFHPGAOX.C
PL/I	DFHPGALX.P
C	DFHPGAHX.H
Copy books:	
Assembler	DFHPGACD.A
COBOL	DFHPGACO.C
PL/I	DFHPGACL.P
C	DFHPGACH.H

Customizing the sample program

You can write your autoinstall control program in any of the languages supported by CICS, with full access to the CICS application and system programming interfaces.

If you customize the supplied control program, or write your own version, you should note the following:

- **Input:**
  The first two fields of the parameter list are input-only fields and should not be altered by your program.
- **Output:**
  The remaining fields on the parameter list are input/output or output only fields, which you can use to specify attributes that override those of the model definition.
- Some of the output fields in the parameter list are not applicable to mapsets or partitionsets. CICS ignores any parameters you specify that are not applicable to the type of object being installed.
- Any attributes you return to CICS in the parameter list are used to modify the model definition, and CICS installs the modified definition. Once installed, the definition can be modified normally using the EXEC CICS SET PROGRAM or CEMT SET PROGRAM commands.
- If you modify your control program, you can make the new version available by using the EXEC CICS SET PROGRAM NEWCOPY or CEMT SET PROGRAM NEWCOPY command.
- You can discard definitions after they have been installed; they are reinstalled when next referenced.
- You must ensure that the parameters you return to CICS are valid, and consistent with other system attributes in your CICS region. For example:
  - Do not return PGAC_SVA_YES on the PGAC_USE_SVA_COPY parameter if CICS is running with the system initialization parameter SVA=NO.

– Do not return PGAC_USER_KEY (which is the default) on the PGAC_EXECUTION_KEY parameter if the task for which your control program is called is running with CICS-key task-lifetime storage.

  You can determine the storage key for the task by testing the TASKDATAKEY option in its transaction definition by means of the following EXEC CICS commands:

```
EXEC CICS ADDRESS EIB
EXEC CICS INQUIRE TRANSACTION(eibtrans) TASKDATAKEY(...)
```

Important

When creating an autoinstalled program definition, CICS ignores the program language specified on the model program definition. CICS determines the language from the load module itself, when the autoinstalled program is invoked.

However, CICS does *not* deduce characteristics other than language from the load module. These other program characteristics must be explicitly defined by the autoinstall control program or by RDO. If your programs have varying characteristics (varying AMODE or DATALOCATION requirements, for example), you must be able to distinguish between the various types when using autoinstall. You could do this by keeping a list of exceptions to the default characteristics, and coding your autoinstall control program to refer to this list; or you might decide to install explicit RDO definitions of the exceptions.

Resource definition

The autoinstall control program cannot itself be autoinstalled, nor can any program it references. You must define a program resource definition in the CSD for the control program and for any other programs it references. You must also ensure these definitions are installed in the CICS region during startup by including the group containing the definitions in your startup grouplist. If you specify an invalid name for the control program, CICS disables the program, thus disabling the program autoinstall function.

The following program resource definitions are supplied by CICS for the autoinstall control program; the default is the assembler version, DFHPGADX. If these definitions are not suitable for your use, you can create your own, using RDO or the DFHCSDUP utility.

- Default autoinstall control program definition for DFHPGADX. This defines the assembler version, and its status is set to ENABLED:

```
GROUP(DFHPGAIP)       PROGRAM(DFHPGADX)
DESCRIPTION(Assembler definition for program autoinstall exit)
LANGUAGE(ASSEMBLER)   EXECKEY(CICS)         EXECUTIONSET(FULLAPI)
RELOAD(NO)            RESIDENT(NO)          USAGE(NORMAL)
STATUS(ENABLED)       CEDF(NO)              DATALOCATION(ANY)
```

- Autoinstall control program definition for DFHPGAOX. This defines the CICS-supplied COBOL version, and its status is set to DISABLED:

```
GROUP(DFHPGAIP)       PROGRAM(DFHPGAOX)
DESCRIPTION(COBOL definition for program autoinstall exit)
LANGUAGE(COBOL)       EXECKEY(CICS)         EXECUTIONSET(FULLAPI)
RELOAD(NO)            RESIDENT(NO)          USAGE(NORMAL)
STATUS(DISABLED)      CEDF(NO)              DATALOCATION(ANY)
```

- Autoinstall control program definition for DFHPGAHX. This defines the CICS-supplied C version, and its status is set to DISABLED:

```
GROUP(DFHPGAIP)       PROGRAM(DFHPGAHX)
DESCRIPTION(C definition for program autoinstall exit)
LANGUAGE(C)           EXECKEY(CICS)         EXECUTIONSET(FULLAPI)
RELOAD(NO)            RESIDENT(NO)          USAGE(NORMAL)
STATUS(DISABLED)      CEDF(NO)              DATALOCATION(ANY)
```

- Autoinstall control program definition for DFHPGALX. This defines the CICS-supplied PL/I version, and its status is set to DISABLED:

```
GROUP(DFHPGAIP)       PROGRAM(DFHPGALX)
DESCRIPTION(PL/I definition for program autoinstall exit)
LANGUAGE(PLI)         EXECKEY(CICS)         EXECUTIONSET(FULLAPI)
RELOAD(NO)            RESIDENT(NO)          USAGE(NORMAL)
STATUS(DISABLED)      CEDF(NO)              DATALOCATION(ANY)
```

Testing and debugging your program

You can use the CICS execution diagnostic facility (EDF) to help you test your autoinstall control program. However, EDF is inhibited for programs with names that begin with the letters DFH; so to use EDF you must name your program something other than one of the default names.

Chapter 14. Writing a dynamic transaction routing program

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, “General notes about user-replaceable programs” on page 347 apply to this chapter.

This chapter tells you how to write a dynamic transaction routing program. It is divided into the following sections:

Overview of dynamic transaction routing

When you define transactions to CICS, you can describe them as “remote” or “local”. Local transactions are always executed in the terminal-owning region; remote transactions can be routed to other regions connected to the terminal-owning region by MRO links, or to other systems that are connected by APPC (LUTYPE6.2) ISC links.

You can select both the system to which the transaction is to be routed and the transaction’s remote name dynamically, rather than when the transaction is defined to CICS. To do this you must use a **dynamic transaction routing program**. The CICS-supplied default routing program is called DFHDYP. Its source-level code is supplied in assembler-language, COBOL, PL/I, and C versions in the VSE/ESA sublibrary PRD1.BASE. You can write your own program in any of these languages, using the default program as a model.

This chapter describes the default program, and tells you how to write your own version. If you need more guidance information about transaction routing, you should first refer to the *CICS Intercommunication Guide*.

Dynamic transactions

When you want to route transactions dynamically, you must define them with the value DYNAMIC(YES) on the RDO TRANSACTION resource definition. (The default value is DYNAMIC(NO).) You must also supply values for both the remote and the local options. This allows CICS to select the appropriate values when the transaction is routed, and to ignore those values that are not needed. For information about defining transactions for dynamic transaction routing, see the *CICS Intercommunication Guide*.

The dynamic transaction routing program, DFHDYP

CICS invokes the user-replaceable dynamic transaction routing program as follows:

- When a transaction defined with the value DYNAMIC(YES) is initiated.
- When a transaction definition is not found and CICS uses the special transaction defined on the DTRTRAN system initialization parameter. (For more information about DTRTRAN, see the *CICS System Definition Guide.*)
- Before routing a remote, terminal-oriented, transaction initiated by ATI.
- If an error occurs in route selection.
- At the end of a routed transaction, if the initial invocation requests reinvocation at termination.
- If a routed transaction abends, if the initial invocation requests re-invocation at termination.

Information passed to the dynamic transaction routing program

The CICS relay program, DFHAPRT, passes information to the dynamic transaction routing program by means of a communications area. The communications area contains fields that are mapped by the DSECT DFHDYPDS, and is described in detail in "Parameters passed to the dynamic transaction routing program" on page 478. Some of the data passed to the dynamic transaction routing program in the communications area is:

- The SYSID of the remote CICS region specified when the transaction was installed
- The netname of the remote CICS region
- The name of the remote transaction
- The dispatch priority (MRO only) of the remote transaction
- Whether or not the request is to be queued if no sessions are immediately available to the remote CICS region
- The address of the remote transaction's communications area
- The address of a copy of the transaction's terminal input/output area (TIOA)
- A task-local user data area

The communications area DSECT contains comments to describe the information passed.

The dynamic transaction routing program can accept these values, or change them, or tell CICS not to continue routing the transaction. The values used depend on the function being performed; that is, some values may be ignored.

The information passed to the dynamic transaction routing program indicates whether the transaction is being routed dynamically or statically (for remote ATI requests).

If the transaction is being routed dynamically, the dynamic transaction routing program can change the SYSID or netname to determine where the transaction is to run.

If the transaction was started by ATI, the dynamic transaction routing program is called only to notify it of where the transaction is going to run. In this case, the dynamic transaction routing program cannot change the remote system name, and any changes to the SYSID or NETNAME fields in the communications area are ignored.

For transactions that are run remotely, either because they are defined as remote or because they are dynamically routed to a remote CICS region, CICS monitoring is informed of the SYSID of the remote CICS region. For transactions that the dynamic transaction routing program routes locally, the monitoring field is set to nulls.

Changing the target CICS region

The communications area passed to the dynamic transaction routing program initially contains the SYSID and netname of the default CICS region to which the transaction is to be routed. These are derived from the value of the REMOTESYSTEM option of the installed transaction definition. If the transaction definition does not specify a REMOTESYSTEM value, the SYSID and netname passed are those of the local CICS region.

The dynamic transaction routing program can change the SYSID and netname, so that the CICS region to which the transaction is routed is determined as follows:

- The NETNAME and the SYSID are not changed.

  CICS tries to route to the SYSID as originally specified in the communications area.

- The NETNAME is not changed, but the SYSID is changed.

  CICS updates the communications area with the NETNAME corresponding to the new SYSID, and tries to route to the new SYSID.

- The NETNAME is changed, but the SYSID is not changed.

  CICS updates the communications area with a SYSID corresponding to the new NETNAME, and tries to route to the new SYSID.

- The NETNAME is changed **and** the SYSID is changed.

  CICS overwrites the communications area with a SYSID corresponding to the new NETNAME, and tries to route to that new SYSID.

If the NETNAME specified is invalid, or cannot be found, SYSIDERR is returned to the dynamic transaction routing program.

Using a common transaction definition in the TOR

The recommended method is to use a single, common definition for all remote transactions that are to be dynamically routed. The name of the common definition is specified on the DTRTRAN system initialization parameter. You can use the REMOTESYSTEM option of the common definition to specify a default AOR to which transactions are to be routed. For information about defining remote transactions for dynamic transaction routing, see the *CICS Intercommunication Guide*.

Important

To route a transaction defined by the DTRTRAN definition, your dynamic transaction routing program must set the DYRDTRRJ field of the communications area to 'N' (the default is 'Y'). If you leave DYTDTRRJ set to 'Y', the transaction is rejected.

You can test the DYRDTRXN field to check if the transaction passed to your routing program is defined by the DTRTRAN definition. Figure 35 contains skeleton code for routing transactions defined by DTRTRAN.

```
if DYRDTRXN='Y' then        /* Is DYP invoked because of DTRTRAN */
do                          /* .. Yes                            */
  Call Find_AOR(sysid)      /*    Select the SYSID of the AOR    */
  if rc=0 then              /*    Is AOR available?              */
  do                        /*    .. Yes                         */
    DYRRETC=RETCOD0         /*       Set OK Return Code          */
    DYRSYSID=sysid          /*       Set the sysid               */
    DYRDTRRJ='N'            /*       Don't reject DTRTRAN defns  */
    ...                     /*       Set other commarea fields   */
  end                       /*                                   */
  else                      /*    .. No                          */
    ...                     /*       AOR unavailable logic       */
end                         /*                                   */
```

Figure 35. Example pseudocode to route transactions defined by DTRTRAN

Changing the program name

For transactions defined as DYNAMIC, on invocation of the routing program the DYRLPROG field in the communications area contains the name of the initial program associated with the transaction to be routed. If you decide to route the transaction locally, you can use this field to specify an alternative program to be run. For example, if all remote CICS regions are unavailable and the transaction cannot be routed, you may want to run a program in the local CICS terminal-owning region to send an appropriate message to the user.

Telling CICS whether to route or terminate a transaction

If you want a transaction to be routed, whether you have changed any values or not, you return a zero value to CICS in field DYRRETC of the communications area. If you want to terminate the transaction with a message or an abend, you supply a return code of X'8'. A further option (return code X'4') tells CICS to terminate the transaction without issuing a message or abend.

Warning: Setting a return code of X'4' for APPC transaction routing leads to unpredictable results, and should be avoided.

When you return control to CICS with return code zero, CICS first compares the returned SYSID with its own local SYSID:

- If the SYSIDs are the same (or the returned SYSID is blank) CICS executes the transaction locally.

- If the two SYSIDs are not the same, CICS routes the transaction to the remote CICS region, using the remote transaction name.

The dynamic transaction routing program is invoked again if the routed transaction abends and, optionally, when the routed transaction terminates.

If the system is unavailable or unknown

The dynamic transaction routing program is invoked again if the remote system name that you specify on the route selection call is not known or is unavailable. When this happens, you have a choice of actions:

- You can tell CICS not to continue trying to route the transaction, by issuing a return code of ‘8’ in DYRRETC. If the reason for the error is that the system is unavailable, CICS issues message ‘DFHAC2014’ or ‘DFHAC2029’ to the terminal user. If the reason for the error is that the system is unknown, DFHAPRT abends the transaction.
- You can tell CICS to terminate the transaction without issuing a message or abend by placing a return code of ‘4’ in DYRRETC. However, note the above warning about setting return code ‘4’.
- If the reason for the error is that no sessions are immediately available to the remote system, you can reset field DYRQUEUE to ‘Y’ (it must previously have been set to ‘N’—the request is **not** to be queued—for this error to occur), issue a return code of ‘0’ in DYRRETC, and try to route the transaction again.

  If you try to route the transaction again **without** resetting DYRQUEUE to ‘Y’ (and without changing the sysid), and the system is still unavailable, DFHDYP is reinvoked. If you then choose to set return code ‘8’, CICS terminates the transaction with message ‘DFHAC2030’.
- You can change the sysid, and issue a return code of ‘0’ in DYRRETC to try to route the transaction again. Note that if you change the sysid, you may also need to supply a different remote transaction ID. You need to do this if, for example, the transaction has a different remote transaction name on each system.

A count of the times the routing program has been invoked for routing purposes for this transaction is passed in field DYRCOUNT. Use this count to help you decide when to stop trying to route the transaction.

Invoking the dynamic transaction routing program at end of routed transactions

If you want your dynamic transaction routing program to be invoked again when the routed transaction has completed, you must set the DYROPTER field in the communications area to `'Y'` before returning control to CICS. You might want to do this, for example, if you are keeping a count of the number of transactions currently executing on a particular CICS region. However, during this reinvocation, the dynamic transaction routing program should update only its own resources, because at this stage the final command to the terminal from the application program in the AOR may be pending, and the dynamic transaction routing program is about to terminate.

Note: If you have set DYROPTER to `'Y'`, and the routed transaction abends, the dynamic transaction routing program is invoked again to notify it of the abend. You could use this invocation to initiate a user-defined program in response to the transaction abend.

Invoking the dynamic transaction routing program on abend

If the routed transaction abends, the DFHAPRT program in the TOR:

1. Passes back a response to the CICS transaction manager indicating that a transaction abend has occurred
2. If the dynamic transaction routing program requested to be reinvoked at termination of the transaction (by setting DYROPTER to `'Y'` when invoked for routing), reinvokes the dynamic transaction routing program
3. Returns to CICS transaction manager

Modifying the initial terminal data

The dynamic routing program should **not** perform an EXEC CICS RECEIVE or an EXEC CICS GDS RECEIVE command, because this prevents the routed-to transaction from obtaining the initial terminal data.

The CICS relay program, DFHAPRT, places a *copy* of the user's initial terminal input into a separate buffer. This information includes SNA presentation services headers for APPC mapped and unmapped conversations. A pointer to this buffer (DYRBPNTR), and its length (DYRBLGTH), are provided in the communication area passed from DFHAPRT to the dynamic routing program.

Because the transaction profile has not been queried at this point, uppercase translation has not been performed on the input data unless UCTRAN(YES) is specified on the TYPETERM definition.

Sometimes you may want to modify the initial data input by the user. (It may be necessary to do this if, for example, you change the ID of the remote transaction, using field DYRTRAN of the communications area.) To modify the input data, your routing program should, when invoked for route selection:

1. Copy the input data pointed to by DYRBPNTR into a named variable, of length DYRBLGTH
2. Modify the data in the named variable
3. Use the INPUTMSG option of the EXEC CICS RETURN command to make the modified data available to the application program

For guidance information about using INPUTMSG on EXEC CICS RETURN commands, see the *CICS Application Programming Guide*. For programming information about the INPUTMSG option, see the *CICS Application Programming Reference* manual.

Note: If, after modifying the input data, the dynamic transaction routing program is reinvoked because an error occurs in routing to the selected transaction, it should "remember" that it has modified the original user-input.

Modifying the application's communications area

Sometimes you may want to modify the routed application's communications area. For example, if your routing program changes the ID of the remote transaction, it may also need to change the input communications area passed to the routed application. Field DYRACMAA of the routing program's communications area enables you to do this; it is a pointer to the application's communications area.

Receiving information from a routed transaction

If your dynamic transaction routing program chooses to be reinvoked at the end of a routed transaction, it can obtain information about the transaction by monitoring its output communications area and output TIOA.

Monitoring the output communications area

A routed transaction can pass information back to the dynamic transaction routing program in its output communications area. When invoked at transaction termination, your routing program can examine the output communications area (pointed to by DYRACMAA). The following is an example of how this facility could be used:

> You have a CICSplex consisting of sets of functionally-equivalent TORs and AORs, and need to identify any intertransaction affinities that may affect transaction routing. (Note that some transactions may sometimes create affinities, and sometimes not.)
>
> The routed transactions themselves "know" when an affinity is created, and can communicate this to the dynamic transaction routing program. The routing program is then able to route such transactions accordingly.

Monitoring the output TIOA

When invoked at transaction termination, your routing program can examine the copy of the routed transaction's output TIOA pointed to by DYRBPNTR. This can be useful, for example, to guard against the situation where one AOR in a CICSplex develops software problems. These may be reported by means of a message to the end user, rather than by a transaction abend. If this happens, the routing program is unaware of the failure and cannot bypass the AOR that has the problem. By reading the output TIOA, your routing program can check for messages indicating specific kinds of failure, and bypass any AOR that is affected.

Some processing considerations

- Any of the EXEC CICS commands (except EXEC CICS RECEIVE—see "Modifying the initial terminal data" on page 476) can be issued from the routing program. You are likely to find the EXEC CICS INQUIRE CONNECTION and INQUIRE IRC commands particularly useful if you want to confirm that a link is available before routing a transaction. The EXEC CICS INQUIRE and SET commands are described in the *CICS System Programming Reference* manual.
- Although the routing program can issue any EXEC CICS command, you should consider carefully the effect of commands that alter protected resources, because changes to those resources may be committed or backed out inadvertently as a result of logic in the routed transaction. You should also consider carefully the effect of EXEC CICS SYNCPOINT and ABEND commands on APPC transaction routing.

- If you want to keep information about how transactions are routed, it must be done in the user routing program, perhaps by writing the information to a temporary storage queue associated with this terminal.
- Several transactions can form a single conversation with the end user. At the start of the conversation, resources are allocated to record the state of the conversation. Because these resources are local to the system to which the first transaction in the conversation was routed, the routing program must be able to continue to route to this system until the end of the conversation.
- It is important to avoid creating “tangled daisychains”: for any transaction that is being dynamically routed, you must avoid routing back to a node that has previously been routed from.
- The dynamic transaction routing program can be RMODE(ANY) but must be AMODE(31).

Unit of work considerations

Depending on the terminal type, the CICS relay program, the dynamic transaction routing program, and the routed transaction may constitute a single unit of work. Any protected resources owned by the dynamic transaction routing program could therefore be affected by the syncpoint activity of the routed transaction. This means that these resources may be committed or backed out inadvertently by the routed transaction. If you want to avoid this, you have to define the routing program’s resources as unprotected rather than protected.

Parameters passed to the dynamic transaction routing program

Figure 36 on page 479 shows all the parameters passed from DFHAPRT, the CICS relay program, to the dynamic transaction routing program by means of a communications area. The communications area is mapped by the copy book DFHDYPDS, which is supplied, for all the supported programming languages, in the VSE/ESA sublibrary PRD1.BASE.

```
            DS      0CL4        Standard Header
  DYRFUNC   DS      CL1         Function Code
  DYRCOMP   DS      CL2         Component Code        Always 'RT'
  DYRFILL1  DS      CL1         Reserved
  DYRERROR  DS      CL1         Route selection error code
  DYROPTER  DS      CL1         Transaction termination option
  DYRQUEUE  DS      CL1         Queue-the-request indicator
  DYRFILL2  DS      CL1         Reserved
  DYRRETC   DS      F           Return code
  DYRSYSID  DS      CL4         Default/Selected sysid
  DYRVER    DS      H           Version of the interface
  DYRFILL3  DS      H           Reserved
  DYRTRAN   DS      CL8         Default/Selected remote tranid
  DYRCOUNT  DS      F           Number of invocations count
  DYRBPNTR  DS      F           Address of input buffer
  DYRBLGTH  DS      F           Length of input buffer
  DYRRTPRI  DS      CL1         Route priority to AOR?
  DYRFILL4  DS      CL1         Reserved
  DYRPRTY   DS      H           Dispatch priority passed to AOR
  DYRNETNM  DS      CL8         Netname matching sysid
  DYRLPROG  DS      CL8         Run this program if routed locally
  DYRDTRXN  DS      CL1         DTRTRAN indicator
  DYRDTRRJ  DS      CL1         DTRTRAN reject
  DYRSRCTK  DS      XL4         Reserved
  DYRABNLC  DS      XL4         Reserved
  DYRABCDE  DS      CL4         Transaction abend code
  DYRCABP   DS      CL1         Continue abend processing?
  DYRFILL5  DS      CL1         Reserved
  DYRACMAA  DS      F           Address of application's commarea
  DYRACMAL  DS      F           Length of application's commarea
  DYRUAPTR  DS      F           Address of the user area
  DYRUSER   DS      CL128       User area
```

Figure 36. The communication area passed to a dynamic transaction routing program

DYRABCDE
is the abend code returned when a remote or locally routed transaction abends.

DYRACMAA
is the 31-bit address of the routed application's communications area. If there is no communications area, this field is set to null.

When your dynamic routing program is invoked for routing (DYRFUNC=0), the address is that of the input communications area (if any). Likewise, when your routing program is invoked because of a route-selection error or a remote ATI request (DYRFUNC=1 and 3, respectively), the address is that of the input communications area.

When your routing program is invoked because a previously-routed transaction has terminated normally (DYRFUNC=2), the address is that of the output communications area (if any). Routed applications can use their output communications area to pass information to the dynamic routing program—see "Receiving information from a routed transaction" on page 477.

When your routing program is invoked because the routed transaction has abended (DYRFUNC=4), the information in the communications area is not meaningful.

Your routing program can alter the data in the application's communications area.

DYRACMAL
is the length of the routed-to application's communications area. If there is no communications area, this field is set to zero.

DYRBLGTH
is the length of the copy of the TIOA/LUC buffer.

DYRBPNTR
is the 31-bit address of a copy of the TIOA/LUC buffer.

When your dynamic routing program is invoked for routing, because of a route-selection error, or for a remote ATI request (DYRFUNC=0, 1, and 3, respectively), it is given a copy of the input TIOA. Your routing program can alter the terminal input data passed to the routed transaction—see "Modifying the initial terminal data" on page 476.

When your routing program is invoked because a previously-routed transaction has terminated normally (DYRFUNC=2), it is given a copy of the output TIOA. Your routing program can monitor the output TIOA to detect possible problems in the AOR—see "Receiving information from a routed transaction" on page 477.

DYRCABP
indicates whether or not you want CICS to continue standard abend processing. The possible values are:

Y Continue with CICS abend processing.

N Terminate the transaction, do not continue with CICS abend processing, and give control to the program specified by DYRLPROG.

This option enables you to pass control to a local program that can handle the condition in your own way, and issue appropriate messages to terminal users.

If you enter N, you must ensure that DYRLPROG specifies the name of a valid program on the local system.

There is no default value.

DYRCOUNT
is a count of the times the dynamic transaction routing program has been invoked for routing purposes for this transaction with DYRFUNC set to '0', '1', or '3'. This option is provided to allow you to limit the number of retry requests.

DYRDTRRJ
indicates whether the transaction, which is defined by the common transaction definition specified on the DTRTRAN system initialization parameter, is to be rejected, or accepted for processing. This parameter is only relevant when DYRTRXN is set to Y. The possible values are:

Y The transaction is rejected. This is the default.

N The transaction is not rejected.

This indicator is always set to the reject condition when the dynamic transaction routing program is invoked. To dynamically route a transaction defined by the DTRTRAN definition, you must change this to the accept condition.

If you reject the transaction, message DFHAC2001—“Transaction *‘tranid’* is unrecognized”—is sent to the user’s terminal.

DYRDTRXN
indicates whether the transaction to be routed is defined by the common transaction definition specified on the DTRTRAN system initialization parameter, or by a specific transaction definition. The possible values are:

Y The transaction is defined by the definition specified by the system initialization parameter DTRTRAN. That is, there is no resource definition for the input transaction identifier (id).

The transaction is initiated in the terminal-owning region using the transaction id specified by the system initialization parameter, DTRTRAN. The input transaction id is passed to the dynamic transaction routing program in the DYRTRAN field.

N The transaction is not defined by the definition specified by the system initialization parameter, DTRTRAN. There is an installed resource definition for the input transaction id.

The transaction is initiated in the terminal-owning region using the input transaction id. The transaction id passed to the dynamic transaction routing program in the DYRTRAN field is the remote transaction id from the transaction resource definition (if this is different from the input transaction id).

For an explanation of the DTRTRAN system initialization parameter, see the *CICS System Definition Guide*.

DYRERROR
has a value only when DYRFUNC is set to ‘1’. It indicates the type of error that occurred during the last attempt to route a transaction. The possible values are:

0 The selected sysid is unknown.

1 The selected system is not in service.

2 The selected system is in service, but no sessions are available.

3 An allocate request has been rejected, and SYSIDERR returned to the application program. This error occurs for one of the following reasons:

1. An XZIQUE global user exit program requested that the allocate be rejected, or
2. CICS rejected the allocate request automatically because the QUEUELIMIT value specified on the RDO CONNECTION resource definition has been reached.

4 A queue of allocate requests has been purged, and SYSIDERR returned to all the waiting application programs. This error occurs for one of the following reasons:

1. An XZIQUE global user exit program requested that the queue be purged, or
2. CICS purged the queue automatically because the MAXQTIME limit specified on the RDO CONNECTION resource definition has been reached.

DYRFUNC

tells you the reason for this invocation of the dynamic transaction routing program. The possible values are:

0	Invoked for transaction routing.
1	Invoked because an error occurred in route selection.
2	Invoked because a previously routed transaction has terminated.
3	Invoked before automatic initiation.
4	Invoked because the routed transaction abended.

DYRLPROG

is the name of the initial program associated with the transaction for which the dynamic transaction routing program is invoked, if the transaction is defined for dynamic routing. If the transaction is being statically routed (the RDO TRANSACTION resource definition specifies DYNAMIC(NO) and a specific REMOTESYSTEM name), this field contains blanks.

You can use this field to specify the name of an alternative program to be run if the transaction is routed locally. For example, if all remote CICS regions are unavailable, and the transaction cannot be routed, you may want to run a program in the local terminal-owning region to send an appropriate message to the user.

Note: DYRLPROG must not be set to blanks when you specify DYRCABP=N. If you specify DYRCABP, ensure you also specify a valid program name on DYRLPROG.

DYRNETNM

is the netname of the CICS region identified in DYRSYSID.

If the DYRNETNM value is changed by the initial invocation of the dynamic transaction routing program, CICS tries to route the transaction to the CICS region with the new netname.

DYROPTER

specifies whether the dynamic transaction routing program is to be reinvoked when the routed transaction terminates. The possible values are:

N The dynamic transaction routing program is not to be reinvoked. This is the default.

Y The dynamic transaction routing program is to be reinvoked.

You can specify this option for transactions that are routed to remote CICS regions and also for transactions that are executed locally.

DYRQUEUE

identifies whether or not the request is to be queued if no sessions are immediately available to the remote system identified by DYRSYSID. The possible values are:

Y	The request is to be queued if necessary. This is the default.
N	The request is not to be queued.

DYRPRTY

can be used to set the dispatch priority of the task in the application-owning region, if the connection between the terminal-owning region and application-owning region is MRO.

CICS sets this value to ‘0’ (zero) before invoking the dynamic transaction routing program. If the DYRRTPRI value is ‘Y’ on return from the initial invocation, CICS passes the DYPPRTY value to the application-owning region.

DYRRETC
contains a return code that tells CICS how to proceed. The possible values are:

0	Continue processing the transaction.
4	Terminate the transaction without message or abend.
8	Terminate the transaction with either a message or an abend.

Whenever the routing program is invoked, DYRRETC is set to ‘0’. If you want CICS to continue processing the transaction, you must leave it set to ‘0’.

To make CICS terminate the transaction (issuing a message or abend), return a value of ‘8’.

To make CICS terminate the transaction without issuing a message or abend (indicating that DFHDYP has done all the processing that is necessary), return a value of ‘4’.

Warning: Setting a return code of ‘4’ for APPC transaction routing leads to unpredictable results, and should be avoided.

You do not need to set a return code when the routing program is invoked at transaction termination. (Any code you set is ignored by CICS.)

DYRRTPRI
indicates whether or not the dispatch priority of the transaction should be passed to the application-owning region, if the connection between the terminal-owning region and the application-owning region is MRO. The possible values are:

N	The dispatch priority is not passed. This is the default.
Y	The dispatch priority is passed.

DYRSYSID
identifies the SYSID of a CICS region. The exact meaning of this parameter depends on the value for DYRFUNC:

- When DYRFUNC is set to ‘0’, DYRSYSID contains:
  - The remote CICS region name as specified on the REMOTESYSTEM option of the installed RDO TRANSACTION resource definition, or,
  - The system name of the local CICS region if REMOTESYSTEM is not specified.

  The dynamic transaction routing program can accept this value or change it before returning to CICS.

  If the SYSID you return to CICS is the same as the local sysid, CICS runs the transaction in the local region (the terminal-owning region).

- When DYRFUNC is set to ‘1’, DYRSYSID contains the CICS region name returned to CICS by the dynamic transaction routing program on its previous invocation, and the SYSID is found to be in error.

  The action your dynamic transaction routing program can take when DYRFUNC=1 depends on the DYRERROR parameter setting:

- If DYRERROR is set to ‘0’ (unknown sysid) or ‘1’ (CICS region not in service) and you want CICS to retry transaction routing, you must change DYRSYSID before returning to CICS.
- If DYRERROR is set to ‘2’ (no session available) and you want CICS to retry transaction, you must change DYRSYSID or change the value of DYRQUEUE to ‘Y’ (queue the request until a session is available).

- When DYRFUNC is set to ‘2’, DYRSYSID contains the name of the CICS region on which the completed transaction executed.
- When DYRFUNC is set to ‘3’, DYRSYSID contains the CICS region name specified on the REMOTESYSTEM option of the installed transaction definition, with DYNAMIC(NO) also specified. Any changes to this value, or to DYRNETNAME, are ignored.
- When DYRFUNC is set to ‘4’, DYRSYSID contains the name of the CICS region on which the transaction abended.

DYRTRAN
contains the remote transaction id.

When DYRFUNC is set to ‘0’ or ‘3’, DYRTRAN contains the remote transaction id specified on the REMOTENAME option of the installed RDO TRANSACTION resource definition. Your dynamic transaction routing program can accept this remote transaction id, or supply a different transaction name for forwarding to the remote CICS region. If the supplied name is longer than four characters, it is truncated by CICS.

You can change DYRTRAN on any call to the dynamic transaction routing program, though it is effective only when DYRFUNC is set to ‘0’, ‘1’, or ‘3’.

DYRUAPTR
is the 31-bit address of the user area (DYRUSER).

DYRUSER
is a 128-byte user area.

CICS initializes this user area to zeroes before invoking the dynamic transaction routing program for a given task. This user area can be modified by the dynamic transaction routing program, returned to the CICS relay program, DFHAPRT, and is passed to subsequent invocations of the dynamic transaction routing program for a given transaction instance.

DYRVER
is the version number of the dynamic transaction routing program interface. The default is “2”.

Naming your dynamic routing program

The supplied, user-replaceable dynamic routing program is named DFHDYP. If you write your own version, you can name it differently.

After the system has been loaded, to find the name of the dynamic routing program currently identified to CICS, use the EXEC CICS INQUIRE SYSTEM command. Field DTRPROGRAM contains the name of the current program.

The default is DFHDYP.

To change the current program:

- Use the DTRPGM system initialization parameter. For more guidance information about how to do this, refer to the *CICS System Definition Guide*.
- Make the change online using the EXEC CICS SET SYSTEM DTRPROGRAM command. For programming information about this command, refer to the *CICS System Programming Reference* manual.

Note: A sample definition is provided for DFHDYP, but you must install a new resource definition for a customized dynamic routing program.

Testing your dynamic routing program

You can use the CICS execution diagnostic facility (EDF) to test your dynamic transaction routing program. To do so, you must name your program something other than DFHDYP, because you cannot use EDF for programs that begin with "DFH". For details of how to use EDF, see the *CICS Application Programming Guide*.

You can use EDF in either single- or dual-terminal mode. If you choose single-terminal mode, EDF displays screens for both the dynamic transaction routing program and the application program that is invoked by the routed transaction. The screens relate to:

- The initial invocation of the dynamic transaction routing program for transaction routing (DYRFUNC=0 or DYRFUNC=3)
- The invocation of the dynamic transaction routing program if an error occurs in route selection (DYRFUNC=1)
- The invocation of the application program
- The termination of the task
- The invocation of the dynamic transaction routing program at termination of the routed transaction (DYRFUNC=2), if you have specified DYROPTER=Y
- The invocation of the dynamic transaction routing program if the routed transaction abends (DYRFUNC=4)

If you want EDF to display the execution of your dynamic routing program only, either choose dual-terminal mode, or use one of the other methods described in the *CICS Application Programming Guide*.

Dynamic transaction routing sample programs

The CICS-supplied sample dynamic transaction routing program is an assembler-language command-level program, named DFHDYP. The corresponding sample copy book that defines the communication area is DFHDYPDS. In addition, there are COBOL, PL/I, and C source-level samples and copy books. The names of the supplied programs and copy books are summarized in Table 118. All the supplied programs and copy books are in the VSE/ESA sublibrary PRD1.BASE.

Table 118. Dynamic transaction routing programs and copy books

Language	PRD1.BASE member name
Programs:	
Assembler	DFHDYP.A
COBOL	DFHDYP.C
PL/I	DFHDYP.P
C	DFHDYP.H
Copy books:	
Assembler	DFHDYPDS.A
COBOL	DFHDYPDS.C
PL/I	DFHDYPDS.P
C	DFHDYPDS.H

You can write your own dynamic routing program in COBOL, PL/I, C, or assembler language, and you can change the name of the program.

When invoked with DYRFUNC set to ‘0’ or ‘3’, the sample programs accept the sysid and remote transaction name that are passed in fields DYRSYSID and DYRTRAN of the communication area, and set DYRRETC to ‘0’ before returning to CICS. When invoked with DYRFUNC set to ‘1’ or ‘4’, they set a return code of ‘8’.

If you want to route transactions dynamically, you must customize DFHDYP, or replace it completely with your own routing program.

Chapter 15. The user-replaceable journaling programs

Considerations common to all user-replaceable programs

Note that the comments contained in Chapter 5, “General notes about user-replaceable programs” on page 347 apply to this chapter.

CICS Transaction Server for VSE/ESA Release 1 provides automatic journal archiving, as described in Chapter 17, “CICS journaling” on page 513. However, you can still use the two user-replaceable programs, DFHXJCO and DFHXJCC, in CICS Transaction Server for VSE/ESA Release 1 to use your own archiving procedures.

The user-replaceable programs, DFHXJCO and DFHXJCC

There are two user-replaceable journaling programs. These are DFHXJCO and DFHXJCC.

DFHXJCO is invoked just before CICS executes an open-for-output request for a non-DMF disk journal.

DFHXJCC is invoked after CICS has executed a request to close an open-for-output, non-DMF disk journal. DFHXJCC is invoked whether the CLOSE request is successful or not.

The supplied versions of DFHXJCO and DFHXJCC simply return to their callers. You can write your own programs to replace the CICS-supplied versions if you want to do any additional processing at journal open or close time. Note, if you do write your own programs, that they must be coded in assembler language.

Some possible uses are:

- Control procedures to ensure that journal data sets have been archived before they are made available for reuse.
- Automatic submission of journal archiving jobs through POWER, rather than using manual procedures. This can be valuable in an XRF environment, where the need to minimize operator involvement in the recovery procedure may be an important factor.

The communication area

The type of OPEN or CLOSE is passed to the user-replaceable programs, along with additional information, in a communication area. The communication area contains all the information you may need to do any extra processing in the user-replaceable programs. It is listed in Figure 37 on page 488.

```
DFHXJCOM DSECT
XJCOMBA  EQU   *                   Commarea begin address
COMINVDS DS    0CL4                Invocation Descriptor
COMLOCDS DS    CL1                 Local Invocation Descriptor
COMEOFO  EQU   C'1'                Reserved
COMEOFC  EQU   C'2'                Reserved
COMFOPN  EQU   C'3'                First open
COMMSCL  EQU   C'4'                Midstream close
COMMSOP  EQU   C'5'                Reserved
COMSDCL  EQU   C'6'                Shutdown close
COMGLBDS DS    CL2                 Global Invocation Descriptor 'JC'
         DS    CL1                 Reserved
COMJRNUM DS    XL2                 Hexadecimal Journal Number
COMJRNDS DS    CL1                 Journal Data Set Id (A or B)
         DS    CL1                 Reserved
COMJNDCB DS    A                   DTF Address
COMJNDDN DS    CL8                 Journal DLBL name
XJCOMEA  EQU   *                   Commarea end address
XJCOMLEN EQU   XJCOMEA-XJCOMBA     Commarea length
```

Figure 37. DFHXJCOM communication area

The settings of field COMLOCDS have the following meanings:

COMFOPN	Set when the journal is first opened at normal CICS start up.
COMSDCL	Set when the journal is closed at CICS shutdown.
COMMSCL	Set when the journal is closed at times other than shutdown and emergency restart.

You should address the communication area as follows:

```
EXEC CICS ADDRESS COMMAREA (XJCOMPTR)
USING DFHXJCOM,XJCOMPTR
```

Limitations on the use of DFHXJCO and DFHXJCC

Because DFHXJCO and DFHXJCC may be invoked during CICS initialization, before support for other languages is available, they must be coded in assembler language.

You can only use a certain set of CICS commands in programs DFHXJCO and DFHXJCC, for the following reasons:

- You must not invoke journal control and many of its requesters recursively.
- The user-replaceable programs may be invoked during initialization before some of the CICS services are initialized.

You are strongly advised not to use any CICS commands that are not in the list below; if you do, the results are unpredictable. Permitted commands are:

- EXEC CICS HANDLE CONDITION and IGNORE CONDITION
- EXEC CICS PUSH HANDLE and POP HANDLE
- EXEC CICS ABEND and HANDLE ABEND
- EXEC CICS ADDRESS and ASSIGN
- EXEC CICS GETMAIN and FREEMAIN
- EXEC CICS RETURN
- EXEC CICS WAIT EVENT
- EXEC CICS INQUIRE JOURNALNUM and INQUIRE SYSTEM

If you want to modify the programs so that they can do extra processing, you must take into account the circumstances under which these user-replaceable programs are called. Both may be called during initialization if CICS has determined that the journals were not closed during the previous run of CICS. Under these circumstances, CICS may issue an end-of-file OPEN and CLOSE prior to the first journal OPEN.

The sample programs and copy book

The source-code of the default journaling programs, DFHXJCO and DFHXJCC, is provided, in assembler language only, in the VSE/ESA sublibrary PRD1.BASE, together with a copy book, DFHXJCOM, which maps the communication area.

Part 4. Customizing the XRF overseer program

Table 119. XRF overseer road map

If you want to...	Refer to...
Write a program to control XRF	Chapter 16, “The extended recovery facility overseer program” on page 493

Chapter 16. The extended recovery facility overseer program

The information in this chapter is of interest only to users of the extended recovery facility (XRF). Details of XRF are provided in the *CICS XRF Guide*, and guidance information about running the overseer, including a sample job stream, is provided in the *CICS Operations and Utilities Guide*.

The XRF overseer program has two major functions:

- To display the current status of active and alternate CICS regions
- To restart failed CICS regions in place without operator intervention

There is a CICS-supplied sample overseer program which performs these two functions and which you may find adequate for your installation.

The chapter is divided into the following sections:

1. **"The sample XRF overseer program"** contains:
   - "Functions of the sample program"
   - "How the sample overseer program interfaces with CICS" on page 498
   - "How to tell the sample overseer which actives and alternates to monitor" on page 498
2. **"The DFHWOSM macros"** on page 499 describes the macros that you use to provide services to the overseer program.
3. **"Customizing the sample overseer program"** on page 508 describes how you can extend the functions of the sample program.

The sample XRF overseer program

The CICS-supplied sample overseer is an assembler-language batch program that runs in its own partition. The source of the sample program, DFH$AXRO, and its associated DSECTs are supplied in the VSE/ESA sublibrary PRD1.BASE. An assembled version of the sample program is also supplied in PRD1.BASE, as are the DFHWOSM macros that you use to provide CICS services to the overseer.

Functions of the sample program

The program acts on six commands that the console operator can enter. (Minimum abbreviations are shown like this: **D**.) These commands are as follows:

Display
: Display the current status of all active-alternate pairs being monitored by the overseer program.

Restart
: Enable or disable the restart-in-place function of the overseer program.

Snap
: Take a snap dump of the sample program.

End
: Terminate the sample program.

Open
: Ask the overseer to try to open CICS availability manager (CAVM) data sets that it has previously failed to open.

? help
: Ask the overseer to display a list of available overseer commands along with descriptions, on the system console.

The Display and Restart commands control the two major functions of the sample overseer program. These are described in the following sections. The Open command is described in "Opening CAVM data sets dynamically" on page 497.

The Display function

When the operator enters the Display command at the VSE console, the sample overseer program issues a multiline write-to-operator command (MLWTO) showing the last known state of each of the active-alternate pairs that it is monitoring. The overseer retrieves this information from the control and message data sets, in which the CICS availability manager (CAVM) has been recording state and surveillance information. The display includes a title line and one line of status information for each active-alternate pair. The title line is as follows:

```
GEN-APP  ACT-JOB  ACT-APP  APWR A-ST  BKP-JOB  BKP-APP  BPWR B-ST  TKV
```

Each line of status information provides the status values listed in Table 120.

Two additional items might appear on the status display:

NO ACTIVE DATA

NO BACKUP DATA.

These are displayed instead of status data when no data was extracted from the CAVM data sets. This happens when newly-created data sets are used—CICS has not yet written any data to them—or when the overseer fails to open the data sets.

An example of the status display is shown, for guidance purposes, in the *CICS Operations and Utilities Guide*.

Table 120 (Page 1 of 2). Explanation of the overseer status values

Value	Description
GEN-APP	The generic applid of the active-alternate pair.
ACT-JOB	The CICS jobname of the active.
BKP-JOB	The CICS jobname of the alternate.
ACT-APP	The specific applid of the active.
BKP-APP	The specific applid of the alternate.
APWR	The VSE/POWER SYSID of the CPU on which the active was last known to be executing.
BPWR	The VSE/POWER SYSID of the CPU on which the alternate was last known to be executing.

Table 120 (Page 2 of 2). Explanation of the overseer status values

Value	Description
A-ST	The last known status of the active. The status can be: **ACT** Active signed on normally and running the active CICS workload. **BACK** Alternate signed on and running normally. **INCA** Incipient active, meaning that an alternate CICS is taking over from an active CICS. The active job has signed off abnormally, and the incipient active is waiting for the active job to terminate. **SOFA** Signed off abnormally. **SOFN** Signed off normally. **TKIP** Takeover in progress. An alternate CICS is attempting a takeover of this active system. When the takeover is complete, the status is changed. **TKOV** Taking over (alternate only). **UNKN** Unknown—the overseer has no current information about the status, which was in an intermediate state when the Display command was processed. Reissuing the Display command causes UNKN to be replaced by another status value.
B-ST	The last known status of the alternate. The status can be: **ACT** Active signed on normally and running the active CICS workload. **BACK** Alternate signed on and running normally. **INCA** Incipient active, meaning that an alternate CICS is taking over from an active CICS. The active job has signed off abnormally, and the incipient active is waiting for the active job to terminate. **OLD** The information displayed for the alternate refers to out-of-date information about the system that was the alternate until a recent takeover. That system is the current active, and the information displayed for the alternate is marked as OLD until a new alternate is signed on and running normally. **SOFA** Signed off abnormally. **SOFN** Signed off normally. **TKOV** Taking over (alternate only). **UNKN** Unknown—the overseer has no current information about the status, which was in an intermediate state when the Display command was processed. Reissuing the Display command causes UNKN to be replaced by another status value.
TKV	The XRF takeover option for the alternate CICS system. This can be AUT, COM, or MAN.
Note: An 'X' following any of these status values indicates that the associated job is currently executing. However, because VSE/POWER services are used to discover the execution state of a job, only those jobs that are running on the same VSE/POWER system as the overseer program, show the correct execution state. Any job that is not on the same VSE/POWER shared spool appears not to be executing.	

Restart-in-place

The overseer program can restart failed CICS regions in place automatically, if they are in the same VSE/ESA operating system image as the overseer. The alternatives to automatic restart are operator-initiated restart, automatic takeover to the alternate, and operator-initiated takeover.

Automatic restart in place of failed regions is most useful in a multi-VSE/ESA, multiregion, XRF configuration. Because related regions must operate in the same VSE/ESA operating system image, a takeover of one region means that all related regions must also be taken over by their alternates. A region may not be important enough for you to want every failure to cause a takeover to the alternate VSE/ESA operating system image. This could disrupt users who would not otherwise have been affected by the failure. Automatic restart in place of the failed region is therefore likely to be preferred to takeover in these circumstances.

If your system consists of one or more independent regions, with actives and alternates located in separate VSE/ESA operating system images, you can:

- Allow the overseer to restart an active region in place automatically when it fails.
- Choose automatic takeover by the alternate.
- Leave the operator to decide what to do. The operator could decide to restart the failing region in place or to initiate a takeover by the alternate, and this decision is likely to depend on which part of your system has failed.

If you are operating an MRO system in a single VSE/ESA operating system image, the failure of an active region can be handled by a takeover by the alternate, without causing all the related regions to be taken over, because the new active region can continue communication with the other active regions. Takeover is therefore likely to be your preferred course of action.

Enabling and disabling restart in place: You can enable and disable the restart-in-place function of the overseer program using the Restart command. When you enter this command, restart processing is enabled or disabled for all generic applids that the overseer is monitoring. You can also specify that particular active-alternate pairs are not to be automatically restarted in place, regardless of whether restart processing is enabled or disabled. This is described in “How to tell the sample overseer which actives and alternates to monitor” on page 498.

The Restart command works like an ON/OFF switch. Restart in place is enabled when the sample program is initialized. When the Restart command is first entered, restart in place is disabled. If you issue the command again, restart will be enabled again, and so on. If a region fails while restart in place is disabled, no attempt to restart it will be made, even if restart in place is enabled again.

Rules that control restart in place: The sample overseer program concludes that a region has failed if both:

- The region is not executing now, and was known to have been executing during the previous examination of the relevant CAVM data sets by the overseer.
- The region did not sign off normally from the CICS availability manager (CAVM).

The overseer program can restart a failed **active** region in place, if all the following conditions are met:

- Restart in place is enabled for this overseer.
- Restart in place is enabled for this active-alternate pair.
- There is no executing alternate region for this active, or the alternate region is currently defined with the TAKEOVER=COMMAND system initialization parameter. If the alternate region is defined with TAKEOVER=AUTO or TAKEOVER=MANUAL, the overseer assumes that the alternate will initiate a takeover or that the console operator will decide what action to take.
- The failing region was running in the same VSE/ESA operating system image as the overseer.
- An attempt to restart the region in place is not already in progress.
- If the failing region belongs to a group of related regions (an MRO environment, for example), a takeover to another VSE/ESA operating system image, perhaps initiated by another region, is not under way.

When a failed active region is restarted in place, whether by the operator or by the overseer, the corresponding alternate region cannot continue to support the new active region, and must be restarted. The overseer program restarts the **alternate** region automatically in these circumstances, provided that restart processing is enabled for both the failing region and the overseer.

If you want to be able to restart regions in place on both VSE/ESA operating system images in a multi-VSE/ESA environment, an overseer program must execute on each VSE/ESA operating system image. For more guidance information about how the sample overseer program restarts failed regions in place, see the *CICS Operations and Utilities Guide*.

Opening CAVM data sets dynamically

When the overseer program is initialized, it is possible that some CAVM data sets have not yet been formatted by a CICS system. The overseer program obtains an ‘open error’ return code on these data sets, and subsequent attempts to display details about the associated CICS systems receive the response ‘NO ACTIVE DATA AVAILABLE’.

This problem arises only if the overseer is initialized before all the CAVM data sets have been formatted. If it occurs, the operator can use the Open command to retry the opening of those CAVM data sets for which the Open previously failed. The overseer retries an Open only if the previous attempt failed with the return code `X'C'`. (See “DFHWOSM FUNC=OPEN macro” on page 502.)

The use of the Open command is indicated when:

- The overseer displays ‘NO ACTIVE DATA AVAILABLE’ for a system that the operator knows has successfully signed on to the CAVM.
- In an already established XRF environment, a new XRF system has just started up and formatted its CAVM data sets, and the operator wants future displays from the overseer to display information for the new job.

How the sample overseer program interfaces with CICS

The overseer service consists of two CICS modules (DFHWOSA and DFHWOSB) which you cannot customize, and a sample overseer program (DFH$AXRO), which you can customize or replace with your own overseer program. DFHWOSA loads the overseer program. DFHWOSA and DFHWOSB are supplied in the VSE/ESA sublibrary PRD1.BASE.

The CICS overseer module DFHWOSB provides a stable interface to the CAVM datasets and to certain VSE/ESA and VSE/POWER services that the overseer program requires. The overseer program invokes those services using a CICS-supplied group of macros called the DFHWOSM macros. (These are described in “The DFHWOSM macros” on page 499.)

In summary, DFHWOSA invokes the sample program, and DFHWOSB is subsequently invoked by the sample program whenever the sample issues a DFHWOSM macro. The DFHWOSM macros do not interact directly with either the active or the alternate CICS partitions.

How to tell the sample overseer which actives and alternates to monitor

As written, the sample overseer program can handle 20 active-alternate pairs and 20 “related system names”. (A related system name identifies those regions or systems that cannot be considered in isolation by the overseer. The most common example of this is an MRO environment, where the overseer needs to be able to identify related regions when deciding whether to restart a failed region in place. Those regions or systems that are identified with a common related system name must execute on the same VSE/ESA operating system image.)

You can increase or decrease the numbers of active-alternate pairs and related system names that the overseer can handle, by changing the values of the variables GENSIZE (active-alternate pairs) and RLTSIZE (related system names) in DFH$AXRO.

The sample program discovers which active-alternate pairs it is monitoring from a VSAM key-sequenced data set called DFHOSD, which contains a single entry for each active-alternate pair. You create this data set and initialize it with information about active-alternate pairs before you use the overseer for the first time. You also have to redefine the DFHOSD data set whenever you want to change the information that it holds.

The sample overseer program reads the DFHOSD records in key sequence and builds a table of entries. Each active-alternate pair is known by its generic applid on this data set. Every entry on the data set contains the following information:

- A 12-byte key field, containing the 4-byte value ‘GNbb’ followed by the 8-byte generic applid of the active-alternate pair.
- The filenames of the control data set and the message data set associated with this generic applid. Each of these is an 8-byte value.
- An optional 8-byte RELATEID, to identify related systems.
- A restart-in-place indicator to show whether a region can be restarted in place. The only value that will prevent an attempt to restart in place is ‘N’.

The data structure of the DFHOSD data set entries is provided in member DFH$XRDS of the VSE/ESA sublibrary PRD1.BASE.

For a sample of the console listing from an overseer job, see the *CICS Operations and Utilities Guide*.

The DFHWOSM macros

The DFHWOSM macros invoke the CICS module DFHWOS to provide services to the overseer program. The macros are the supported interface to the CAVM data sets. They are supplied in the VSE/ESA sublibrary PRD1.BASE. The following list tells you what the macros do, and where to find a full description of them:

"DFHWOSM FUNC=BUILD macro" on page 500
Open communication with DFHWOSB.

"DFHWOSM FUNC=CLOSE macro" on page 500
Terminate access to the CAVM data sets for a named generic applid.

"DFHWOSM FUNC=DSECT macro" on page 501
Generate required DSECTs.

"DFHWOSM FUNC=JJC macro" on page 501
Issue a VSE/POWER cancel for a named job.

"DFHWOSM FUNC={JJS|QJJS} macro" on page 502
Discover current VSE/POWER JOB status.

"DFHWOSM FUNC=OPEN macro" on page 502
Initialize access to the CAVM data sets for a named generic applid.

"DFHWOSM FUNC=OSCMD macro" on page 503
Issue operating system VSE/POWER commands.

"DFHWOSM FUNC=READ macro" on page 504
Retrieve status information for a named generic applid from the CAVM data sets.

"DFHWOSM FUNC=TERM macro" on page 506
Close communication with DFHWOSB.

"DFHWOSM FUNC=WAIT macro" on page 507
Communicate with the system operator and wait for an overseer command.

The macros are described in detail in the following sections. For all the DFHWOSM macros, the following rules apply:

- The "label" field is optional.
- If the macro has an input parameter list, the address of that parameter list must be supplied as the value of the PARM operand. The address itself may be specified as a register number or as a label. Register **1** is the default value.
- If the macro has to supply either a BUILD TOKEN or an OPEN TOKEN to DFHWOSA (as described in "The DFHWOSM tokens" on page 500), the token must be provided in the register specified in the TOKEN operand. Register **14** is the default value.

The DFHWOSM tokens

When DFHWOSA first invokes the overseer program, it passes a value in register 1 which is known as the **ENTRY** token. The ENTRY token value is stored by the overseer program on entry and is passed back to DFHWOSB as input to the BUILD macro.

The DFHWOSM FUNC=BUILD macro must be the first macro issued by the overseer program and must complete successfully. The register 1 output from this macro is a second token called the **BUILD** token. The BUILD token value is stored by the overseer program and passed back to DFHWOSB as input to the OPEN, CLOSE, READ, QJJS, JJS, JJC, OSCMD, WAIT and TERM macros.

DFHWOSM FUNC=BUILD macro

The DFHWOSM FUNC=BUILD macro must be issued by the overseer program to initialize its communication with DFHWOS. No other macro can be issued by the overseer program until DFHWOS FUNC=BUILD has completed successfully.

```
label      DFHWOSM FUNC=BUILD
                 [,TOKEN={token register|14}]
```

Input

The TOKEN value is the ENTRY token that was passed to the sample overseer program when it was first invoked by DFHWOSA.

Output

Register 1
Contains the BUILD token value, which must be returned as an input value by the overseer program on certain subsequent requests. This value will be returned to register 1 only if register 15 has a return code of 0.

Register 15
Contains one of the following return codes:

0	Communication successfully initialized between the overseer program and DFHWOSA.
4	Incorrect TOKEN value supplied.
8	Insufficient storage.

DFHWOSM FUNC=CLOSE macro

The DFHWOSM FUNC=CLOSE macro terminates access to the CAVM data sets for a named generic applid.

```
label      DFHWOSM FUNC=CLOSE
                 [,PARM={parm address|1}]
                 [,TOKEN={token register|14}]
```

Input

The PARM value is a pointer to the address of the generic applid whose associated CAVM data sets are no longer to be accessed by the overseer program.

The TOKEN value is the BUILD token.

Output

Register 15 Contains one of the following return codes:

0	CLOSE request was successful and the CAVM data sets associated with this generic applid can no longer be accessed by the overseer program.
4	Close request failed.
8	Access to CAVM data sets for the named generic applid had not been initialized.

DFHWOSM FUNC=DSECT macro

The DFHWOSM FUNC=DSECT macro generates a number of DSECTs, including the DSECT of the DBLID definitions.

```
label    DFHWOSM FUNC=DSECT
```

DFHWOSM FUNC=JJC macro

The DFHWOSM FUNC=JJC macro issues a VSE/POWER cancel for a named job with a POWER job number.

```
label      DFHWOSM FUNC=JJC
                 [,PARM={parm address|1}]
                 [,TOKEN={token register|14}]
```

Input

The PARM value is a pointer to the addresses of the following:

An 8-byte VSE/POWER job name
An 8-byte VSE/POWER job number

The TOKEN value is the BUILD token.

Output

Register 15 Contains the following return codes:

0	VSE/POWER cancel completed. Check VSE/POWER data in XPCCB user area.
Nonzero	Return code from XPCC/POWER request.

Register 1 Contains the XPCCB control block address.

Register 0

0	If register 15 = 0, XPCC request has completed successfully. If register 15 is nonzero, XPCC has failed.
1	Timeout occurred.
2	Cancel failed.

DFHWOSM FUNC={JJS|QJJS} macro

Given a VSE/POWER JOBNAME and POWER job number, both versions of this macro return the current VSE/POWER job status into the POWER USER DATA PORTION of the XPCCB control block (PXPUSER in IJBXPCCB).

The FUNC=JJS macro returns control when the POWER call has completed successfully or unsuccessfully. The FUNC=QJJS macro returns control immediately and posts an event control block (ECB) once the POWER request has completed.

```
label      DFHWOSM FUNC={JJS|QJJS}
                 [,PARM={parm address|1}]
                 [,TOKEN={token register|14}]
```

Input

The PARM value is a pointer to the addresses of the following:

An 8-byte POWER job name
An 8-byte POWER job number

The TOKEN value is the BUILD token.

Output

Register 15 Contains the following return codes:

0	POWER status request complete. Check POWER data in XPCCB user area.
Nonzero	Return code from XPCC/POWER request.

Register 1 Contains the XPCCB control block address.

Register 0 For FUNC=QJJS, the address of the spooler ECB is returned.

For FUNC=JJS, the following return codes are returned.

0	If register 15 = 0 then XPCC request has completed successfully. If register 15 is nonzero then XPCC has failed.
1	Timeout occurred.

DFHWOSM FUNC=OPEN macro

The DFHWOSM FUNC=OPEN macro initializes access to the CAVM data sets for a named generic applid.

```
label      DFHWOSM FUNC=OPEN
                  [,PARM={parm address|1}]
                  [,TOKEN={token register|14}]
```

Input

The PARM value is a pointer to three addresses, and these are:

1. The address of the generic applid
2. The address of the filename of the control data set
3. The address of the filename of the message data set

The TOKEN value is the BUILD token.

Output

Register 15 Contains one of the following return codes:

0	Access initialized, active and alternate signed on.
1	Access initialized, active signed on.
2	Access initialized, alternate signed on.
3	Access initialized, nothing signed on.
4	Same POWER SYSID; IPL time of active earlier than VSE/ESA IPL time.
5	Same POWER SYSID; IPL time of alternate earlier than VSE/ESA IPL time.
6	Insufficient storage.
7	Generic applid is not associated with the named CAVM data sets.
8	Access already initialized for this generic applid or for this file name.
C	Data set open failure.
10	SHOWCB failure.

A register 15 return code value of 0–5 indicates that a DFHWOSM FUNC=READ macro can now be issued. A return code value of 6 or above indicates that the OPEN has failed and that the overseer program will not be able to access the CAVM data sets. A return code value of C indicates that the OPEN has failed but can be retried by the operator entering the ‘O’ (Open) command.

DFHWOSM FUNC=OSCMD macro

The DFHWOSM FUNC=OSCMD macro is used to issue VSE/POWER commands. (The overseer program performs restart in place of a failed region by issuing an OSCMD macro.) The text of the required command is provided as input to the macro, and the OSCMD service issues an XPCC SENDR specifying this command text. In addition, the OSCMD service issues a VSE/ESA WTO request so that a copy of the command text appears on the VSE console to keep the operator informed of what is about to happen. This copy has the comment ‘(BY IOP)’ appended to show that the command is going to be issued by an overseer program. A second copy of the command text is sent to the console when the VSE/ESA command is issued. The run-time sample provided in the *CICS Operations and Utilities Guide* for guidance purposes includes an example of this.

```
label      DFHWOSM FUNC=OSCMD
                 [,PARM={parm address|1}]
                 [,TOKEN={token register|14}]
```

Input

The PARM value is a single address that points to a command area. The command area is made up of a 4-byte length field followed by the command data. The length field contains the length of the whole command area. The command data must be in WTO command format.

The TOKEN value is the BUILD token.

Output

Register 0	Power spooler ECB address. Request does not complete until ECB is posted.
Register 1	XPCCB address.
Register 15	Return code from XPCC SEND request. A return code of greater than zero indicates that the XPCC request has failed.

DFHWOSM FUNC=READ macro

The DFHWOSM FUNC=READ macro returns information about a named generic applid from its associated CAVM data sets.

```
label      DFHWOSM FUNC=READ
                 [,PARM={parm address|1}]
                 [,TOKEN={token register|14}]
```

Input

Figure 38 on page 505 illustrates the input to and output from the READ macro. The PARM value is a pointer to a parameter list that contains the addresses of the generic applid and the dbllist. The dbllist is a list of one or more doublewords.

In the first two bytes of the second word of each of these doublewords you supply the DBLID of the information you require. Each piece of information that you can request is identified by a DBLID, and a list of these is provided in Figure 39 on page 506.

The first word of each doubleword is an output area to contain the address of the requested information, and the last two bytes of the second word of each doubleword will contain the length of the information. The end of the dbllist is signalled by setting the high order bit of the last doubleword to one.

The TOKEN value is the BUILD token.

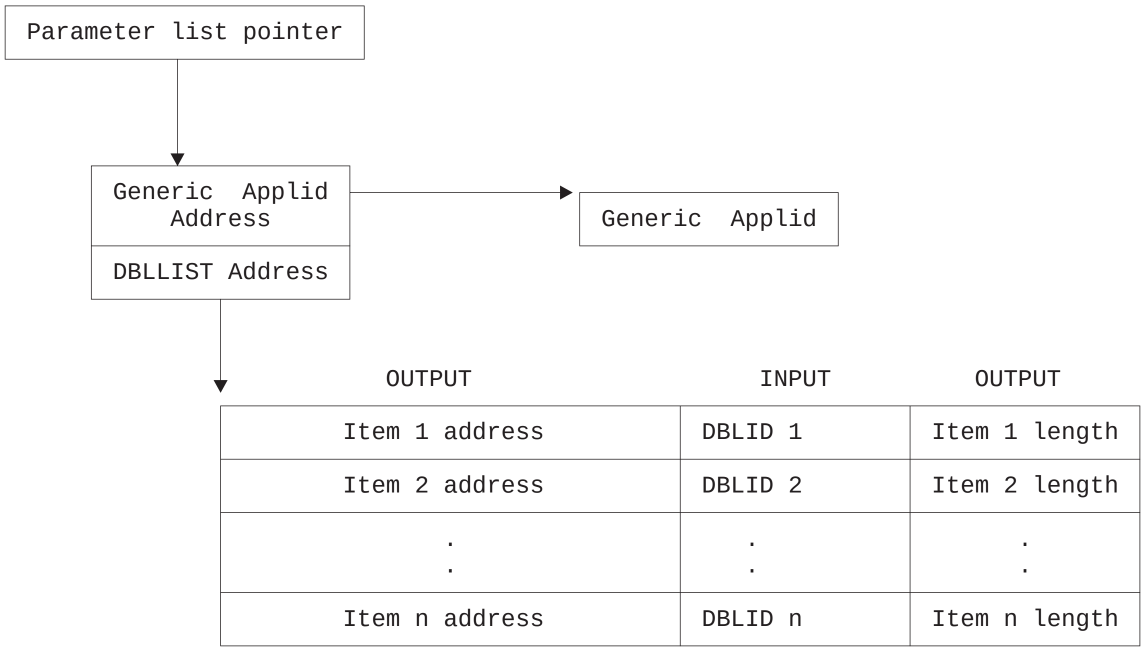


Figure 38. Input to and output from the DFHWOSM FUNC=READ macro

Note: The data structures of the status information pointed to by items X'0024' and X'0124' are provided in DSECT DFHXRHDS of the PRD1.BASE.

Output

Register 15 Contains one of the following return codes:

0	Read successful, active and alternate signed on.
1	Read successful, active signed on.
2	Read successful, alternate signed on.
3	Read successful, nothing signed on.
4	Same POWER SYSID; IPL time of active earlier than VSE/ESA IPL time.
5	Same POWER SYSID; IPL time of alternate earlier than VSE/ESA IPL time.
8	CAVM data set access not initialized.
10C	DBLID not known.
1xx	Read subtask problem.

If a return code of 0–5 is returned to register 15, each doubleword of the DBLLIST contains the address (4 bytes) and the length (2 bytes) of the output from this read. A return code of 8, 10C or 1xx indicates a READ failure.

```
DBLIDs for the active:

DBLID1   EQU   X'0001'               JOBNAME
DBLID2   EQU   X'0002'               POWER JOBID
DBLID3   EQU   X'0003'               JOB SUBMISSION TIME (STIME)
DBLID4   EQU   X'0004'               JOB STEP TASK ATTACH TIME (ATIME)
DBLID5   EQU   X'0005'               CANCEL NAME
DBLID6   EQU   X'0006'               POWER SSNAME
DBLID7   EQU   X'0007'               VSE/POWER SYSID
DBLID8   EQU   X'0008'               VSE/ESA IPL TIME
DBLID9   EQU   X'0009'               SPECIFIC APPL NAME
DBLID10  EQU   X'000A'               ADDRESS SPACE IDENTIFIER (ASID)
DBLID11  EQU   X'000B' TO X'001F'    SPARE FOR STATE CTL ITEMS
DBLID32  EQU   X'0020'               HEARTBEAT INTERVAL
DBLID33  EQU   X'0021'               HEARTBEAT COUNTER
DBLID34  EQU   X'0022'               MSG FILE CURSOR
DBLID35  EQU   X'0023'               STATUS VALUE (STATE)
DBLID36  EQU   X'0024'               INQUIRE HEALTHDATA
DBLID37  EQU   X'0025'               SPARE
DBLID38  EQU   X'0026'               SPARE

DBLIDs for the alternate:

DBLID257 EQU   X'0101'               JOBNAME
DBLID258 EQU   X'0102'               POWER JOBID
DBLID259 EQU   X'0103'               JOB SUBMISSION TIME (STIME)
DBLID260 EQU   X'0104'               JOB STEP TASK ATTACH TIME (ATIME)
DBLID261 EQU   X'0105'               CANCEL NAME
DBLID262 EQU   X'0106'               POWER SSNAME
DBLID263 EQU   X'0107'               POWER SYSID
DBLID264 EQU   X'0108'               VSE/ESA IPL TIME
DBLID265 EQU   X'0109'               SPECIFIC APPL NAME
DBLID266 EQU   X'010A'               ADDRESS SPACE IDENTIFIER (ASID)
DBLID267 EQU   X'010B' TO X'011F'    SPARE FOR STATE CTL ITEMS
DBLID288 EQU   X'0120'               HEARTBEAT INTERVAL
DBLID289 EQU   X'0121'               HEARTBEAT COUNTER
DBLID290 EQU   X'0122'               MSG FILE CURSOR
DBLID291 EQU   X'0123'               STATUS VALUE (STATE)
DBLID292 EQU   X'0124'               INQUIRE HEALTHDATA
DBLID293 EQU   X'0125'               SPARE
DBLID294 EQU   X'0126'               SPARE
```

Figure 39. DBLIDs for the DFHWOSM FUNC=READ macro

DFHWOSM FUNC=TERM macro

The DFHWOSM FUNC=TERM macro terminates communication between the overseer program and DFHWOSB, and releases any VSE/ESA system or POWER connections. It must be issued before the overseer program completes to ensure an orderly termination.

```
label      DFHWOSM FUNC=TERM
                 [,TOKEN={token register|14}]
```

Input

The TOKEN value is the BUILD token.

Output

Register 15	Contains one of the following return codes:

0	Communication terminated successfully.
Nonzero	Request failed. Return code from XPCC/POWER request performed by DFHWOSB.

DFHWOSM FUNC=WAIT macro

The DFHWOSM FUNC=WAIT macro allows the console operator to communicate with the overseer program. When the overseer program issues a DFHWOSM FUNC=WAIT macro, DFHWOSB sends a message to the console asking the operator to reply with an overseer command. DFHWOSB then waits for up to 4 seconds for the operator to reply. If the operator does not reply, control is passed back to the overseer so that it can continue to monitor CICS XRF jobs. When the WAIT macro is executed again, DFHWOSB does not send the message to the operator. Instead, it waits for four seconds for the operator to reply to the first message, before returning to the overseer. If the operator replies, DFHWOSB passes the command back to the overseer where it will be processed. The next execution of the WAIT once again sends the message to the console operator and waits for a reply.

```
label      DFHWOSM FUNC=WAIT
                 [,PARM={parm address|1}]
                 [,TOKEN={token register|14}]
```

Input

The PARM value is a pointer to two addresses, and these are:

1. The address of the TIMER ECB.
2. The address of the CONSOLE ECB. This should contain either:
   - The address of the console CCB as supplied as output by a previous DFHWOSM WAIT call, indicating that the operator has not replied, **or**
   - Zero, indicating that the operator has replied and the overseer has just processed that reply.

The TOKEN value is the BUILD token.

Output

Register 0	Console CCB address. If the console CCB has been posted, (this means bit 0 of byte 2 is set to ‘1’), then the operator has replied and the address of the input data is returned in register 15. If the console CCB has not been posted (this means bit 0 of byte 2 is set to ‘0’), then the operator has not replied and the contents of register 15 are unpredictable.
Register 15	Address of input area if console CCB has been posted.

Customizing the sample overseer program

The sample overseer program consists of three routines—the main module **DFH$AXRO** and two subroutines:

- **DFH$ADSP** displays status information.
- **DFH$ARES** performs restart in place.

The associated DSECTs are provided in member DFH$XRDS of the PRD1.BASE. There are a number of ways in which you can change the supplied code if you want to make the overseer program more suitable for your installation.

Here are some customization suggestions:

- If the supplied display of status information (DSECT DSPDS) is not suitable, you can change the layout for your installation.
- The CSECT DFH$ADSP can be customized so that, for example, status information is displayed automatically at regular intervals, or whenever a region is in trouble, as well as when the console operator enters the 'D' (Display) command. This would require interpretation of the status information by the overseer.
- Any of the messages to the system console, which are listed in the prologue of the source module DFH$AXRO, can be changed.
- You can change the format or the content of the DFHOSD data set (DSECT OSDDS) if, for example, you want it to contain more information.
- You can change the restart function so that, for example, a failed region will be restarted only during periods of heavy use, while at other times a takeover to the alternate will be initiated by the operator.
- When an active region fails and is taken over by the alternate, the old active region must be restarted as the new alternate. In those cases where the cause of the takeover was not a VSE/ESA operating system failure, restart of the old active as an alternate region could be automated in the overseer program.

There is one optional section of code in the overseer program, which is described in the next section.

Detection of loops and waits

The sample overseer program includes some code that you can use to detect possible loops or waits in the active CICS region.

The sample program monitors the CICS TCB (task control block) time stamp. If this remains the same for a period defined by the variable LOOPTM, a message is sent to the console warning of a possible loop or wait. The value of LOOPTM is the number of seconds (wait time) before a loop is suspected; you may need to change it to suit your requirements and to avoid the detection of false loops. You should set it to a value greater than the largest runaway task time interval (as specified on the ICVR system initialization parameter—for guidance on the syntax of this parameter, see the *CICS System Definition Guide*) to avoid detection of user transaction loops.

To include this LOOP WARNING code, set the variable &LPWARN to '1' and reassemble the sample.

Assembling and link-editing the overseer program

The non specific job control statements required to assemble and link-edit the overseer program are the same as those required for user-replaceable programs.

The specific link-edit statements that you require are:

```
PHASE DFH$AXRO,*
ENTRY DFH$AXNA
```

If you change the overseer code in any way, note that the VSE/ESA sublibrary PRD1.BASE is required for the assembly, and that the link-edit job step requires the entry name DFH$AXNA. If you change any of the DSECTs used by the sample program, you should reassemble DFH$AXRO.

Part 5. CICS journaling, monitoring, and statistics

Table 121. Journaling, monitoring, and statistics road map

If you want to...	Refer to...
Control and interpret the journal records written by CICS	Chapter 17, "CICS journaling" on page 513
Control and interpret the monitoring data collected by CICS	Chapter 18, "CICS monitoring" on page 531
Control and interpret the statistics data collected by CICS	Chapter 19, "CICS statistics" on page 569
Write non-CICS programs that use DMF to store monitoring data	Chapter 20, "The user interface to DMF" on page 579

Chapter 17. CICS journaling

CICS journaling provides facilities for the creation, control, and retrieval of a special-purpose series of data sets called **journals** during real-time CICS execution. Journals are intended for recording, in chronological order, any information that you may later need to reconstruct data or events. For example, you could create journals to act as audit trails; to record database updates, additions, and deletions for backup purposes; or to track transaction activity in the system.

This chapter describes the following aspects of CICS journaling:

1. **"Formatting a journal before output"**
2. **"Opening, closing, and reading journals"** on page 513
3. **"The structure and contents of journal records"** on page 515
4. **"Notes on CICS journaling"** on page 529. This section contains:
   - "Automatic journal archiving"
   - "The journaling user-replaceable programs"
   - "The global user exits in DFHJCP"

For information about the uses of journaling, refer to the *CICS Recovery and Restart Guide*.

Formatting a journal before output

Before using a journal data set for the first time, you must format it. Use DFHJCJFP for formatting disk journals, and DFHFTAP for formatting tape journals.

The method by which CICS repositions at startup normally rules out the need for the journal set to be reformatted before subsequent CICS runs. Thus, *reformatting should only be undertaken in exceptional circumstances* (for example, prior to a cold start). Refer to the *CICS Recovery and Restart Guide* for guidance information about journal positioning at system initialization. If you do decide to reformat, ensure that the journaled data that will be erased is no longer needed.

As an alternative to reformatting, with the data set offline, you can force an EOF into the block number 1 position. You should *not* apply this procedure (or reformatting) to the system log, nor for DL/I, nor for the automatic archiving facility, because they may be required for emergency restart.

Data collected during the current run of CICS is likely to be written after the last record from the previous run. Therefore, when reading the journals, you must be aware that data may be present for more than one CICS execution.

Opening, closing, and reading journals

Journal records are written to the journal data sets either directly from a user application program, or from a CICS management program on behalf of a user application. Journal records can be written from a user application using the EXEC CICS WRITE JOURNALNUM command. For programming information about the

EXEC CICS WRITE JOURNALNUM command, see the *CICS Application Programming Reference* manual.

This section describes the commands that you use for opening and closing journals, and for reading journals offline.

Opening and closing a journal

To open or close a journal data set from an application program, use the EXEC CICS SET JOURNALNUM command. For programming information about the EXEC CICS SET JOURNALNUM command, see the *CICS System Programming Reference* manual.

Reading journals offline

Journal data sets can be read offline by user-written programs. Although written as operating-system undefined (U-format) records by CICS journal management, the blocks are compatible with records of the variable-length blocked (VB) format. The data set label information indicates U-format, but this can be overridden to VB (using RECFORM=VARBLK on the DTFSD macro); this causes data management to deblock records and offer them to the offline program.

Each block begins with a 4-byte block-length field, and each logical record within a block begins with a 4-byte record-length field. These 4-byte fields are in the form ‘LLbb’ (where “LL” represents 2 bytes containing the length of the block or record).

Unless a journal volume was successfully closed when last written during CICS execution, or unless it had a tape mark written by the DFHTEOF program, there is no end-of-file indicator on the volume. If this is the case, data can run into old records.

Offline user-written programs can map journal records by issuing the DFHJCR CICSYST=YES statement, which results in the DFHJCRDS DSECT being included in the program. The DSECT thus generated is identical to that obtained for CICS programs by the COPY DFHJCRDS statement, except that the fields are not preceded by a CICS storage accounting area. The DSECT is intended to map journal records directly in the block, rather than in a CICS storage area.

Using the offline program: The offline program can be used with a DISK or TAPE journal device. The following points should be considered when reading journals offline while CICS is still active.

- For a DISK journal, two data sets should be allocated. The appropriate JCT option (JOUROPT=PAUSE or JOUROPT=AUTOARCH) must be specified. You are responsible for ensuring that journal volumes are read in the required sequence.
- For a TAPE journal, the journal volume can be removed and read whenever you want. Another tape volume can be mounted to record data while the first volume is being processed. The advantages of a tape journal over a journal on a disk device are that the job to read the tape journal can run for a relatively long time and is usually easier to process clerically because there is no need to alternate between the information on the two separate data sets.

Printing journal files: You can use the CICS-supplied utility, DFHJUP, to print journal files. For more guidance information about the CICS-supplied utilities, refer to the *CICS Operations and Utilities Guide*.

The structure and contents of journal records

DL/I and DMF/SMF records

The following description does not apply to journal records written on behalf of DL/I, nor to those written to a DMF data set in SMF format. These are described on page 527.

Journal data sets are usually specified as of undefined record type. They are then constructed by the journal control program (JCP) to correspond to the layout of variable-length blocked records, where each block and every record within the block begins with a 4-byte 'LLbb' length field. Each resultant block on a journal data set contains the following logical records:

1. One journal control label record.

   The journal control label record provides global CICS information, such as the block number, the CICS run start time, and the journal identification.

2. One or more journal records.

   These records follow the journal control label record, and contain all the information that has been written for the different CICS tasks. These records are variable length. The number in a particular block depends on the length of data to be logged, on the size of the two journal buffers specified for the journal in the journal control table, and on the frequency of writes. Writes occur because they have been explicitly forced, or because the current buffer is full.

Figure 40 shows a typical layout of a block on a journal data set.

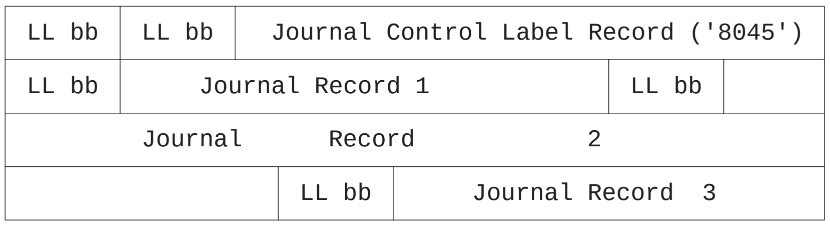


Figure 40. CICS journal block layout

The DSECT DFHJCRDS describes all of the journal records. DFHJCRDS includes the 8-byte storage accounting field, which precedes the journal records if they are read by CICS, but which is not present if the journal is read by an offline program. To include DFHJCRDS in an offline program, code DFHJCR CICSYST=YES. This causes the DSECT to be included without the CICS storage accounting area.

The system header

The first 10 bytes of every journal record, including the journal control label record (but excluding DL/I and SMF-format records) is the system header.[8] The system header consists of the fields shown in Table 122.

Table 122. Format of the system header for journal records

Field name in DFHJCRDS DSECT	Field size in bytes	Format	Contents
JCRBA	EQU	*	Label for start of journal records
JCRLL	2	Halfword binary	Length of record
JCRBB	2	Binary zeros	Not used
JCRSTRID	2	Hexadecimal	System-type ID
JCRUTRID	2	Hexadecimal	User-type ID
JCRLRN	2	Packed decimal	Record number within block

The field JCRSTRID (the system-type ID) and the field JCRUTRID (the user-type ID) allow you to distinguish those journal records output by CICS (by such features as automatic journaling), from those issued by direct user requests.

For CICS journal requests, JCRUTRID contains binary zeros, and JCRSTRID contains a 1-byte function code followed by a 1-byte module code. The function code tells you which function was being journaled, and the module code shows which module caused the record to be written. Valid settings of these codes are contained in the member DFHFMIDS of the VSE/ESA sublibrary PRD1.BASE. Figure 41 on page 517 shows the valid function identifiers, and Figure 42 on page 521 shows the valid module identifiers.

For user journal requests, JCRSTRID always contains binary zeros, and JCRUTRID contains the 2-byte hexadecimal code specified by the JTYPEID keyword of the JOURNAL request in the application program.

[8] The formats of journal records written on behalf of DL/I, and those written to a DMF data set in SMF-format, are described on page 527.

```
*********************************************************************
* * *                                                           * * *
* * *         FUNCTION AND MODULE IDENTIFIERS                   * * *
* * *         (SEE FOLLOWING DSECTS: DFHDWEDS,DFHJCADS,DFHJCR)   * * *
* * *                                                           * * *
*********************************************************************
* *            F U N C T I O N   I D E N T I F I E R S            * *
*********************************************************************
*                                                                   *
*        X'01' THRU X'7F' ARE RESERVED FOR DL/I                     *
*        X'20' PLUS X'8-' ...USE FOR AUTOMATIC JOURNALING           *
*        X'40' PLUS X'8-' ...USE FOR AUTOMATIC LOGGING              *
*        X'E0' THROUGH X'FF' ARE RESERVED FOR SYNCPOINT LOGGING     *
*             (MUST BE PRESENT IN 'LOGGABLE' DWE'S)                 *
*                                                                   *
*********************************************************************
* *                        JOURNAL CONTROL                        * *
*********************************************************************
FIDJCLAB EQU   X'80'               ...JOURNAL CONTROL LABEL
*                                  RECORD (DFHJCR)                  *
*********************************************************************
* *            DYNAMIC BACKOUT FUNCTION IDENTIFIERS:-             * *
*********************************************************************
FIDDBOFL EQU   X'80'               OVERFLOW DYNAMIC LOG RECORD
FIDDBCHN EQU   X'81'               CHAIN DYNAMIC LOG RECORD
*********************************************************************
* *                         FILE CONTROL                          * *
*********************************************************************
FIDALOG  EQU   X'40'               ...AUTOMATICALLY LOGGED
FIDAJRN  EQU   X'20'               ...AUTOMATICALLY JOURNALED
FIDMASS  EQU   X'10'               ...MASSINSERT REQ. (FIDFCWA ONLY)
*                                       PLUS ONE OF...              *
FIDFCRO  EQU   X'80'               ...FILE CONTROL READ-ONLY
FIDFCRU  EQU   X'81'               ...FILE CONTROL READ-UPDATE
FIDFCWU  EQU   X'82'               ...FILE CONTROL WRITE-UPDATE
FIDFCWA  EQU   X'83'               ...FILE CONTROL WRITE-ADD
FIDFCWAC EQU   X'84'               ...FILE CONTROL WRITE-ADD-COMPLETE
FIDFCWD  EQU   X'86'               ...FILE CONTROL WRITE DELETE
FIDFCBOF EQU   X'88'               ...BACKOUT FAILED LOG RECORD
FIDFCDSN EQU   X'8F'               ...DSNAME RECORD
*                                                                   *
*        NOTE THAT FID* VALUES (AS ABOVE) ARE OFTEN USED BOTH TO    *
*        IDENTIFY THE FUNCTION OF THE DWE AND THE FUNCTION OF THE   *
*        LOG RECORD.  IN THE CASE OF THE FIDFC* EQU'S ABOVE, THEY   *
*        ARE USED FOR LOG RECORDS ONLY.  THOSE BELOW APPLY ONLY     *
*        TO DWE'S                                                   *
*                                                                   *
FIDFCVWA EQU   X'80'               THIS DWE ADDRESSES A VSWA.
FIDFCRVY EQU   X'40'               THIS DWE IS ASSOCIATED WITH A    *
                                   RECOVERABLE CHANGE.
```

Figure 41 (Part 1 of 4). Journal function identifiers

```
**********************************************************************
*                TRANSIENT DATA FUNCTION IDENTIFIERS:-               *
FIDTDIT  EQU   X'F1'               TD DESTINATION'S INPUT TASK
FIDTDOT  EQU   X'F2'               TD DESTINATION'S OUTPUT
*                                  TASK                              *
FIDTDPT  EQU   X'F3'               TD DESTINATION'S PURGE TASK
*        EQU   X'08'               ...DYNAMIC BACKOUT MASK           *
                                      RESERVED
FIDTDPLP EQU   X'81'               TD PHYSICAL 'FIRST PUT' LOG
FIDTDPGT EQU   X'82'               TD PHYSICAL 'GET' LOG
FIDTDPRL EQU   X'83'               TD PHYSICAL QUEUE ZERO LOG
*                                    - REUSE=YES                     *
FIDTDPLG EQU   X'84'               TD PHYSICAL 'PURGE' LOG
FIDTDPQZ EQU   X'85'               TD PHYSICAL QUEUE ZERO LOG
*                                    - REUSE=NO                      *
**********************************************************************
*               TEMPORARY STORAGE FUNCTION IDENTIFIERS               *
FIDTSAL  EQU   X'40'               AUTOMATIC LOGGING MASK
*        EQU   X'08'               ...DYNAMIC BACKOUT MASK           *
                                      RESERVED
FIDTSUPD EQU   X'80'               ..TEMPORARY STORAGE UPDATE
FIDTSPRI EQU   X'F2'               ..TEMPORARY STORAGE
*                                  PURGE/RELEASE                     *
FIDTSPUT EQU   X'F4'               ..TEMPORARY STORAGE
*                                  PUT/PUTQ                          *
**********************************************************************
*               SPECIAL FEATURES  FUNCTION IDENTIFIERS               *
FIDPSOPC EQU   X'80'               CONTINOUS LOGICAL SPOOLOPEN
FIDPSWRC EQU   X'81'               CONTINOUS LOGICAL SPOOLWRITE
FIDPSCLC EQU   X'82'               CONTINOUS LOGICAL SPOOLCLOSE
FIDPSOPS EQU   X'83'               STANDARD SPOOLOPEN
**********************************************************************
*                INTERVAL CONTROL FUNCTION IDENTIFIERS               *
FIDICPDF EQU   X'50'               INTERVAL CONTROL PUT,DEFER
FIDICRGT EQU   X'80'               RESTART GET.
*        EQU   X'08'               BACKOUT MASK, RESERVED            *
**********************************************************************
*                 ALP FUNCTION IDENTIFIERS                           *
FIDALRGT EQU   X'80'               RESTART GET
**********************************************************************
*                 PROGRAM CONTROL FUNCTION IDENTIFIERS               *
FIDPCPPT EQU   X'80'               PC REPLACE PPT DEFINITION
**********************************************************************
*                 TASK CONTROL FUNCTION IDENTIFIERS                  *
FIDKCPCT EQU   X'80'               KC REPLACE PCT DEFINITION
FIDKCPFT EQU   X'81'               KC REPLACE PFT DEFINITION
FIDKCPCA EQU   X'82'               KC ADD PCT DEFINITION
FIDKCPFA EQU   X'83'               KC ADD PFT DEFINITION
FIDKCPCD EQU   X'84'               KC DELETE PCT DEFINITION
FIDKCPFD EQU   X'85'               KC DELETE PFT DEFINITION
```

Figure 41 (Part 2 of 4). Journal function identifiers

```
***********************************************************************
*             ACTIVITY KEYPOINT FUNCTION IDENTIFIERS:-                *
FIDAKS   EQU   X'80'               ACTIVITY KEYPOINT: START.
FIDAKE   EQU   X'81'               ACTIVITY KEYPOINT: END.
*        EQU   X'82'               RESERVED - WAS FIDKPTCA            *
*        EQU   X'83'               RESERVED - WAS FIDKPDCT            *
*        EQU   X'84'               RESERVED - WAS FIDKPTCR            *
*        EQU   X'85'               RESERVED - WAS FIDKPTST            *
FIDAKM   EQU   X'86'               ACTIVITY KEYPOINT: MIDDLE.
***********************************************************************
         SPACE 1
***********************************************************************
*                 SYNCPOINT FUNCTION IDENTIFIERS:-                    *
FIDSPUOW EQU   X'EF'               START OF UNIT OF WORK
FIDSPLUC EQU   X'F0'               LUC RELATED FUNCTION
FIDLSOSP EQU   X'F1'               LOGICAL START OF SYNCPOINT
FIDLEOTK EQU   X'F2'               LOGICAL END OF TASK
FIDPEOTK EQU   X'F3'               PHYSICAL END OF TASK
FIDBEOTK EQU   X'F4'               BAD END OF TASK LOG RECORD
FIDSPR   EQU   X'F5'               SPR LOG RECORD
FIDBEOSP EQU   X'F6'               BAD END OF SYNCPOINT LOG
*                                  RECORD                              *
FIDRSQ   EQU   X'F7'               REMOTE SESSION QUALIFIER
FIDSPRMI EQU   X'F8'               RMI DWE. (ALSO USED AS A TEST MASK..*
                                   ..FOR THE FOLLOWING RMI CODES.      *
                                   ...
FIDSPPTC EQU   X'F9'               RMI PREPARE
FIDSPPTB EQU   X'FA'               RMI ABOUT TO BACKOUT
FIDSPRSC EQU   X'FB'               RMI RESYNC COMMITTED
FIDSPRSB EQU   X'FC'               RMI RESYNC BACKED OUT
FIDSPFGT EQU   X'FD'               RMI FORGET
FIDSPLTC EQU   X'FE'               RMI 'LOST TO COLD START'
FIDSPNID EQU   X'FF'               RMI 'NOT IN DOUBT'
***********************************************************************
         SPACE 1
***********************************************************************
*                 RECOVERY CONTROL FUNCTION IDENTIFIERS:-             *
FIDRCFWD EQU   X'F0'               FORWARD RECOVERY RECORD
FIDRCBWD EQU   X'80'               BACKOUT RECORD
***********************************************************************
         SPACE 1
***********************************************************************
*                 BMS FUNCTION IDENTIFIERS:-                          *
FIDBMPM  EQU   X'81'               ...BMS - PARTIAL MESSAGE ON
*                                                TEMPORARY STORAGE    *
FIDBMODS EQU   X'82'               ...BMS - OPEN DATA SET ON
*                                  BATCH LU                           *
```

Figure 41 (Part 3 of 4). Journal function identifiers

```
*********************************************************************
*                TERMINAL CONTROL FUNCTION IDENTIFIERS              *
*                                                                   *
FIDTCML  EQU   X'F0'              SYNCPOINT - LOG SEQUENCE
*                                 NUMBERS                           *
*                                 CAN BE OR'ED WITH ANY OF          *
                                  THE FOLLOWING THREE FIELDS:
FIDTCDWL EQU   X'01'              ...DEFERRED WRITE DATA
FIDTCFMH EQU   X'02'              ...+ FUNCTION MANAGEMENT
*                                 HEADER
FIDTCDIP EQU   X'04'              ...+ DIP REQUEST
*                                                                   *
*        EQU   X'08'              ...DYNAMIC BACKOUT MASK           *
                                     RESERVED
FIDTCAL  EQU   X'40'              AUTOMATIC LOGGING MASK...
FIDTCAJ  EQU   X'20'              AUTOMATIC JOURNALING MASK..
*                        ...THE ABOVE 2 PLUS 1 OF FOLLOWING SET     *
FIDTCTL  EQU   X'80'              ...SEQUENCE NUMBER ONLY
*                                 (LOG ONLY)                        *
FIDTCIM  EQU   X'81'              ...INPUT MESSAGE (LOG AND
*                                 JOURNAL)                          *
FIDTCOM  EQU   X'82'              ...OUTPUT MESSAGE (JOURNAL
*                                 ONLY)                             *
FIDTCWP  EQU   X'83'              ...WRITE WAS PURGED (LOG
*                                 ONLY)                             *
FIDTCPRR EQU   X'84'              ...POSITIVE RESPONSE
*                                 RECEIVED (LOG ONLY)               *
FIDTCIMF EQU   X'85'              ...INPUT MESSAGE (W/FMH,
*                                 LOG AND JOURNAL)                  *
FIDTCOMN EQU   X'86'              ...OUTPUT MESSAGE, (W/O
*                                 FMH, JOURNAL ONLY)                *
FIDTCON  EQU   X'87'              ...OUTPUT MESSAGE, FMH,
*                                 CCOMPL=NO                         *
FIDTCONN EQU   X'88'              ...OUTPUT MESSAGE, W/O FMH,
                                  ...CCOMPL=NO
FIDTCUA  EQU   X'89'              ...INITIAL TCT USER AREA
FIDTCEIB EQU   X'8A'              ...INITIAL EXEC COMM AREA
FIDTCIMN EQU   X'8B'              INPUT MSG, NO FMH, COMPLETE
FIDTCINN EQU   X'8C'              INPUT MSG, NO FMH, INCOMPLETE
*********************************************************************
*              TABLE BUILDER SERVICES FUNCTION IDENTIFIERS          *
FIDBSDOP EQU   X'80'              TBS DWE IS 'OPEN'
FIDBSDCL EQU   X'81'              TBS DWE IS 'CLOSED'
*********************************************************************
*              FRONT END PROGRAMMING INTERFACE IDENTIFIERS          *
FIDFEPIN EQU   X'F0'              FEPI INBOUND DATA    API <--- FEPI
FIDFEPOU EQU   X'F1'              FEPI OUTBOUND DATA   API ---> FEPI
*********************************************************************
*              GENERAL PURPOSE SUBTASK IDENTIFIERS                  *
FIDSKDF  EQU   X'80'              ...SK - DEFAULT
*********************************************************************
```

Figure 41 (Part 4 of 4). Journal function identifiers

```
**********************************************************************
* *            M O D U L E   I D E N T I F I E R S              * *
**********************************************************************
*                                                                    *
*            (MAY BE X'01'-->X'FF'.)                                 *
*                                                                    *
MODIDKC  EQU   X'03'               ...TASK CONTROL
MODIDPC  EQU   X'04'               ...PROGRAM CONTROL
MODIDSC  EQU   X'05'               ...STORAGE CONTROL
MODIDDC  EQU   X'07'               ...DUMP CONTROL
MODIDIC  EQU   X'08'               ...INTERVAL CONTROL
MODIDTC  EQU   X'10'               ...TERMINAL CONTROL
MODIDFC  EQU   X'11'               ...FILE CONTROL
MODIDTD  EQU   X'12'               ...TRANSIENT DATA
MODIDTS  EQU   X'13'               ...TEMPORARY STORAGE
MODIDFCJ EQU   X'14'               ...FILE CONTROL JOURNALING
MODIDIRC EQU   X'37'               ...IRC INTERFACE
MODIDDL  EQU   X'39'               ...Reserved
MODIDBM  EQU   X'40'               ...BASIC MAPPING
MODIDJC  EQU   X'45'               ...JOURNAL CONTROL
MODIDDB  EQU   X'46'               ...DYNAMIC BACKOUT PROGRAM
MODIDVC  EQU   X'47'               ...Reserved
MODIDPS  EQU   X'53'               ...SPECIAL FEATURES
MODIDKPP EQU   X'54'               ...KEYPOINT PROGRAM
MODIDBI  EQU   X'55'               ...BUILT-IN FUNCTIONS
MODIDAKP EQU   X'58'               ...ACTIVITY KEYPOINT PROG
MODIDSPP EQU   X'59'               ...SYNCPOINT PROGRAM
MODIDEIP EQU   X'5A'               ...EXEC INTERFACE PROGRAM
MODIDTMP EQU   X'5B'               ...TABLE MANAGER
MODIDSKP EQU   X'5C'               ...SUBTASK MANAGER
MODIDFEP EQU   X'5D'               ...FRONT-END PROGRAMMING INTERFACE
MODIDAL  EQU   X'5E'               ...ALLOCATION PROGRAM (ALP)
MODIDBBP EQU   X'BB'               ...BB INTERFACE
MODIDRCP EQU   X'CE'               ...RECOVERY CONTROL PROGRAM
MODIDTBS EQU   X'E3'               ...TABLE BUILDER SERVICES
MODIDTOR EQU   X'EF'               ...TERMINAL OBJECT RESOLUTION
MODIDUSR EQU   X'FF'               RESERVED FOR USER SYNCPOINT
*                                  SUPPORT                           *
**********************************************************************
```

Figure 42. Journal module identifiers

The journal control label record

The first record in each block of journal records is a label record. The label record, including the system header, is 42 bytes long. The format of the journal control label record (excluding the system header) is shown in Table 123.

Table 123. Format of the journal control label record

Field name in DFHJCRDS DSECT	Field size in bytes	Format	Contents
JCLRJFID	1	Binary	Journal ID (1–99)
JCLRBLKN	3	Packed decimal	Block number (1–n) in this data set
JCLRVCD	4	Packed decimal	Volume creation date (0cyyddd+)
JCLRVSN	2	Packed decimal	Volume sequence number within run (nnn+) (only 1 or 2 for disk journals)
JCLRLBW	4	Binary (disk)	Relative TTR0 of previous block
JCLRTBAL	2	Binary (disk)	Track-balance from previous block (disk journals)
JCLRTIME	4	Packed decimal	Time block written (hhmmsss+)
JCLRRST	4	Packed decimal	Run start time (hhmmsss+)
JCLRDATE	4	Packed decimal	Date block written (0cyyddd+)
JCLRSEQ	4	Binary	Journal block sequence number

Other journal records

All journal records other than the journal control label record—that is, all those written in response to EXEC CICS WRITE JOURNALNUM commands—have one through three variable-length segments in the following order after the system header.

Note: This does not apply to DL/I nor to SMF-format journal records, which have their own format, described on page 527.

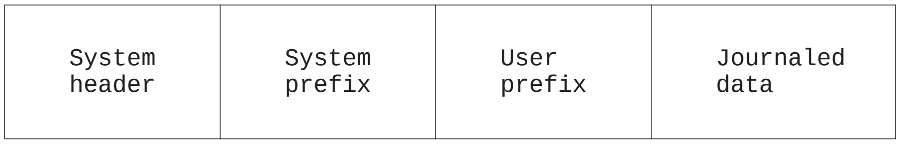


Figure 43. CICS journal record format

Each of these three segments is described in the sections that follow.

The system prefix

The system prefix is variable in length, and it identifies the origin of the record. The system prefix contains at least the data shown in Table 124.

Table 124. Data contained in the system prefix

Field name in DFHJCRDS DSECT	Field size in bytes	Format	Contents
JCSPBA	0	-	Label for system prefix begin address
JCSPLL	2	Halfword binary	Length of system prefix
JCSPFS	3	Binary	Flags
	Note: The first two bytes of JCSPFS are reserved. The third byte is field JCSPF1, and the settings are:		
	JCSPUP	EQU X'01'	User prefix present in record
	JCSPSOTK	EQU X'02'	Physical start-of-task[9]
	JCSPLSTK	EQU X'04'	Logical start-of-task[9]
	JCSPRRIF	EQU X'08'	DFHRUP record-in-flight flag
	JCSPMIDT	EQU X'10'	Output message in doubt
	JCSPEMER	EQU X'20'	Written by emergency restart
	JCSPDSP	EQU X'80'	DL/I checkpoint
JCSPTASK	3	Packed decimal	Task number
JCSPTIME	4	Packed decimal	Time of request (hhmmsss+)
JCSPTRAN	4	Characters	Transaction identification
JCSPTERM	4	Characters	Terminal identification (or binary zeros)
JCSPREA		EQU *	Label for end of system prefix common root.

Additional system prefix data: For some CICS journal requests, additional data is included in the system prefix to identify more specifically the originator of the request. This extra data follows the common fields of the system prefix, and is usually variable in length; hence the need for the length field JCSPLL at the start of the system prefix. All the following have their own prefix layout, and these are described, for the purposes of diagnosis and recovery, in the *CICS Data Areas* manual.

- Activity keypointing
- File control
- Front End Programming Interface (for details of FEPI, see the *CICS Front End Programming Interface User's Guide*)
- Recovery control
- Remote session qualifier
- Resource manager interface
- SPR (intersystem communication)
- Terminal control

[9] The setting of this bit is meaningful for system journal records only. You should ignore its setting for user journal records.

The user prefix

The user prefix is optional, and is placed in a journal output record next to the system prefix, in response to the PREFIX option of the EXEC CICS WRITE JOURNALNUM command. As with the system prefix, the user prefix always begins with a halfword binary length field; the user prefix data follows the halfword. For journal records that include a user prefix, the flag byte JCSPF1 of the system prefix has the indicator bit JCSPUP set to '1'.

Journaled data

The final segment of a journal record is the journaled data. CICS does not generate a length field for the data portion of the record. If you want a length field for the data, you must include it in the data. Alternatively, you can compute the length of the data portion of a journal record by taking the length of the system header (10 bytes), plus the length of the system prefix (JCSPLL), plus the length of the user prefix (in the field, if any, defined by yourself), and subtracting the total from the length of the journal record (JCRLL).

Not all journal records contain journaled data. For example, syncpoint records contain no journaled data.

Identifying records for the start and end of tasks or LUWs

You can identify records written by the syncpoint program to mark the start and end of tasks, and the start and end of LUWs, by examining the value of JCRSTRID, together with the flags set in the JCSPFS field of the system prefix. See Table 125 and Figure 44 on page 526.

Table 125. Identifying syncpoint events

Syncpoint event	JCRSTRID value	System prefix flag
Physical start-of-task	X'EF59'	JCSPSOTK
Logical start-of-task (start-of-LUW)	X'EF59'	JCSPLSTK
Logical end-of-task (end-of-LUW)	X'F259'	N/A
Physical end-of-task	X'F359'	N/A

Coding hint

You **must** check JCRSTRID before using the flags JCSPSOTK and JCSPLSTK, which have no meaning if the record is a DL/I log record. The following is a possible algorithm.

1. If the first byte of JCRSTRID is in the range X'01' to X'7F', process as a **DL/I log record**, and bypass following steps.
2. If JCSPSOTK or JCSPLSTK is set on, process as **start-of-task** or **start-of-LUW** respectively, and go to the next step. If neither JCSPSOTK nor JCSPLSTK is set on, go to step 3.
3. Process as a **CICS log record**.

Identifying a record for an unfinished task or LUW

You can tell if a record is for an unfinished task by the presence or absence of a physical end-of-task record (JCRSTRID=X'F359') for the same task. The end of each LUW is indicated by a logical end-of-task record (JCRSTRID=X'F259'). In Figure 44 on page 526, if a system failure occurred before the completion of task 33, no physical end-of-task record would be written to the journal. In the restart data set, written by the recovery utility program (DFHRUP) during emergency restart, records for in-flight tasks are identified by the flag JCSPRRIF in the system prefix.

Identifying in-doubt messages at system termination

You can identify in-doubt messages at system termination only if the task is invoked from a VTAM terminal, and the installed transaction definition includes the MSGPOPT|MSGPREQ=PROTECT option. This causes logging (for each LUW) of the first input, last output, and positive-response-received messages. In this case, the deferred write record (JCRSTRID=X'F110') should be followed by a positive-response-received record (JCRSTRID=X'C410'). If not, the message was in doubt when the system terminated. On the restart data set (and in the message cache) the deferred write record, if in doubt, has the JCSPMIDT flag set on. (For information about message caches, see the *CICS Recovery and Restart Guide*.)

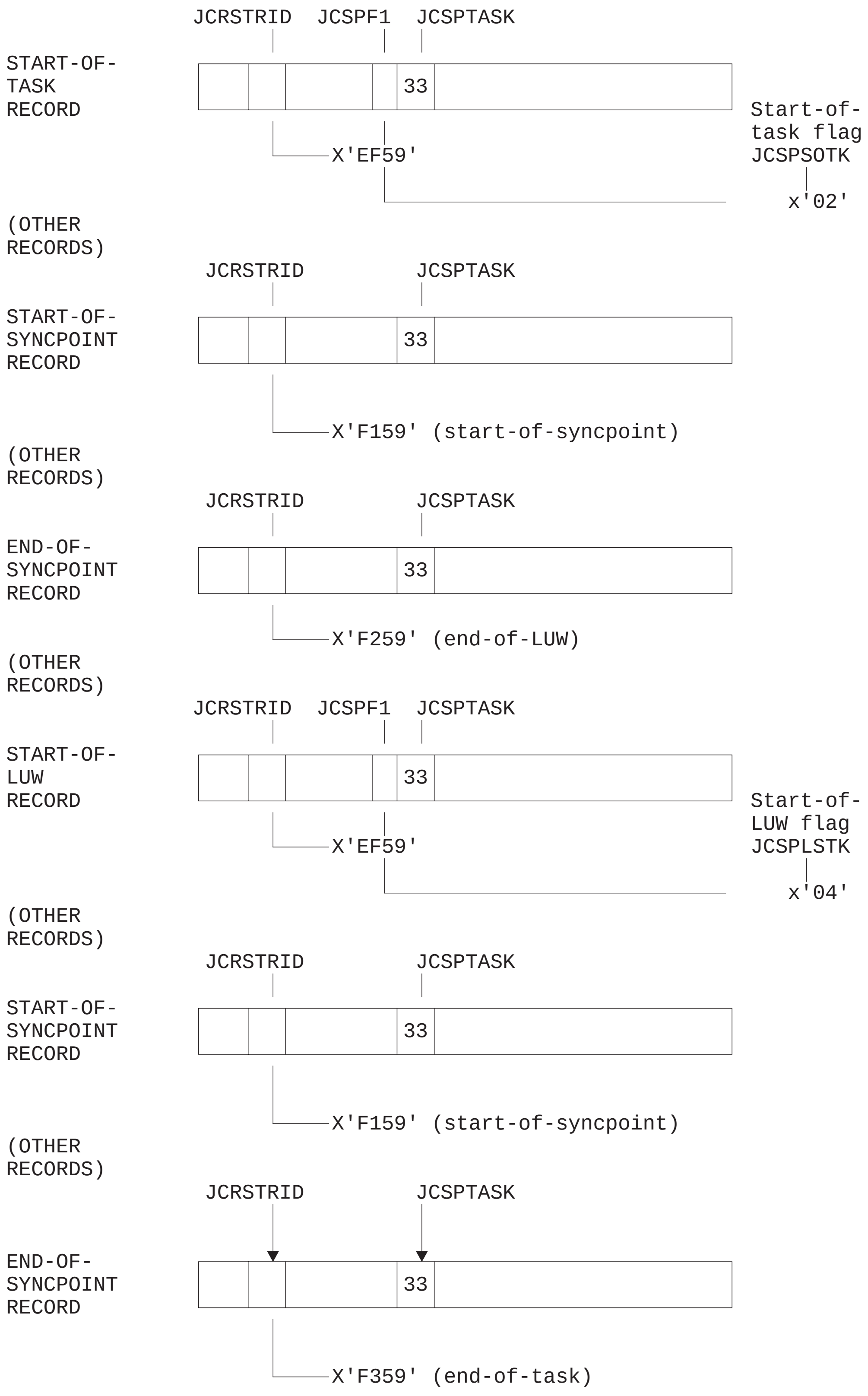


Figure 44. Journal records, showing task and LUW delimiters. This figure shows physical and logical start- and end-of-task records, with the setting of JCSPSOTK and JCSPLSTK flags to indicate start-of-task and start-of-LUW in a task with two LUWs.

Journal records for DL/I

Records written to the CICS journal on behalf of DL/I have the format shown in Table 126.

Table 126. The format of journal records for DL/I

Field name in DFHJCRDS DSECT	Field size in bytes	Format	Contents
JCRLL	2	Halfword binary	Length of record
JCRBB	2	Binary zeros	Not used
None	V	Data	Variable-length DL/I data

Note: If the first byte of the data following field JCRBB has a value in the range `X'01'` through `X'7F'`, the journal records are written to DL/I. To analyze a DL/I log record, refer to the DL/I documentation.

Format of journal records written to in SMF format

This section describes the format of journaling records that are written:

- To a Data Management Facilities (DMF) data set (JTYPE=SMF is specified on the DFHJCT TYPE=ENTRY macro)

or

- To a CICS journal in SMF-format (FORMAT=SMF is specified on the DFHJCT TYPE=ENTRY macro).

In either case, the records are of System Management Facilities (SMF) type 110. The three components of each record are an SMF header, an SMF product section, and a CICS data section.

SMF Header
SMF Product Section
CICS Data Section

Figure 45. Format of an SMF type 110 journaling record

The SMF header describes the system creating the output.

The SMF product section identifies the subsystem to which the journaling data relates. Both the SMF header and the SMF product section can be mapped by the DSECT JCSMFDS, which you can generate using the DFHJCSMF macro as follows:

```
JCSMFDS DFHJCSMF PREFIX=SMF
```

The label ‘JCSMFDS’ is the default DSECT name, and SMF is the default PREFIX value, so you could also generate the DSECT simply by coding `DFHJCSMF`. The format of the JCSMFDS DSECT is shown in Figure 46 on page 528.

Note: The copy book DFHSMFDS is also provided and can be used to map the SMF header and the SMF product sections of all three subtypes of SMF 110 records written by CICS journaling, CICS monitoring, and CICS statistics.

The CICS data section contains a variable-length blocked journal record. Figure 40 on page 515 shows a typical layout of a blocked journal record.

```
*        START OF THE SMF HEADER
*
JCSMFDS  DSECT
SMFFLG   DS    X                   OPERATING SYSTEM INDICATOR (see note)
SMFRTY   DC    X'6E'               RECORD 110 FOR CICS
SMFTME   DS    XL4                 TIME RECORD MOVED TO SMF
SMFDTE   DS    XL4                 DATE RECORD MOVED TO SMF
SMFSID   DC    CL4'CICS'           SYSTEM IDENTIFICATION
SMFSSI   DC    CL4'CICS'           SUBSYSTEM IDENTIFICATION
SMFSTY   DS    XL2                 RECORD SUBTYPE - X'0000' FOR JOURNALING
SMFTRN   DS    XL2                 NUMBER OF TRIPLETS
         DS    XL2                 RESERVED
SMFAPS   DS    XL4                 OFFSET TO PRODUCT SECTION
SMFLPS   DS    XL2                 LENGTH OF PRODUCT SECTION
SMFNPS   DS    XL2                 NUMBER OF PRODUCT SECTIONS
SMFASS   DS    XL4                 OFFSET TO DATA SECTION
SMFASL   DS    XL2                 LENGTH OF DATA SECTION
SMFASN   DS    XL2                 NUMBER OF DATA SECTIONS
*
*        THIS CONCLUDES THE SMF HEADER

*
*        START OF THE SMF PRODUCT SECTION
*
SMFPSRVN DS    XL2                 RECORD VERSION (CICS)
SMFPSPRN DS    CL8                 PRODUCT NAME (GENERIC APPLID)
SMFPSSPN DS    CL8                 PRODUCT NAME (SPECIFIC APPLID)
SMFPSMFL DS    XL2                 RECORD MAINTENANCE INDICATOR
         DS    XL2                 RESERVED
SMFPSRSN DS    PL4                 RECORD-NUMBER WITHIN JOURNAL
SMFPSJID DS    X                   JOURNAL IDENTIFIER
SMFPSBKN DS    PL3                 RECORD-NUMBER WITHIN DATA SET
SMFPSLBW DS    XL4                 LAST-RECORD ADDRESS
*                                  (FORMAT IS TTR0)
SMFPSBAL DS    AL2                 TRACK BALANCE IN BYTES
*
         DS    XL46                RESERVED
SMFPSJBN DS    CL8                 JOBNAME
SMFPSRSD DS    XL4                 JOB DATE
SMFPSRST DS    XL4                 JOB TIME
SMFPSUIF DS    CL8                 USER IDENTIFICATION
SMFPSPDN DS    CL8                 OPERATING SYSTEM PRODUCT LEVEL
SMFPSEND EQU   *                   END OF SMF PRODUCT SECTION


*        THIS CONCLUDES THE SMF PRODUCT SECTION
```

Figure 46. Format of the SMF header and product section for journaling records

Note: CICS sets only the subsystem-related bits of the operating system indicator flag byte in the DMF header (SMFFLG). DMF sets the remainder of the byte according to the operating system level and other factors.

Notes on CICS journaling

This section contains brief notes on aspects of CICS journaling that are covered fully in other books, or in other parts of this book.

Automatic journal archiving

CICS Transaction Server for VSE/ESA Release 1 provides automatic journal archiving: when a journal data set fills up, CICS can automatically archive it while the second disk data set is being used. You can find more information about automatic journal archiving in the *CICS Recovery and Restart Guide*.

The journaling user-replaceable programs

For guidance information about the journaling user-replaceable programs, refer to Chapter 15, “The user-replaceable journaling programs” on page 487.

The global user exits in DFHJCP

Global user exit XJCWR in the journaling control program is invoked after a journal record is written to the journal buffer, but before it is written to the journal data set. At this exit, the addresses of the journal record and of the JCT entry are available to your exit program.

Exit XJCWB is invoked before each physical WRITE to each non-SMF journal. It could be used (for example) to pass copies of CICS log records to another system, to aid recovery of the prime-site system after a disaster.

For more information about global user exits in general, and about the journaling exits in particular, refer to Chapter 1, “Global user exit programs” on page 3.

Chapter 18. CICS monitoring

This chapter describes the monitoring facilities of CICS Transaction Server for VSE/ESA Release 1. It is divided into the following sections:

1. **“Introduction to CICS monitoring”** describes the classes of monitoring data, event-monitoring points, and the use of the monitoring control table.
2. **“CICS monitoring record formats”** on page 536 describes the formats of CICS monitoring SMF type 110 records.
3. **“Data produced by CICS monitoring”** on page 546 lists all the system-defined data that can be produced by CICS monitoring.

Introduction to CICS monitoring

CICS monitoring collects data about the performance of all user- and CICS-supplied transactions during online processing for later offline analysis. The records produced by CICS monitoring are of the System Management Facility (SMF) type 110, and are written to a CICS Data Management Facility (DMF) data set.

Note: Statistics records are also written to the DMF data set as type 110 records. You might find it useful to process the statistics records and the monitoring records together, because statistics provide resource and system information that is complementary to the transaction data produced by CICS monitoring. The contents of the statistics fields, and the procedure for processing them, are described in Chapter 19, “CICS statistics” on page 569.

Monitoring data is useful both for performance tuning and for charging your users for the resources they use.

The classes of monitoring data

Two types, or “classes”, of monitoring data can be collected. These are **performance class** data and **exception class** data.

Performance class data is detailed transaction-level information, such as the processor and elapsed time for a transaction, or the time spent waiting for I/O. At least one performance record is written for each transaction that is being monitored. See “Performance class monitoring data” on page 532 for further information.

Exception class data is information about exceptional conditions suffered by a transaction, such as queuing for file strings, or waiting for temporary storage. This data highlights possible problems in system operation. There is one exception record for each exception condition.

You can choose which classes of monitoring data you want to be collected. How to do this is described in “Controlling CICS monitoring” on page 536.

Performance class monitoring data

CICS performance class monitoring data is collected at system-defined event-monitoring points (EMPs) in the CICS code. You cannot relocate these monitoring points, but you can create additional ones, at which user-defined performance data can be gathered.

Coding additional event-monitoring points

If you want to gather more performance class data than is provided at the system-defined EMPs, you can code additional EMPs in your application programs. You could use these additional EMPs to count the number of times a certain event occurs, or to time the interval between two events, for example. If the performance class was active when a transaction was started, but was not active when a user EMP was issued, the operations defined in that user EMP would still be executed on that transaction's monitoring area. The DELIVER option would result in a loss of data at this point, because the generated performance record cannot be output while the performance class is not active. If the performance class was not active when a transaction was started, the user EMP would have no effect.

To code user EMPs in your application programs, you use the EXEC CICS MONITOR command. For programming information about this command, see the *CICS Application Programming Reference* manual.

Additional EMPs are provided in some IBM program products, such as DL/I. From a CICS point of view, these are like any other user-defined EMP. EMPs in user applications and in IBM program products are identified by a decimal number. The numbers 1 through 199 are available for EMPs in user applications, and the numbers 200 through 255 are for use in IBM program products. The numbers can be qualified with an entry name, so that you can use each number more than once. For example, 'ENTRYA.4', 'ENTRYB.4', and '4' identify three different EMPs. Furthermore, any counts, clocks, or byte-strings updated at one of them are different objects from those updated at any of the others. If you do not specify an entry name, CICS assumes the default of 'USER'.

For each EMP that you code in an application program, there must be a corresponding monitoring control table (MCT) definition, with the same entry name and identification number as the EMP that it describes. (The following sections refer to the combination of entry name and identification number as an “empid”.)

If you want to record the same type of data for different transactions, you can code the same empids in several application programs. This causes similar fields in the corresponding transaction performance records to be updated.

You do not have to assign empids to system-defined EMPs, and you do not have to code MCT entries for them.

The monitoring control table (MCT)

You use the monitoring control table (MCT):

- To tell CICS about the EMPs that you have coded in your application programs and about the data that is to be collected at these points. See “DFHMCT TYPE=EMP” on page 533.
- To tell CICS that you want specific system-defined performance data not to be recorded during a particular CICS run. See “DFHMCT TYPE=RECORD” on page 533.

Full details of the DFHMCT macros are provided in the *CICS Resource Definition Guide*, and you should refer to that book when reading the following sections.

DFHMCT TYPE=EMP

There must be a DFHMCT TYPE=EMP macro definition for every user-coded EMP. This macro has an ID operand, whose value must be made up of the ENTRYNAME and POINT values specified on the EXEC CICS MONITOR command. The PERFORM operand of the DFHMCT TYPE=EMP macro tells CICS which user count fields, user clocks, and character values to expect at the identified user EMP, and what operations to perform on them.

Note that, in a single run of CICS, the format of all performance records is identical, and that the length of records increases relative to the number of data fields in the user EMPs defined in the MCT.

The maximum amount of user data that can be added to performance records is 16384 bytes. The user data is divided into user areas. Each user area is defined by coding an entry name qualifier on the ID operand of the DFHMCT TYPE=EMP macro. If you code the same entry name when defining multiple EMPs, all the EMPs operate on fields in the same user area. Correspondingly, by coding different entry names you can append multiple user areas to the monitoring records. Provided that the overall maximum of 16384 bytes is not exceeded, each user area can contain:

- 0 through 256 counters
- 0 through 256 clocks
- A single 8192-byte character string

Each user area is uniquely referenced by its entry name. For example:

```
DFHMCT  TYPE=EMP,ID=ENTRYA.1,PERFORM=...
DFHMCT  TYPE=EMP,ID=ENTRYA.2,PERFORM=...
DFHMCT  TYPE=EMP,ID=ENTRYB.1,PERFORM=...
DFHMCT  TYPE=EMP,ID=ENTRYB.1,PERFORM=...
DFHMCT  TYPE=EMP,ID=1,PERFORM=...
```

In the above examples, in addition to the system-defined performance fields, three user areas, ‘ENTRYA’, ‘ENTRYB’, and ‘USER’, are defined (if no entry name is specified, the default is ‘USER’). If the application codes an EMP invocation with ENTRYNAME(ENTRYA), only the ENTRYA user area is operated on. The only operation that spans all user areas is DELIVER, which operates across the whole monitoring area.

DFHMCT TYPE=RECORD

The DFHMCT TYPE=RECORD macro allows you to *exclude* specific system-defined performance data from a CICS run. (Each performance monitoring record is approximately 572 bytes long, without taking into account any user data that may be added, or any excluded fields.)

Each field of the performance data that is gathered at the system-defined EMPs belongs to a group of fields that has a group identifier. Each performance data field also has its own numeric identifier that is unique within the group identifier. For example, the transaction sequence number field in a performance record belongs to the group DFHTASK, and has the numeric identifier ‘031’. Using these identifiers, you can exclude specific fields or groups of fields, and reduce the size of the performance records.

Examples of MCT coding

The examples below show some EXEC CICS MONITOR commands with the MCT entries that must be coded for them.

Example 1

EXEC CICS MONITOR command	MCT entry
`EXEC CICS MONITOR`	`DFHMCT TYPE=EMP,          *`
`     POINT(11)`	`       CLASS=PERFORM,     *`
`     ENTRYNAME(PROG3)`	`       ID=(PROG3.11),     *`
	`       CLOCK=(1,CLOCKA),  *`
	`       PERFORM=SCLOCK(1)`

Example 1 shows a user clock being started by an application that is identified as PROG3. This is the eleventh EMP in this application. To prevent confusion with the eleventh EMP in another application, this EMP is uniquely identified by the empid PROG3.11. The clock that is being started is the first clock in a string, and has the identifier CLOCKA.

Example 2

EXEC CICS MONITOR command	MCT entry
`EXEC CICS MONITOR`	`DFHMCT TYPE=EMP,          *`
`     POINT(12)`	`       CLASS=PERFORM,     *`
`     ENTRYNAME(PROG3)`	`       ID=(PROG3.12),     *`
	`       PERFORM=PCLOCK(1)`

Example 2 shows the same user clock (CLOCKA) being stopped. Although this is the same clock being stopped by the same application as in example 1, it is being stopped from a different EMP. The EMP is uniquely identified by the empid PROG3.12.

Example 3

```
EXEC CICS MONITOR command            MCT entry

EXEC CICS MONITOR                 DFHMCT TYPE=EMP,          *
     POINT(13)                           CLASS=PERFORM,     *
     DATA1(address of data)              ID=(PROG3.13),     *
     DATA2(length of data)               PERFORM=MOVE(0,32)
     ENTRYNAME(PROG3)
```

Example 3 shows 32 bytes of user data being updated in the character string reserved for that purpose. The updated data starts at offset 0, and the data is not more than 32 bytes in length.

Exception class data

Exception class data is information on exceptional conditions suffered by a transaction. This data highlights possible problems in system operation. There is one exception record for each exception condition. Exception records are produced after each of the following conditions encountered by a transaction has been resolved:

- Wait for storage in the CDSA
- Wait for storage in the UDSA
- Wait for storage in the SDSA
- Wait for storage in the RDSA
- Wait for storage in the ECDSA
- Wait for storage in the EUDSA
- Wait for storage in the ESDSA
- Wait for storage in the ERDSA
- Wait for auxiliary temporary storage
- Wait for auxiliary temporary storage string
- Wait for auxiliary temporary storage buffer
- Wait for file string
- Wait for file buffer
- Wait for LSRPOOL string

An exception record is created each time any of the resources covered by exception class monitoring becomes constrained by system bottlenecks. If performance data is also being recorded, it keeps a count of the number of exception records generated for each task. The exception records can be linked to the performance data by the transaction identifier in both records.

This data is intended to help you identify constraints that affect the performance of your transaction. The information is written to a DMF data set as soon as the task that was originally constrained has been released.

You can enable exception-class monitoring by coding the MNEXC=ON and MN=ON system initialization parameters. Alternatively you can use either the CEMT SET MONITOR ON EXCEPT or the EXEC CICS SET MONITOR STATUS(ON) EXCEPTCLASS(EXCEPT) command.

How performance and exception class data is passed to DMF

Performance class records and exception class records are not written to DMF in the same way by CICS monitoring.

Performance data records are written to a performance record buffer, which is defined and controlled by CICS, as they are produced. The performance records are passed to DMF for processing when the buffer is full, when the performance class of monitoring is switched off, and when CICS itself quiesces. When monitoring itself is deactivated or when there is an immediate shutdown of CICS, the performance records are not written to DMF and the data is lost.

Exception records are passed directly to DMF when the exception condition completes. Each exception record describes one exception condition. You can link performance records with their associated exception records by matching the value of the TRANNUM field in each type of record; each contains the same transaction number.

Controlling CICS monitoring

When CICS is initialized, you switch the monitoring facility on by specifying the system initialization parameter MN=ON. MN=OFF is the default setting. You can select the classes of monitoring data you want to be collected using the MNPER and MNEXC system initialization parameters. You can request the collection of any combination of performance class data and exception class data. The class settings can be changed whether monitoring itself is ON or OFF. For guidance information about system initialization parameters, refer to the *CICS System Definition Guide*.

When CICS is running, you can control the monitoring facility dynamically. Just as at CICS initialization, you can switch monitoring on or off, and you can change the classes of monitoring data that are being collected. There are two ways of doing this:

1. You can use the master terminal CEMT INQ|SET MONITOR command, which is described in the *CICS-Supplied Transactions* manual.
2. You can use the EXEC CICS INQUIRE and SET MONITOR commands, which are described in the *CICS System Programming Reference* manual.

If you activate a class of monitoring data in the middle of a run, the data for that class becomes available only for transactions that are started thereafter. You cannot change the classes of monitoring data collected for a transaction after it has started. It is often preferable, particularly for long-running transactions, to start all classes of monitoring data at CICS initialization.

CICS monitoring record formats

This section describes the formats of CICS monitoring SMF type 110 records in detail. You need this information if you write your own program to analyze the monitoring data. CICS writes two types of SMF 110 record. Each type, or subtype as it is known, can be identified using the record subtype field in the SMF header. The subtype values are as follows:

X'0001'	Monitoring.
X'0002'	Statistics.

For more information about SMF statistics records, refer to Chapter 19, “CICS statistics” on page 569.

The three components of a CICS monitoring record are an SMF header, an SMF product section, and a CICS data section. Each of these is described in the sections that follow.

SMF Header	SMF Product Section	CICS Data Section

Figure 47. Format of an SMF type 110 monitoring record

SMF header and SMF product section

The SMF header describes the system creating the output. The SMF product section identifies the subsystem to which the monitoring data relates, which, in the case of CICS monitoring (and also of CICS statistics), is the CICS region. Both the SMF header and the SMF product section can be mapped by the DSECT MNSMFDS, which you can generate using the DFHMNSMF macro as follows:

```
MNSMFDS DFHMNSMF PREFIX=SMF
```

The label ‘MNSMFDS’ is the default DSECT name, and SMF is the default PREFIX value, so you could also generate the DSECT simply by coding:

```
DFHMNSMF
```

The MNSMFDS DSECT has the format shown in Figure 48 on page 538.

```
*        START OF THE SMF HEADER
*
MNSMFDS  DSECT
SMFMNLEN DS    XL2           RECORD LENGTH
SMFMNSEG DS    XL2           SEGMENT DESCRIPTOR
SMFMNFLG DS    X             OPERATING SYSTEM INDICATOR (see note 1)
SMFMNRTY DC    X'6E'         RECORD 110 FOR CICS
SMFMNTME DS    XL4           TIME RECORD MOVED TO SMF
SMFMNDTE DS    XL4           DATE RECORD MOVED TO SMF
SMFMNSID DS    CL4           SYSTEM IDENTIFICATION
SMFMNSSI DS    CL4           SUBSYSTEM IDENTIFICATION
SMFMNSTY DS    XL2           RECORD SUBTYPE - MONITORING USES TYPE 1
SMFMNTRN DS    XL2           NUMBER OF TRIPLETS
         DS    XL2           RESERVED
SMFMNAPS DS    XL4           OFFSET TO PRODUCT SECTION
SMFMNLPS DS    XL2           LENGTH OF PRODUCT SECTION
SMFMNNPS DS    XL2           NUMBER OF PRODUCT SECTIONS
SMFMNASS DS    XL4           OFFSET TO DATA SECTION
SMFMNASL DS    XL2           LENGTH OF DATA SECTION
SMFMNASN DS    XL2           NUMBER OF DATA SECTIONS
*
*        THIS CONCLUDES THE SMF HEADER
*
*
*        START OF THE SMF PRODUCT SECTION
*
SMFMNRVN DS    XL2           RECORD VERSION (CICS)
SMFMNPRN DS    CL8           PRODUCT NAME (GENERIC APPLID)
SMFMNSPN DS    CL8           PRODUCT NAME (SPECIFIC APPLID)
SMFMNMFL DS    XL2           RECORD MAINTENANCE INDICATOR
         DS    XL2           RESERVED
SMFMNCL  DS    XL2           CLASS OF DATA
*                                        1 = DICTIONARY
*                                        3 = PERFORMANCE
*                                        4 = EXCEPTION
SMFMNDCA DS    XL4           OFFSET TO CICS FIELD CONNECTORS
SMFMNDCL DS    XL2           LENGTH OF EACH CICS FIELD CONNECTOR
SMFMNDCN DS    XL2           NUMBER OF CICS FIELD CONNECTORS
SMFMNDRA DS    XL4           OFFSET TO FIRST CICS DATA RECORD
SMFMNDRL DS    XL2           LENGTH OF EACH CICS DATA RECORD
SMFMNDRN DS    XL2           NUMBER OF CICS DATA RECORDS
*
         DS    XL20          RESERVED
SMFMNTAD DS    XL4           LOCAL TOD CLOCK ADJUSTMENT VALUE
SMFMNLSO DS    XL8           RESERVED
SMFMNDTO DS    XL8           RESERVED
         DS    XL2           RESERVED
SMFMNJBN DS    CL8           JOBNAME
SMFMNRSD DS    XL4           JOB DATE
SMFMSRST DS    XL4           JOB TIME
SMFMNUIF DS    CL8           USER IDENTIFICATION
SMFMNPDN DS    CL8           OPERATING SYSTEM PRODUCT LEVEL
*
*        THIS CONCLUDES THE SMF PRODUCT SECTION
```

Figure 48. Format of the SMF header and product section for monitoring records

Notes:

1. CICS sets only the subsystem-related bits of the operating system indicator flag byte in the SMF header (SMFMNFLG). DMF sets the remainder of the byte according to the operating system level and other factors. For an explanation of the setting of the other bits, refer to the *CICS Operations and Utilities Guide*.
2. For dictionary class monitoring records (described in “Dictionary data sections”), the fields SMFMNDRA, SMFMNDRL, and SMFMNDRN in the SMF product section have the following meaning:

SMFMNDRA	Offset to the first dictionary entry.
SMFMNDRL	Length of a single dictionary entry.
SMFMNDRN	Number of dictionary entries within the CICS data section.

3. The copy book DFHSMFDS is also provided and can be used to map the SMF header and the SMF product sections of both subtypes of SMF 110 records written by CICS monitoring and CICS statistics.

CICS data section

The CICS data section can be made up of a dictionary data section, a performance data section, or an exception data section. You can identify which of these you are dealing with by looking at the value of field SMFMNCL in the SMF product section. Each of the data section types is described in the sections that follow.

Dictionary data sections

Dictionary data sections describe all the fields in the performance data records that are gathered during this CICS run. They describe **all** the system-provided data fields (whether you have excluded any or not), plus any user-provided data fields, which CICS takes at initialization time from the MCT entries you have coded. This means that the descriptions of the system-provided data fields never change, though the user data fields can be changed each time CICS is initialized. The contents of the dictionary data sections cannot be changed while CICS is running.

Dictionary data sections contain a variable number of 26-byte dictionary entries. Each dictionary entry provides the following information about a single performance record data field:

CMODNAME	The identifier of the group to which the field belongs.
CMODTYPE	The field type.
CMODIDNT	The field identifier.
CMODLENG	The length of the field.
CMODCONN	The connector value assigned to the field.
CMODOFST	The offset of the field.
CMODHEAD	The informal name of the field.

You can map the dictionary entries by generating a DSECT with the DFHMCTDR macro as shown in Figure 49 on page 540.

```
DFHMCTDR TYPE=(PREFIX,CMO)
```

CMO is the default label prefix. The DSECT is as follows:

```
CMODNAME DS    CL8     + 0    NAME OF OWNER (entry name)
CMODTYPE DS    C       + 8    OBJECT TYPE
*                           'S' = STOPWATCH (CLOCK)
*                           'A' = ACCUMULATOR (COUNT)
*                           'C' = BYTE-STRING FIELD
*                           'T' = TIMESTAMP (STCK FORMAT)
*                           'P' = PACKED-DECIMAL FIELD
CMODIDNT DS    CL3     +9     ID WITHIN TYPE
*                             CLOCK-, COUNT-, OR FIELD-NO.
CMODLENG DS    H       +12    LENGTH OF OBJECT
CMODCONN DS    XL2     +14    ASSIGNED CONNECTOR
CMODOFST DS    XL2     +16    ASSIGNED OFFSET
CMODHEAD DS    CL8     +18    INFORMAL NAME
CMODNEXT EQU   *
```

Figure 49. CICS monitoring dictionary entry DSECT

Whenever the monitoring of performance class data is switched on, whether at CICS initialization or while CICS is running, a dictionary data section is written. So, if the monitoring of performance class data is switched on and off three times during a single CICS run, there are three separate, but identical, dictionary data sections for that run. The dictionary data section is passed to DMF, together with any performance data sections, when the first buffer of performance data sections for a performance class data monitoring session is output to DMF. Any offline utility should use the most recent dictionary record encountered when processing CICS monitoring records.

The format of dictionary data sections is shown in Figure 50. A list of the default CICS dictionary entries is given in Figure 51 on page 541.

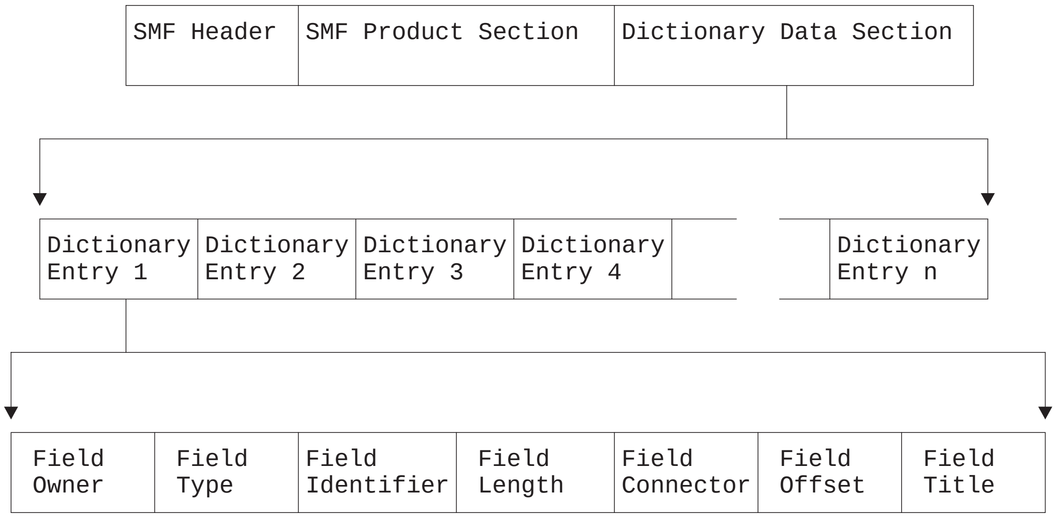


Figure 50. Format of the CICS monitoring dictionary data section

FIELD OWNER	FIELD TYPE	FIELD IDENTIFIER	FIELD LENGTH	FIELD CONNECTOR	FIELD OFFSET	FIELD TITLE
DFHTASK	C	001	4	X'0001'	X'0000'	TRAN
DFHTERM	C	002	4	X'0002'	X'0004'	TERM
DFHCICS	C	089	8	X'0003'	X'0008'	USERID
DFHTASK	C	004	4	X'0004'	X'0010'	TTYPE
DFHCICS	T	005	8	X'0005'	X'0014'	START
DFHCICS	T	006	8	X'0006'	X'001C'	STOP
DFHTASK	P	031	4	X'0007'	X'0024'	TRANNUM
DFHTASK	A	109	4	X'0008'	X'0028'	TRANPRI
DFHTASK	C	166	8	X'0009'	X'002C'	TCLSNAME
DFHTERM	C	111	8	X'000A'	X'0034'	LUNAME
DFHPROG	C	071	8	X'000B'	X'003C'	PGMNAME
DFHTASK	C	097	20	X'000C'	X'0044'	NETNAME
DFHTASK	C	098	8	X'000D'	X'0058'	UOWID
DFHCICS	C	130	4	X'000E'	X'0060'	RSYSID
DFHTASK	C	064	4	X'000F'	X'0064'	TASKFLAG
DFHPROG	C	113	4	X'0010'	X'0068'	ABCODEO
DFHPROG	C	114	4	X'0011'	X'006C'	ABCODEC
DFHCICS	C	112	4	X'0012'	X'0070'	RTYPE
DFHTERM	A	034	4	X'0013'	X'0074'	TCMSGIN1
DFHTERM	A	083	4	X'0014'	X'0078'	TCCHRIN1
DFHTERM	A	035	4	X'0015'	X'007C'	TCMSGOU1
DFHTERM	A	084	4	X'0016'	X'0080'	TCCHROU1
DFHTERM	A	067	4	X'0017'	X'0084'	TCMSGIN2
DFHTERM	A	085	4	X'0018'	X'0088'	TCCHRIN2
DFHTERM	A	068	4	X'0019'	X'008C'	TCMSGOU2
DFHTERM	A	086	4	X'001A'	X'0090'	TCCHROU2
DFHTERM	A	135	4	X'001B'	X'0094'	TCM62IN2
DFHTERM	A	137	4	X'001C'	X'0098'	TCC62IN2
DFHTERM	A	136	4	X'001D'	X'009C'	TCM62OU2
DFHTERM	A	138	4	X'001E'	X'00A0'	TCC62OU2
DFHTERM	A	069	4	X'001F'	X'00A4'	TCALLOCT
DFHSTOR	A	054	4	X'0020'	X'00A8'	SCUGETCT
DFHSTOR	A	105	4	X'0021'	X'00AC'	SCUGETCT
DFHSTOR	A	117	4	X'0022'	X'00B0'	SCCGETCT
DFHSTOR	A	120	4	X'0023'	X'00B4'	SCCGETCT
DFHSTOR	A	033	4	X'0024'	X'00B8'	SCUSRHWM
DFHSTOR	A	106	4	X'0025'	X'00BC'	SCUSRHWM
DFHSTOR	A	116	4	X'0026'	X'00C0'	SC24CHWM
DFHSTOR	A	119	4	X'0027'	X'00C4'	SC31CHWM
DFHSTOR	A	095	8	X'0028'	X'00C8'	SCUSRSTG
DFHSTOR	A	107	8	X'0029'	X'00D0'	SCUSRSTG
DFHSTOR	A	118	8	X'002A'	X'00D8'	SC24COCC
DFHSTOR	A	121	8	X'002B'	X'00E0'	SC31COCC
DFHSTOR	A	087	4	X'002C'	X'00E8'	PCSTGHWM
DFHSTOR	A	139	4	X'002D'	X'00EC'	PC31AHWM
DFHSTOR	A	108	4	X'002E'	X'00F0'	PC24BHWM
DFHSTOR	A	142	4	X'002F'	X'00F4'	PC31CHWM
DFHSTOR	A	143	4	X'0030'	X'00F8'	PC24CHWM
DFHSTOR	A	122	4	X'0031'	X'00FC'	PC31RHWM

Figure 51 (Part 1 of 3). Default CICS dictionary entries

DFHSTOR	A	162	4	X'0032'	X'0100'	PC24RHWM
DFHSTOR	A	161	4	X'0033'	X'0104'	PC31SHWM
DFHSTOR	A	160	4	X'0034'	X'0108'	PC24SHWM
DFHFILE	A	036	4	X'0035'	X'010C'	FCGETCT
DFHFILE	A	037	4	X'0036'	X'0110'	FCPUTCT
DFHFILE	A	038	4	X'0037'	X'0114'	FCBRWCT
DFHFILE	A	039	4	X'0038'	X'0118'	FCADDCT
DFHFILE	A	040	4	X'0039'	X'011C'	FCDELCT
DFHFILE	A	093	4	X'003A'	X'0120'	FCTOTCT
DFHFILE	A	070	4	X'003B'	X'0124'	FCAMCT
DFHDEST	A	041	4	X'003C'	X'0128'	TDGETCT
DFHDEST	A	042	4	X'003D'	X'012C'	TDPUTCT
DFHDEST	A	043	4	X'003E'	X'0130'	TDPURCT
DFHDEST	A	091	4	X'003F'	X'0134'	TDTOTCT
DFHTEMP	A	044	4	X'0040'	X'0138'	TSGETCT
DFHTEMP	A	046	4	X'0041'	X'013C'	TSPUTACT
DFHTEMP	A	047	4	X'0042'	X'0140'	TSPUTMCT
DFHTEMP	A	092	4	X'0043'	X'0144'	TSTOTCT
DFHMAPP	A	050	4	X'0044'	X'0148'	BMSMAPCT
DFHMAPP	A	051	4	X'0045'	X'014C'	BMSINCT
DFHMAPP	A	052	4	X'0046'	X'0150'	BMSOUTCT
DFHMAPP	A	090	4	X'0047'	X'0154'	BMSTOTCT
DFHPROG	A	055	4	X'0048'	X'0158'	PCLINKCT
DFHPROG	A	056	4	X'0049'	X'015C'	PCXCTLCT
DFHPROG	A	057	4	X'004A'	X'0160'	PCLOADCT
DFHJOUR	A	058	4	X'004B'	X'0164'	JCPUWRCT
DFHTASK	A	059	4	X'004C'	X'0168'	ICPUINCT
DFHSYNC	A	060	4	X'004D'	X'016C'	SPSYNCCT
DFHFEPI	A	150	4	X'004E'	X'0170'	SZALLOCT
DFHFEPI	A	151	4	X'004F'	X'0174'	SZRCVCT
DFHFEPI	A	152	4	X'0050'	X'0178'	SZSENDCT
DFHFEPI	A	153	4	X'0051'	X'017C'	SZSTRTCT
DFHFEPI	A	154	4	X'0052'	X'0180'	SZCHROUT
DFHFEPI	A	155	4	X'0053'	X'0184'	SZCHRIN
DFHFEPI	A	157	4	X'0054'	X'0188'	SZALLCTO
DFHFEPI	A	158	4	X'0055'	X'018C'	SZRCVTO
DFHFEPI	A	159	4	X'0056'	X'0190'	SZTOTCT
DFHTASK	S	007	8	X'0057'	X'0194'	USRDISPT
DFHTASK	S	008	8	X'0058'	X'019C'	USRCPUT
DFHTASK	S	014	8	X'0059'	X'01A4'	SUSPTIME
DFHTASK	S	102	8	X'005A'	X'01AC'	DISPWTT
DFHCICS	S	103	8	X'005B'	X'01B4'	EXWTTIME
DFHTERM	S	009	8	X'005C'	X'01BC'	TCIOWTT
DFHFILE	S	063	8	X'005D'	X'01C4'	FCIOWTT
DFHJOUR	S	010	8	X'005E'	X'01CC'	JCIOWTT
DFHTEMP	S	011	8	X'005F'	X'01D4'	TSIOWTT
DFHTERM	S	100	8	X'0060'	X'01DC'	IRIOWTT
DFHDEST	S	101	8	X'0061'	X'01E4'	TDIOWTT

Figure 51 (Part 2 of 3). Default CICS dictionary entries

DFHPROG	S	115	8	X'0062'	X'01EC'	PCLOADTM
DFHTASK	S	125	8	X'0063'	X'01F4'	DSPDELAY
DFHTASK	S	126	8	X'0064'	X'01FC'	TCLDELAY
DFHTASK	S	127	8	X'0065'	X'0204'	MXTDELAY
DFHTASK	S	129	8	X'0066'	X'020C'	ENQDELAY
DFHTERM	S	133	8	X'0067'	X'0214'	LU61WTT
DFHTERM	S	134	8	X'0068'	X'021C'	LU62WTT
DFHFEPI	S	156	8	X'0069'	X'0224'	SZWAIT
DFHTASK	S	170	8	X'006A'	X'022C'	RMITIME
DFHTASK	S	171	8	X'006B'	X'0234'	RMISUSP

Figure 51 (Part 3 of 3). Default CICS dictionary entries

Note: The "field types" in Figure 51 are:

A	Count.
C	Byte-string.
P	Packed decimal number.
S	Clock.
T	Time stamp.

Performance data sections

Each performance data section is made up of a string of field connectors, followed by one or more performance data records. All of the performance records produced by a single CICS run have the same format, and each record is, by default, 380 bytes long. However, the length of the performance records changes if you add user data at user EMPs, or if you exclude any system-defined data from the monitoring process. All of the system-defined data fields in the performance records are described in "Performance class data" on page 548. The format of the performance data section is shown in Figure 52.

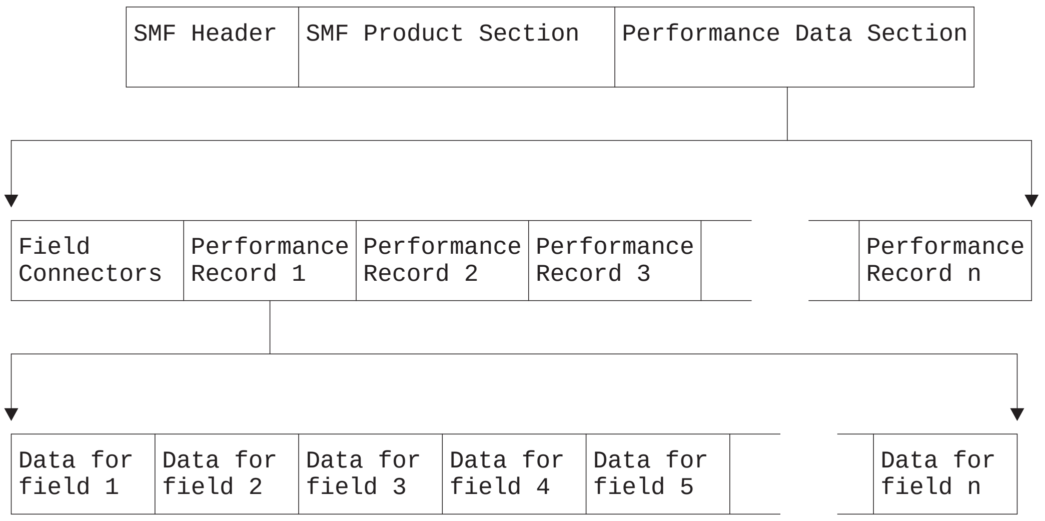


Figure 52. Format of the performance data section

Relationship of the dictionary record to the performance records

Following the performance records' SMF product section, and before the performance records themselves, is a string of **field connectors**. The purpose of the field connectors is to tell you which fields are going to occur in the performance records produced by this CICS run. Each field connector corresponds to one field in each of the succeeding performance records. The first field connector corresponds to the first field, the second to the second field, and so on. Each field connector also corresponds to a single dictionary entry in the associated dictionary record: the connector value is equal to the value of CMODCONN in the corresponding dictionary entry. In this way, each performance record field is connected to the dictionary entry that describes it. A useful technique for calculating the offset of a particular dictionary entry is to take the connector, subtract one, and multiply the result by the length of a single dictionary entry.

Thus, the string of field connectors is the key to the dictionary. And without the dictionary, reporting and analysis programs cannot interpret the performance data.

The successive performance records can be regarded as rows in a table, with each column corresponding to one type of field within the records. Each field connector then describes the contents of one column. This view of the data is helpful when designing tabular reports, which are often arranged in this way.

Figure 53 illustrates the relationship between the dictionary record, the field connectors, and the performance records.

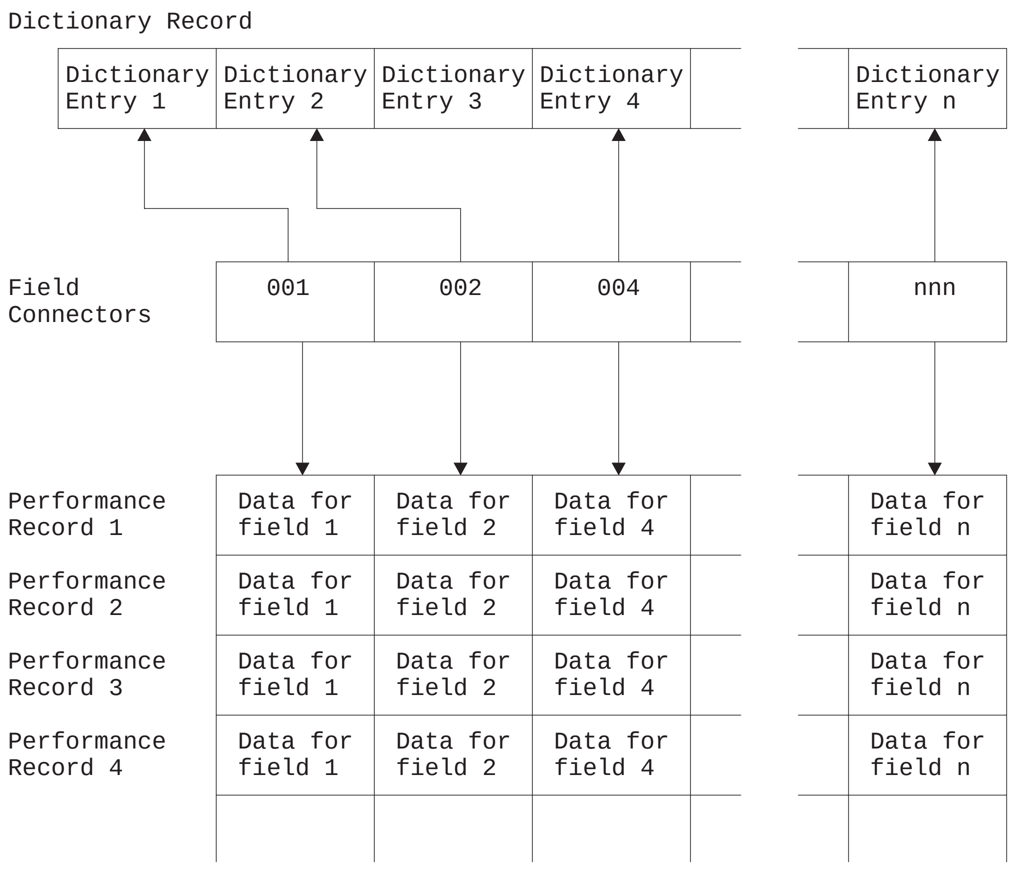


Figure 53. Relationship between the dictionary record and the performance records. In this example, the data that is defined by Dictionary Entry 3 has been excluded, so there is no field connector value for it and it does not appear in the performance records.

How the string of field connectors is constructed: When CICS is initialized, a unique connector value is assigned to every dictionary entry. CICS then examines the MCT entries for this run to see if you have excluded any system-defined performance data. If you have, the offset values for their corresponding dictionary entries are set to `X'FFFF'`. CICS then constructs a sequence of field connectors that excludes those with offsets of `X'FFFF'`. In this way, the connectors tell you which system- and user-data fields are going to occur in your performance records for this run. If you have not excluded any system-defined performance data, there is one field connector for every dictionary entry.

Please note the following:

Field connectors	link the fields in a performance record with their dictionary entries. They are unique values that are assigned at initialization time. They may, therefore, change from one run of CICS to the next.
Field identifiers	allow you to exclude specific system-defined performance data from being collected during a CICS run. They are unique within a group name and record type, and they do **not** change between CICS runs. There is more information about field identifiers in the *CICS Resource Definition Guide*.
Field offsets	in the performance record allow you to build a table for fast selection of required fields in your monitoring data processing programs.

Exception data sections

The format of an exception data record (including the SMF header and SMF product section) is shown in Figure 54. The exception data section contains a single exception record representing one exception condition.

SMF Header	SMF Product Section	Exception Data Section

Figure 54. Format of an SMF type 110 exception data record

The format of the exception data section can be mapped by the DSECT MNEXCDS, which you can generate using the DFHMNEXC macro as follows:

```
MNEXCDS DFHMNEXC PREFIX=EXC
```

The label ‘MNEXCDS’ is the default DSECT name, and EXC is the default PREFIX value, so you could also generate the DSECT simply by coding

```
DFHMNEXC
```

The MNEXCDS DSECT has the format shown in Figure 55 on page 546.

```
MNEXCDS   DSECT
EXCMNTRN  DS    CL4              TRANSACTION IDENTIFICATION
EXCMNTER  DS    XL4              TERMINAL IDENTIFICATION
EXCMNUSR  DS    CL8              USER IDENTIFICATION
EXCMNTST  DS    CL4              TRANSACTION START TYPE
EXCMNSTA  DS    XL8              EXCEPTION START TIME
EXCMNSTO  DS    XL8              EXCEPTION STOP TIME
EXCMNTNO  DS    PL4              TRANSACTION NUMBER
EXCMNTPR  DS    XL4              TRANSACTION PRIORITY
          DS    CL4              RESERVED
EXCMNLUN  DS    CL8              LUNAME
          DS    CL4              RESERVED
EXCMNEXN  DS    XL4              EXCEPTION NUMBER
EXCMNRTY  DS    CL8              EXCEPTION RESOURCE TYPE
EXCMNRID  DS    CL8              EXCEPTION RESOURCE ID
EXCMNTYP  DS    XL2              EXCEPTION TYPE
EXCMNWT   EQU   X'0001'          WAIT
EXCMNBWT  EQU   X'0002'          BUFFER WAIT
EXCMNSWT  EQU   X'0003'          STRING WAIT
          DS    CL2              RESERVED
EXCMNTCN  DS    CL8              TRANSACTION CLASS NAME
*         END OF EXCEPTION RECORD
```

Figure 55. CICS monitoring exception record DSECT

For further information about exception class data, refer to page 565.

Data produced by CICS monitoring

All of the exception class data and all of the system-defined performance class data that can be produced by CICS monitoring is listed below. Each of the data fields is presented as a field description, followed by an explanation of the contents. The field description has the format shown in Figure 56 on page 547, which is taken from the performance data group DFHTASK.

```
001 (TYPE-C, 'TRAN', 4 BYTES)
 |      |       |       |
 |      |       |      Length of the field (as re-
 |      |       |      presented by CMODLENG in the
 |      |       |      dictionary entry).
 |      |       |
 |      |      Informal name for the field, as used,
 |      |      perhaps, in column headings when the
 |      |      monitoring output is processed
 |      |      (CMODHEAD of the dictionary entry).
 |      |
 |     Data type, which may be one of the following:
 |       A - a 32-bit count
 |       C - a byte string
 |       P - a packed decimal value
 |       S - a clock comprising a 32-bit accumulation
 |           of 16-microsecond units followed by an
 |           8-bit flag followed by a 24-bit count
 |           (modulo-16 777 216) of the number of
 |           intervals included in the accumulation.
 |       T - a time stamp derived directly from the
 |           output of an STCK instruction.
 |      (CMODTYPE of the dictionary entry)
 |
Field identifier by which the field may be individually
excluded or included during MCT preparation (CMODIDNT of
the dictionary entry).
```

Figure 56. Format of the descriptions of the data fields

Note: References in Figure 56 to the associated dictionary entries apply only to the performance class data descriptions. Exception class data is not defined in the dictionary record.

Clocks and time stamps

In the descriptions that follow, the term **clock** is distinguished from the term **time stamp**.

A **clock** is a 32-bit value, expressed in units of 16 microseconds, accumulated during one or more measurement periods. The 32-bit value is followed by 8 reserved bits, which are in turn followed by a 24-bit value indicating the number of such periods.

Neither the 32-bit timer component of a clock nor its 24-bit period count are protected against wraparound. The timer capacity is about 18 hours, and the period count runs modulo 16 777 216.

The 8 reserved bits have the following significance:

Bits 0, 1, 2 and 3	Used for online control of the clock when it is running, and should always be zeros on output.
Bits 4 and 7	Not used.
Bits 5 and 6	Used to indicate, when set to 1, that the clock has suffered at least one out-of-phase start (bit 5) or stop (bit 6).

A **time stamp** is an 8-byte copy of the output of an STCK instruction.

Note: All times produced in the offline reports are in GMT (Greenwich Mean Time) not local time. Times produced by online reporting can be expressed in either GMT or local time.

Performance class data

The performance class data is described below in order of group name. The group name is always in field CMODNAME of the dictionary entry.

A user task can be represented by one or more performance class monitoring records, depending on whether the MCT event monitoring option DELIVER or the system initialization parameters MNCONV=YES or MNSYNC=YES have been selected. In the descriptions that follow, the term “user task” means “that part or whole of a transaction that is represented by a performance class record”, unless the description states otherwise.

A note about response time

You can calculate the internal CICS response time by subtracting performance data field 005 (start time) from performance data field 006 (finish time).

Figure 57 shows the relationship of dispatch time, suspend time, and CPU time with the response time.

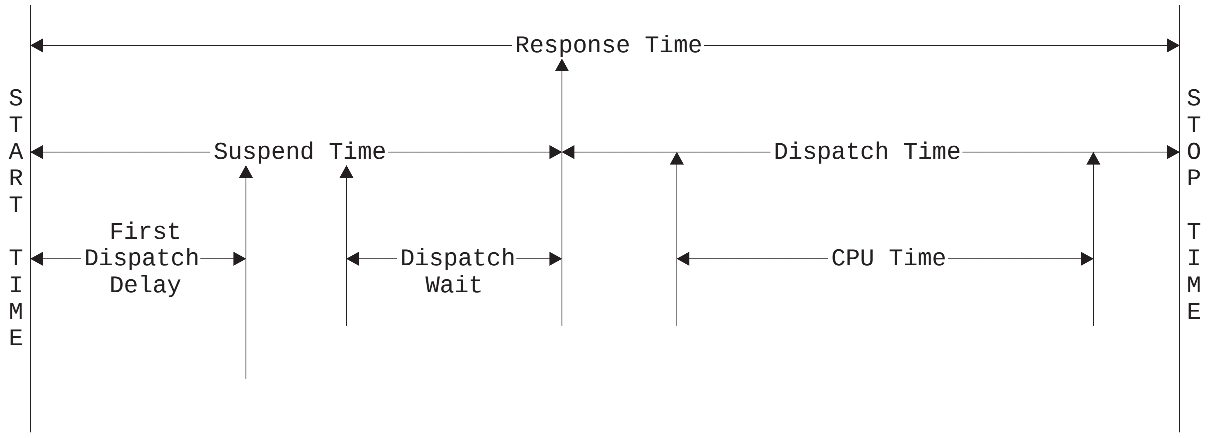


Figure 57. Response time relationships

A note about wait times

The performance data fields 009, 010, 011, 063, 100, 101, 129, 133, 134, 156, and 171 all record the elapsed time spent waiting for a particular type of I/O operation. For example, field 009 records the elapsed time waiting for terminal I/O. The elapsed time includes not only that time during which the I/O operation is actually taking place, but also the time during which the access method is completing the outstanding event control block, and the time subsequent to that until the waiting CICS transaction is redispatched.

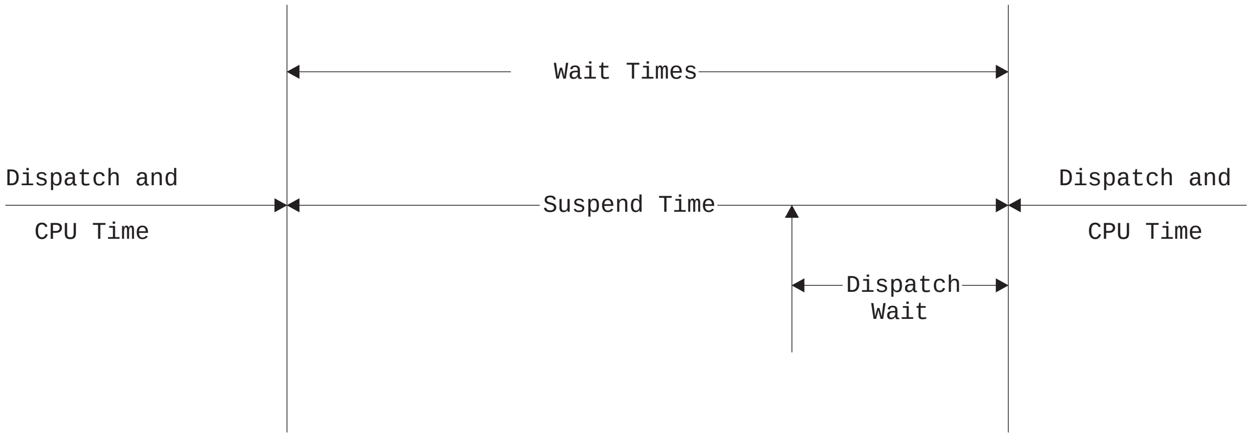


Figure 58. Wait time relationships

A note about program load time

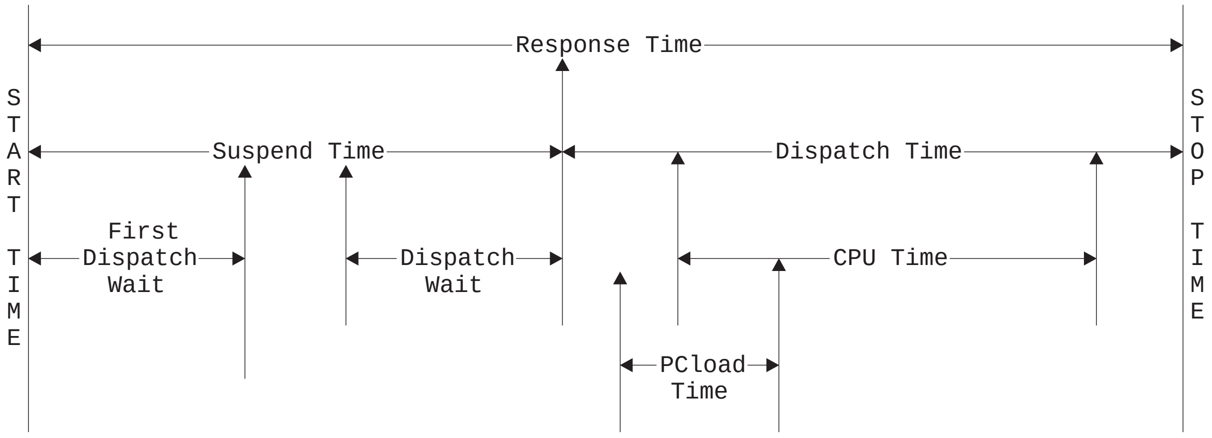


Figure 59. Program load time

Figure 59 shows the relationship between the program load time (field 115) and the dispatch time and the suspend time (fields 7 and 14).

A note about exception wait time

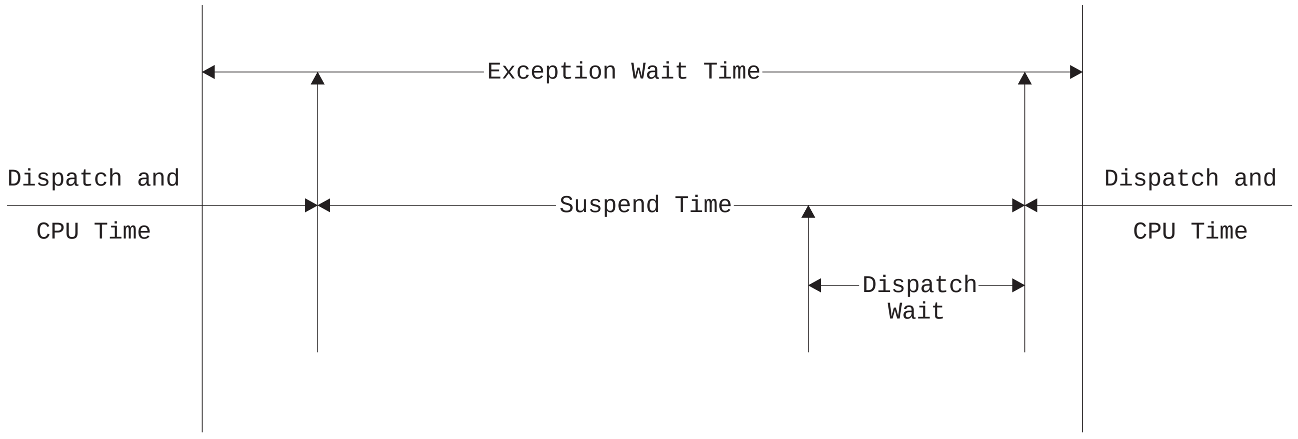


Figure 60. Exception wait time

Figure 60 shows the relationship between the exception wait time (field 103), and the dispatch time and suspend time (fields 7 and 14).

A note about RMI elapsed and suspend time

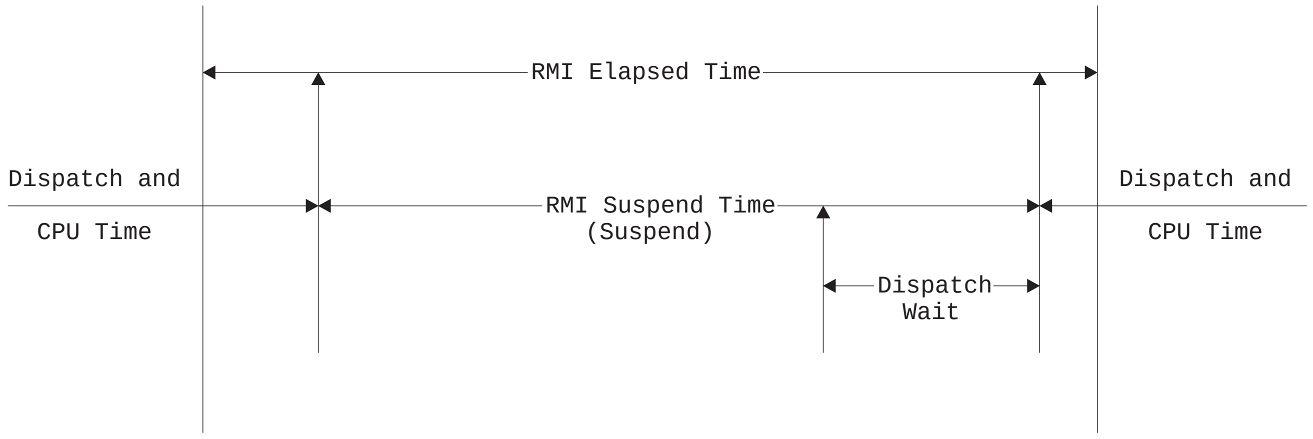


Figure 61. RMI elapsed and suspend time

Figure 61 shows the relationship between the RMI elapsed time and the suspend time (fields 170 and 171).

A note about storage occupancy counts

An occupancy count measures the area under the curve of user-task storage in use against elapsed time. The unit of measure is the “byte-unit”, where the “unit” is equal to 1024 microseconds, or 1.024 milliseconds. A user task occupying, for example, 256 bytes for 125 milliseconds, is measured as follows:

125 / 1.024 *ms* = 122 units * 256 = 31 232 byte-units.

where *ms* is milliseconds.

Note: All references to start time and stop time in the calculations below refer to the middle 4 bytes of each 8-byte start/stop time field. Bit 51 of Start time or Stop time represents a unit of 16 microseconds.

To calculate the response time in microsecond units:
Response = ((Stop time – Start time) * 16)

To calculate the number of 1024-microsecond units:
Units = (Response / 1024)
or
Units = ((Stop time – Start time) / 64)

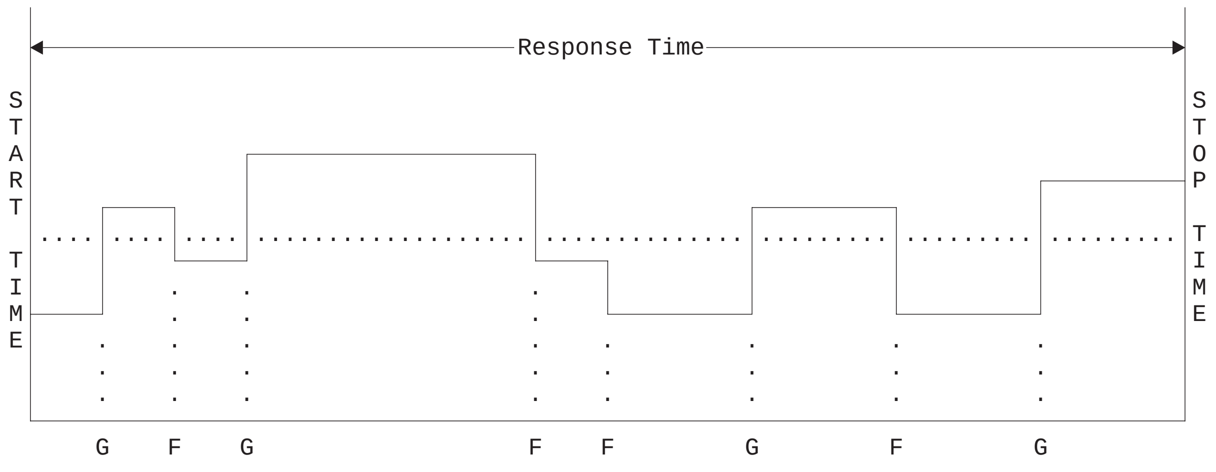
To calculate the average user-task storage used from the storage occupancy count:
Average user-task = storage used (Storage Occupancy / Units)

To calculate units per second:
Units Per Second = (1 000 000 / 1024) = 976.5625

To calculate the response time in seconds:
Response time = (((Stop time – Start time) * 16) / 1 000 000)

During the life of a user task CICS measures, calculates, and accumulates the storage occupancy at the following points:

- Before GETMAIN increases current user-storage values
- Before FREEMAIN reduces current user-storage values
- Just before the performance record is moved to the buffer



```
G = GETMAIN
F = FREEMAIN
Dotted line = Average storage occupancy
```

Figure 62. Storage occupancy

A note about program storage

The level of program storage currently in use is incremented at LOAD, LINK, and XCTL events by the size (in bytes) of the referenced program, and is decremented at RELEASE or RETURN events.

Notes:

1. On an XCTL event, the program storage currently in use is also decremented by the size of the program issuing the XCTL, because the program is no longer required.
2. On a RELEASE event, if the program being released was loaded via a LOAD HOLD command, program storage currently in use is not decremented. This is because it cannot be determined whether the program being released by the current task was also loaded by the current task.

Figure 63 on page 553 shows the relationships between the “high-water mark” data fields that contain the maximum amounts of program storage in use by the user task. Field PCSTGHWM (field ID 087) contains the maximum amount of program storage in use by the task both above **and** below the 16MB line. Fields PC31AHWM (139) and PC24BHWM (108) are subsets of PCSTGHWM, containing the maximum amounts in use above and below the 16MB line, respectively. Further subset-fields contain the maximum amounts of storage in use by the task in each of the CICS dynamic storage areas (DSAs).

Note: The totaled values of all the subsets in a superset may not necessarily equate to the value of the superset; for example, the value of PC31AHWM plus the value of PC24BHWM may not equal the value of PCSTGHWM. This is because the peaks in the different types of program storage acquired by the user task do not necessarily occur simultaneously.

The “high-water mark” fields are described in detail in “Performance data in group DFHSTOR” on page 558.

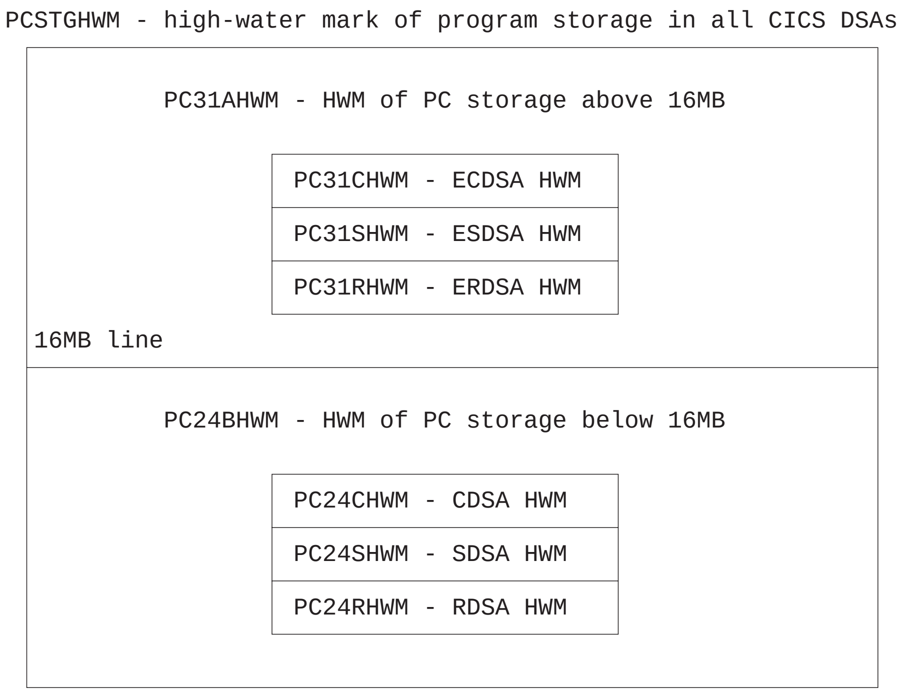

PCSTGHWM - high-water mark of program storage in all CICS DSAs
PC31AHWM - HWM of PC storage above 16MB
PC31CHWM - ECDSA HWM
PC31SHWM - ESDSA HWM
PC31RHWM - ERDSA HWM
16MB line
PC24BHWM - HWM of PC storage below 16MB
PC24CHWM - CDSA HWM
PC24SHWM - SDSA HWM
PC24RHWM - RDSA HWM

Figure 63. Relationships between the “high-water mark” program storage data fields

Performance data in group DFHCICS

005 (TYPE-T, ‘START’, 8 BYTES)
Start time of measurement interval. This is one of the following:

- The time at which the user task was attached
- The time at which data recording was most recently in support of the MCT user event monitoring point DELIVER option
- The monitoring options MNSYNC=YES or FREQUENCY

For more information see “Clocks and time stamps” on page 547.

006 (TYPE-T, ‘STOP’, 8 BYTES)
Finish time of measurement interval. This is either the time at which the user task was detached, or the time at which data recording was completed in support of the MCT user event monitoring point DELIVER option or the monitoring options MNSYNC=YES or FREQUENCY. For more information see “Clocks and time stamps” on page 547.

Note: Response Time = STOP – START. For more information see “A note about response time” on page 548.

089 (TYPE-C, ‘USERID’, 8 BYTES)
User identification at task creation. This can also be the remote user identifier for a task created as the result of receiving an ATTACH request across an MRO or APPC link with attach-time security enabled.

103 (TYPE-S, ‘EXWTTIME’, 8 BYTES)
Accumulated data for exception conditions. The 32-bit clock contains the total elapsed time for which the user waited on exception conditions. The 24-bit period count equals the number of exception conditions that have occurred for this task. For more information see “Clocks and time stamps” on page 547.

Note: The performance class data field ‘exception wait time’ will be updated when exception conditions are encountered even when the exception class is inactive. For more information see Figure 60 on page 550.

112 (TYPE-C, ‘RTYPE’, 4 BYTES)
Performance record type (low-order byte-3):

C	Record output for a terminal converse.
D	Record output for a user EMP DELIVER request.
F	Record output for a long-running transaction.
S	Record output for a syncpoint.
T	Record output for a task termination.

130 (TYPE-C, ‘RSYSID’, 4 bytes)
is the name (sysid) of the remote system to which this transaction was routed either statically or dynamically.

Note: If the transaction was not routed or was routed locally, this field is set to null. Also see the program name (field 71).

Performance data in group DFHDEST

041 (TYPE-A, ‘TDGETCT’, 4 BYTES)
Number of transient data GET requests issued by the user task.

042 (TYPE-A, ‘TDPUTCT’, 4 BYTES)
Number of transient data PUT requests issued by the user task.

043 (TYPE-A, ‘TDPURCT’, 4 BYTES)
Number of transient data PURGE requests issued by the user task.

091 (TYPE-A, ‘TDTOTCT’, 4 BYTES)
Total number of transient data requests issued by the user task. This field is the sum of TDGETCT, TDPUTCT, and TDPURCT.

101 (TYPE-S, ‘TDIOWTT’, 8 BYTES)
Elapsed time in which the user waited for VSAM transient data I/O. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

Performance data in group DFHFEPI

150 (TYPE-A,‘SZALLOCT’, 4 bytes)
Number of conversations allocated by the user task. This number is incremented for each FEPI ALLOCATE POOL or FEPI CONVERSE POOL.

151 (TYPE-A,'SZRCVCT',4 bytes)
Number of FEPI RECEIVE requests made by the user task. This number is also incremented for each FEPI CONVERSE request.

152 (TYPE-A,'SZSENDCT',4 bytes)
Number of FEPI SEND requests made by the user task. This number is also incremented for each FEPI CONVERSE request.

153 (TYPE-A,'SZSTRTCT',4 bytes)
Number of FEPI START requests made by the user task.

154 (TYPE-A,'SZCHROUT',4 bytes)
Number of characters sent through FEPI by the user task.

155 (TYPE-A,'SZCHRIN',4 bytes)
Number of characters received through FEPI by the user task.

156 (TYPE-S,'SZWAIT',8 bytes)
Elapsed time in which the user task waited for all FEPI services. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

157 (TYPE-A,'SZALLCTO',4 bytes)
Number of times the user task timed out while waiting to allocate a conversation.

158 (TYPE-A,'SZRCVTO',4 bytes)
Number of times the user task timed out while waiting to receive data.

159 (TYPE-A,'SZTOTCT',4 bytes)
Total number of all FEPI API and SPI requests made by the user task.

Performance data in group DFHFILE

036 (TYPE-A, ‘FCGETCT’, 4 BYTES)
Number of file GET requests issued by the user task.

037 (TYPE-A, ‘FCPUTCT’, 4 BYTES)
Number of file PUT requests issued by the user task.

038 (TYPE-A, ‘FCBRWCT’, 4 BYTES)
Number of file browse requests issued by the user task. This number excludes the START and END browse requests.

039 (TYPE-A, ‘FCADDCT’, 4 BYTES)
Number of file ADD requests issued by the user task.

040 (TYPE-A, ‘FCDELCT’, 4 BYTES)
Number of file DELETE requests issued by the user task.

063 (TYPE-S, ‘FCIOWTT’, 8 BYTES)
Elapsed time in which the user task waited for file I/O. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

070 (TYPE-A, ‘FCAMCT’, 4 BYTES)
Number of times the user task invoked file access-method interfaces. This number excludes requests for OPEN and CLOSE.

093 (TYPE-A, ‘FCTOTCT’, 4 BYTES)
Total number of file control requests issued by the user task. This number excludes any request for OPEN, CLOSE, ENABLE, or DISABLE of a file.

How EXEC CICS file commands correspond to file control monitoring fields:

Table 127. EXEC CICS file commands related to file control monitoring fields

EXEC CICS command	Monitoring fields
READ	FCGETCT and FCTOTCT
READ UPDATE	FCGETCT and FCTOTCT
DELETE (after READ UPDATE)	FCDELCT and FCTOTCT
DELETE (with RIDFLD)	FCDELCT and FCTOTCT
REWRITE	FCPUTCT and FCTOTCT
WRITE	FCADDCT and FCTOTCT
STARTBR	FCTOTCT
READNEXT	FCBRWCT and FCTOTCT
READPREV	FCBRWCT and FCTOTCT
ENDBR	FCTOTCT
RESETBR	FCTOTCT
UNLOCK	FCTOTCT

Note: The number of STARTBR, ENDBR, RESETBR and UNLOCK file control requests can be calculated by subtracting the file request counts, FCGETCT, FCPUTCT, FCBRWCT, FCADDCT, and FCDELCT from the total file request count, FCTOTCT.

Performance data in group DFHJOUR

010 (TYPE-S, 'JCIOWTT', 8 BYTES)
Elapsed time for which the user task waited for journal I/O. For more information see "Clocks and time stamps" on page 547, and "A note about wait times" on page 548.

058 (TYPE-A, 'JCPUWRCT', 4 BYTES)
Number of journal output requests during the user task.

Performance data in group DFHMAPP

050 (TYPE-A, 'BMSMAPCT', 4 BYTES)
Number of BMS MAP requests issued by the user task. This field corresponds to the number of RECEIVE MAP requests that did not incur a terminal I/O, and the number of RECEIVE MAP FROM requests.

051 (TYPE-A, 'BMSINCT', 4 BYTES)
Number of BMS IN requests issued by the user task. This field corresponds to the number of RECEIVE MAP requests that incurred a terminal I/O.

052 (TYPE-A, 'BMSOUTCT', 4 BYTES)
Number of BMS OUT requests issued by the user task. This field corresponds to the number of SEND MAP requests.

090 (TYPE-A, 'BMSTOTCT', 4 BYTES)
Total number of BMS requests issued by the user task. This field is the sum of BMSMAPCT, BMSINCT, and BMSOUTCT counts.

Performance data in group DFHPROG

055 (TYPE-A, ‘PCLINKCT’, 4 BYTES)
Number of program LINK requests issued by the user task, including the link to the first program of the user task.

056 (TYPE-A, ‘PCXCTLCT’, 4 BYTES)
Number of program XCTL requests issued by the user task.

057 (TYPE-A, ‘PCLOADCT’, 4 BYTES)
Number of program LOAD requests issued by the user task.

071 (TYPE-C, ‘PGMNAME’, 8 BYTES)
The name of the first program invoked at attach-time.

For a remote transaction:

- If this CICS definition of the remote transaction does not specify a program name, this field contains blanks.
- If this CICS definition of the remote transaction specifies a program name, this field contains the name of the specified program. (Note that this is not necessarily the program that is run on the remote system.)

For a dynamically-routed transaction, if the dynamic transaction routing program routes the transaction locally and specifies an alternate program name, this field contains the name of the alternate program.

113 (TYPE-C, ‘ABCODEO’, 4 BYTES)
Original abend code.

114 (TYPE-C, ‘ABCODEC’, 4 BYTES)
Current abend code.

115 (TYPE-S, ‘PCLOADTM’, 8 BYTES)
Elapsed time in which the user task waited for LIBDEF sublibrary chain fetches. Only fetches for programs with installed program definitions or autoinstalled as a result of application requests are included in this figure. However, installed programs residing in the SVA are not included (because they do not incur a physical fetch from a library). For more information about program load time see “Clocks and time stamps” on page 547, and “A note about wait times” and Figure 59 on page 549.

Performance data in group DFHSTOR

User storage fields in group DFHSTOR:

033 (TYPE-A, 'SCUSRHWM', 4 BYTES)
Maximum amount (high-water mark) of user storage allocated to the user task below the 16MB line, in the user dynamic storage area (UDSA).

054 (TYPE-A, 'SCUGETCT', 4 BYTES)
Number of user-storage GETMAIN requests issued by the user task below the 16MB line, in the UDSA.

095 (TYPE-A, 'SCUSRSTG', 8 BYTES)
Storage occupancy of the user task below the 16MB line, in the UDSA. This measures the area under the curve of storage in use against elapsed time. For more information about storage occupancy, see "A note about storage occupancy counts" on page 550.

105 (TYPE-A, 'SCUGETCT', 4 BYTES)
Number of user-storage GETMAIN requests issued by the user task for storage above the 16MB line, in the extended user dynamic storage area (EUDSA).

106 (TYPE-A, 'SCUSRHWM', 4 BYTES)
Maximum amount (high-water mark) of user-storage allocated to the user task above the 16MB line, in the EUDSA.

107 (TYPE-A, 'SCUCRSTG', 8 BYTES)
Storage occupancy of the user task above the 16MB line, in the EUDSA. This measures the area under the curve of storage in use against elapsed time. For more information see "A note about storage occupancy counts" on page 550.

116 (TYPE-A, 'SC24CHWM', 4 BYTES)
Maximum amount (high-water mark) of user-storage allocated to the user task below the 16MB line, in the CICS dynamic storage area (CDSA).

117 (TYPE-A, 'SCCGETCT', 4 BYTES)
Number of user-storage GETMAIN requests issued by the user task for storage below the 16MB line, in the CDSA.

118 (TYPE-A, 'SC24COCC', 8 BYTES)
Storage occupancy of the user task below the 16MB line, in the CDSA. This measures the area under the curve of storage in use against elapsed time. For more information see "A note about storage occupancy counts" on page 550.

119 (TYPE-A, 'SC31CHWM', 4 BYTES)
Maximum amount (high-water mark) of user-storage allocated to the user task above the 16MB line, in the extended CICS dynamic storage area (ECDSA).

120 (TYPE-A, 'SCCGETCT', 4 BYTES)
Number of user-storage GETMAIN requests issued by the user task for storage above the 16MB line, in the ECDSA.

121 (TYPE-A, 'SC31COCC', 8 BYTES)
Storage occupancy of the user task above the 16MB line, in the ECDSA. This measures the area under the curve of storage in use against elapsed time. For more information see "A note about storage occupancy counts" on page 550.

Table 128. User storage field id cross reference				
	UDSA	**EUDSA**	**CDSA**	**ECDSA**
Getmain count	054	105	117	120
High-water-mark	033	106	116	119
Occupancy	095	107	118	121

Program storage fields in group DFHSTOR:

087 (TYPE-A, ‘PCSTGHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task both above **and** below the 16MB line.

108 (TYPE-A, ‘PC24BHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task below the 16MB line. This field is a subset of PCSTGHWM (field ID 087) that resides below the 16MB line.

122 (TYPE-A, ‘PC31RHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task above the 16MB line, in the extended read-only dynamic storage area (ERDSA). This field is a subset of PC31AHWM (field ID 139) that resides in the ERDSA.

139 (TYPE-A, ‘PC31AHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task above the 16MB line. This field is a subset of PCSTGHWM (field ID 087) that resides above the 16MB line.

142 (TYPE-A, ‘PC31CHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task above the 16MB line, in the extended CICS dynamic storage area (ECDSA). This field is a subset of PC31AHWM (139) that resides in the ECDSA.

143 (TYPE-A, ‘PC24CHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task below the 16MB line, in the CICS dynamic storage area (CDSA). This field is a subset of PC24BHWM (108) that resides in the CDSA.

160 (TYPE-A, ‘PC24SHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task below the 16MB line, in the shared dynamic storage area (SDSA). This field is a subset of PC24BHWM (108) that resides in the SDSA.

161 (TYPE-A, ‘PC31SHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task above the 16MB line, in the extended shared dynamic storage area (ESDSA). This field is a subset of PC31AHWM (139) that resides in the ESDSA.

162 (TYPE-A, ‘PC24RHWM’, 4 BYTES)
Maximum amount (high-water mark) of program storage in use by the user task below the 16MB line, in the read-only dynamic storage area (RDSA). This field is a subset of PC24BHWM (108) that resides in the RDSA.

Performance data in group DFHSYNC

060 (TYPE-A, ‘SPSYNCCT’, 4 BYTES)
Number of SYNCPOINT requests issued during the user task.

Notes:

1. A SYNCPOINT is implicitly issued as part of the task-detach processing.
2. A SYNCPOINT is issued at PSB termination for DL/I.

Performance data in group DFHTASK

001 (TYPE-C, ‘TRAN’, 4 BYTES)
Transaction identification.

004 (TYPE-C, ‘TTYPE’, 4 BYTES)
Transaction start type. The high-order bytes (0 and 1) are set to:

`'TO '`	Attached from terminal input.
`'S '`	Attached by automatic transaction initiation (ATI) without data.
`'SD'`	Attached by automatic transaction initiation (ATI) with data.
`'QD'`	Attached by transient data trigger level.
`'U '`	Attached by user request.
`'TP'`	Attached from terminal TCTTE transaction ID.
`'SZ'`	Attached by Front End Programming Interface (FEPI).

007 (TYPE-S, ‘USRDISPT’, 8 BYTES)
Elapsed time for which the user task was dispatched. For more information see “Clocks and time stamps” on page 547.

008 (TYPE-S, ‘USRCPUT’, 8 BYTES)
Processor time for which the user task was dispatched under the CICS TCBs (QR, RO, CO). For more information see “Clocks and time stamps” on page 547.

014 (TYPE-S, ‘SUSPTIME’, 8 BYTES)
Total elapsed wait time for which the user task was suspended by the dispatcher. This includes:

- The elapsed time waiting for the first dispatch. This also includes any delay incurred because of the limits set for this transaction’s transaction class (if any) or by the system parameter MXT being reached.
- The task suspend (wait) time.
- The elapsed time waiting for redispatch after a suspended task has been resumed.

For more information, see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

031 (TYPE-P, ‘TRANNUM’, 4 BYTES)
Transaction identification number.

The transaction number field is normally a 4-byte packed decimal number. However, some CICS system tasks are identified by special character “transaction numbers”, as follows:

- `' III'` for system initialization task

- `' JBS'` or ‘ Jnn’ for journal control (where nn = the journal number from 01 - 99
- `' TCP'` for terminal control

These special identifiers are placed in bytes 2 through 4. Byte 1 is a blank (X`'40'`) before the terminal control TCP identifier, and a null value (X`'00'`) before the others.

059 (TYPE-A, ‘ICPUINCT’, 4 BYTES)
Number of interval control START or INITIATE requests during the user task.

064 (TYPE-A, ‘TASKFLAG’, 4 BYTES)
Task error flags, a string of 31 bits used for signaling unusual conditions occurring during the user task:

Bit 0	Reserved.
Bit 1	Detected an attempt either to start a user clock that was already running, or to stop one that was not running.
Bits 2–31	Reserved.

097 (TYPE-C, ‘NETNAME’, 20 BYTES)
Fully qualified name by which the terminal-owning CICS region is known to its VTAM. This name is assigned at attach time using either the NETNAME derived from the TCT (when the task is attached to a local terminal), or the NETNAME passed as part of an ISC APPC or IRC attach header. At least three padding bytes (X`'00'`) are present at the right end of the name.

If the originating terminal is VTAM across an ISC APPC or IRC link, then the NETNAME is the *networkid.LUname* If the terminal is non-VTAM, then the NETNAME is *networkid.generic_applid*.

All originating information passed as part of an ISC LUTYPE6.1 attach header has the same format as the non-VTAM terminal originators above.

When the originator is communicating over an external CICS interface (EXCI) session, the name is a concatenation of:

```
'DFHEXCIU' | '.'    | 'VSE1'  | Address Space Id (ASID)
 8 bytes   | 1 byte | 4 bytes | 4 bytes
```

derived from the originating system. That is, the name is a 17-byte LU name consisting of:

- An 8-byte eye-catcher set to 'DFHEXCIU'.
- A 1-byte field containing a period (.).
- A 4-byte field containing the characters `'VSE1'`.
- A 4-byte field containing the address space id (ASID) in which the client program is running. (This is the 4-character EBCDIC representation of the 2-byte hex address space id.)

098 (TYPE-C, ‘UOWID’, 8 BYTES)
Name by which the unit of work is known within the originating system. This name is assigned at attach time using either an STCK-derived token (when the task is attached to a local terminal), or the unit of work ID passed as part of an ISC APPC or IRC attach header.

The first six bytes of this field are one of the following:

- A binary value derived from the clock of the originating system and wrapping round at intervals of several months
- A character value of the form “hhmmss”, which wraps round daily. This case applies when the originating system is communicating through a DL/I batch session.

The last two bytes of this field are for the period count. These may change during the life of the task as a result of syncpoint activity.

Note: When using MRO or ISC, the UOWID field must be combined with the NETNAME field (097) to uniquely identify a task, because UOWID is unique only to the originating CICS system.

102 (TYPE-S, ‘DISPWTT’, 8 BYTES)
Elapsed time for which the user task waited for redispatch. This is the aggregate of the wait times between each event completion and user-task redispatch.

Note: This field does not include the elapsed time spent waiting for first dispatch. This field is a subset of the task suspend time, SUSPTIME (014), field.

109 (TYPE-C, ‘TRANPRI’, 4 BYTES)
Transaction priority when monitoring of the task was initialized (low-order byte-3).

125 (TYPE-S, ‘DSPDELAY’, 8 BYTES)
The elapsed time waiting for first dispatch.

Note: This field is a subset of the task suspend time, SUSPTIME (014), field. For more information see “Clocks and time stamps” on page 547.

126 (TYPE-S, ‘TCLDELAY’, 8 BYTES)
The elapsed time waiting for first dispatch which was delayed because of the limits set for this transaction’s transaction class, TCLSNAME (166), being reached. For more information see “Clocks and time stamps” on page 547.

Note: This field is a subset of the first dispatch delay, DSPDELAY (125), field.

127 (TYPE-S, ‘MXTDELAY’, 8 BYTES)
The elapsed time waiting for first dispatch which was delayed because of the limits set by the system parameter, MXT, being reached.

Note: The field is a subset of the first dispatch delay, DSPDELAY (125), field.

129 (TYPE-S, ‘ENQDELAY’, 8 BYTES)
The elapsed time waiting for a CICS Task Control ENQ. For more information see “Clocks and time stamps” on page 547.

Note: This field is a subset of the task suspend time, SUSPTIME (014), field.

166 (TYPE-C, ‘TCLSNAME’, 8 BYTES)
Transaction class name. This field is null if the transaction is not in a TRANCLASS.

170 (TYPE-S, ‘RMITIME’, 8 BYTES)
Amount of elapsed time spent in the Resource Manager Interface (RMI). For more information see “Clocks and time stamps” on page 547, and Figure 61 on page 550.

171 (TYPE-S, ‘RMISUSP’, 8 BYTES)
Amount of elapsed time the task was suspended by the dispatcher while in the Resource Manager Interface (RMI). For more information see “Clocks and time stamps” on page 547, “A note about wait times” on page 548, and Figure 61 on page 550.

Note: The field is a subset of the task suspend time, SUSPTIME (014), field and also the RMITIME (170) field.

Performance data in group DFHTERM

002 (TYPE-C, ‘TERM’, 4 BYTES)
Terminal or session identification. This field is null if the task is not associated with a terminal or session.

009 (TYPE-S, ‘TCIOWTT’, 8 BYTES)
Elapsed time for which the user task waited for input from the terminal operator, after issuing a RECEIVE request. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

034 (TYPE-A, ‘TCMSGIN1’, 4 BYTES)
Number of messages received from the task’s principal terminal facility, including LUTYPE6.1 and LUTYPE6.2 (APPC) but not MRO (IRC).

035 (TYPE-A, ‘TCMSGOU1’, 4 BYTES)
Number of messages sent to the task’s principal terminal facility, including LUTYPE6.1 and LUTYPE6.2 (APPC) but not MRO (IRC).

067 (TYPE-A, ‘TCMSGIN2’, 4 BYTES)
Number of messages received from the LUTYPE6.1 alternate terminal facilities by the user task.

068 (TYPE-A, ‘TCMSGOU2’, 4 BYTES)
Number of messages sent to the LUTYPE6.1 alternate terminal facilities by the user task.

069 (TYPE-A, ‘TCALLOCT’, 4 BYTES)
Number of TCTTE ALLOCATE requests issued by the user task for LUTYPE6.2 (APPC), LUTYPE6.1, and IRC sessions.

083 (TYPE-A, ‘TCCHRIN1’, 4 BYTES)
Number of characters received from the task's principal terminal facility, including LUTYPE6.1 and LUTYPE6.2 (APPC) but not MRO (IRC).

084 (TYPE-A, ‘TCCHROU1’, 4 BYTES)
Number of characters sent to the task's principal terminal facility, including LUTYPE6.1 and LUTYPE6.2 (APPC) but not MRO (IRC).

085 (TYPE-A, ‘TCCHRIN2’, 4 BYTES)
Number of characters received from the LUTYPE6.1 alternate terminal facilities by the user task. *(Not applicable to ISC APPC.)*

086 (TYPE-A, ‘TCCHROU2’, 4 BYTES)
Number of characters sent to the LUTYPE6.1 alternate terminal facilities by the user task. *(Not applicable to ISC APPC.)*

100 (TYPE-S, ‘IRIOWTT’, 8 BYTES)
Elapsed time for which the user task waited for control at this end of an MRO link. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

111 (TYPE-C, ‘LUNAME’, 8 BYTES)
VTAM logical unit name (if available) of the terminal associated with this transaction. If the task is executing in an application-owning or file-owning region then the luname is the generic applid of the originating connection for LUTYPE6.1 and LUTYPE6.2 (APPC). The luname is blank if the originating connection is either MRO (ISC) or external CICS interface (EXCI).

133 (TYPE-S, ‘LU61WTT’, 8 BYTES)
The elapsed time for which the user task waited for I/O on a LUTYPE6.1 connection or session. This time also includes the waits incurred for conversations across LUTYPE6.1 connections, but not the waits incurred due to LUTYPE6.1 syncpoint flows. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

134 (TYPE-S, ‘LU62WTT’, 8 BYTES)
The elapsed time for which the user task waited for I/O on a LUTYPE6.2 (APPC) connection or session. This time also includes the waits incurred for conversations across LUTYPE6.2 (APPC) connections, but not the waits incurred due to LUTYPE6.2 (APPC) syncpoint flows. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

135 (TYPE-A, ‘TCM62IN2’, 4 BYTES)
Number of messages received from the alternate facility by the user task for LUTYPE6.2 (APPC) sessions.

136 (TYPE-A, ‘TCM62OU2’, 4 BYTES)
Number of messages sent to the alternate facility by the user task for LUTYPE6.2 (APPC) sessions.

137 (TYPE-A, ‘TCC62IN2’, 4 BYTES)
Number of characters received from the alternate facility by the user task for LUTYPE6.2 (APPC) sessions.

138 (TYPE-A, ‘TCC62OU2’, 4 BYTES)
Number of characters sent to the alternate facility by the user task for LUTYPE6.2 (APPC) sessions.

Performance data in group DFHTEMP

011 (TYPE-S, ‘TSIOWTT’, 8 BYTES)
Elapsed time for which the user task waited for VSAM temporary storage I/O. For more information see “Clocks and time stamps” on page 547, and “A note about wait times” on page 548.

044 (TYPE-A, ‘TSGETCT’, 4 BYTES)
Number of temporary-storage GET requests issued by the user task.

046 (TYPE-A, ‘TSPUTACT’, 4 BYTES)
Number of PUT requests to auxiliary temporary storage issued by the user task.

047 (TYPE-A, ‘TSPUTMCT’, 4 BYTES)
Number of PUT requests to main temporary storage issued by the user task.

092 (TYPE-A, ‘TSTOTCT’, 4 BYTES)
Total number of temporary-storage requests issued by the user task. This field is the sum of TSGETCT, TSPUTACT, and TSPUTMCT.

Exception class data

Exception records are produced after each of the following conditions encountered by a transaction has been resolved:

- Wait for storage in the CDSA
- Wait for storage in the UDSA
- Wait for storage in the SDSA
- Wait for storage in the RDSA
- Wait for storage in the ECDSA
- Wait for storage in the EUDSA
- Wait for storage in the ESDSA
- Wait for storage in the ERDSA
- Wait for auxiliary temporary storage
- Wait for auxiliary temporary storage string
- Wait for auxiliary temporary storage buffer
- Wait for file string
- Wait for file buffer
- Wait for LSRPOOL string

Exception records are fixed format (their format is shown on page 545).

Exception data

EXCMNTRN (TYPE-C, 4 BYTES)
Transaction identification. This field is null if the task is not associated with a terminal or session.

EXCMNTER (TYPE-C, 4 BYTES)
Terminal identification. This field is null if the task is not associated with a terminal or session.

EXCMNUSR (TYPE-C, 8 BYTES)
User identification at task creation. This can also be the remote user identifier for a task created as the result of receiving an ATTACH request across an MRO or APPC link with attach-time security enabled.

EXCMNTST (TYPE-C, 4 BYTES)
Transaction start type. The low-order byte (0 and 1) is set to:

`'TO'`	Attached from terminal input.
`'S'`	Attached by automatic transaction initiation (ATI) without data.
`'SD'`	Attached by automatic transaction initiation (ATI) with data.
`'QD'`	Attached by transient data trigger level.
`'U '`	Attached by user request.
`'TP'`	Attached from terminal TCTTE transaction ID.
`'SZ'`	Attached by Front End Programming Interface (FEPI).

EXCMNSTA (TYPE-T, 8 BYTES)
Start time of the exception.

EXCMNSTO (TYPE-T, 8 BYTES)
Finish time of the exception.

Note: The performance class exception wait time field, EXWTTIME (103), is a calculation based on subtracting the start time of the exception (EXCMNSTA) from the finish time of the exception (EXCMNSTO).

EXCMNTNO (TYPE-P, 4 BYTES)
Transaction identification number.

EXCMNTPR (TYPE-C, 4 BYTES)
Transaction priority when monitoring was initialized for the task (low-order byte).

EXCMNLUN (TYPE-C, 4 BYTES)
VTAM logical unit name (if available) of the terminal associated with this transaction. This field is nulls if the task is not associated with a terminal.

EXCMNEXN (TYPE-A, 4 BYTES)
Exception sequence number for this task.

EXCMNRTY (TYPE-C, 8 BYTES)
Exception resource type. The possible values for EXCMNRTY are shown in Table 129 on page 567.

EXCMNRID (TYPE-C, 8 BYTES)
Exception resource identification. The possible values for EXCMNRID are shown in Table 129 on page 567.

EXCMNTYP (TYPE-A, 2 BYTES)
Exception type. This field can be set to one of the following values:

X'0001'	Exception due to a wait (EXCMNWT).
X'0002'	Exception due to a buffer wait (EXCMNBWT).
X'0003'	Exception due to a string wait (EXCMNSWT).

EXCMNTCN (TYPE-C, 8 BYTES)
Transaction class name. This field is null if the transaction is not in a transaction class.

The following table shows the value and relationships of the fields EXCMNTYP, EXCMNRTY, and EXCMNRID.

Table 129. Possible values of EXCMNTYP, EXCMNRTY, and EXCMNRID. The relationship between exception type, resource type, and resource identification.

EXCMNTYP Exception type	**EXCMNRTY** Resource type	**EXCMNRID** Resource ID	**MEANING**
EXCMNWT	‘STORAGE’	‘UDSA’	Wait for UDSA storage
EXCMNWT	‘STORAGE’	‘EUDSA’	Wait for EUDSA storage
EXCMNWT	‘STORAGE’	‘CDSA’	Wait for CDSA storage
EXCMNWT	‘STORAGE’	‘ECDSA’	Wait for ECDSA storage
EXCMNWT	‘STORAGE’	‘SDSA’	Wait for SDSA storage
EXCMNWT	‘STORAGE’	‘ESDSA’	Wait for ESDSA storage
EXCMNWT	‘STORAGE’	‘RDSA’	Wait for RDSA storage
EXCMNWT	‘STORAGE’	‘ERDSA’	Wait for ERDSA storage
EXCMNWT	‘TEMPSTOR’	TS Qname	Wait for temporary storage
EXCMNSWT	‘FILE’	filename	Wait for string associated with file
EXCMNSWT	‘LSRPOOL’	filename	Wait for string associated with LSRPOOL
EXCMNSWT	‘TEMPSTOR’	TS Qname	Wait for string associated with DFHTEMP
EXCMNBWT	‘LSRPOOL’	LSRPOOL	Wait for buffer associated with LSRPOOL
EXCMNBWT	‘TEMPSTOR’	TS Qname	Wait for buffer associated with DFHTEMP

Chapter 19. CICS statistics

This chapter is divided into the following sections:

1. **"Introduction to CICS statistics"** describes the types of statistics data, and the use of the EXEC CICS COLLECT STATISTICS command.
2. **"CICS statistics record format"** on page 573 describes the format of CICS statistics SMF type 110 records.
3. **"Global user exit in the CICS statistics domain"** on page 578 suggests ways in which you can use the XSTOUT statistics exit.
4. **"Processing the output from CICS statistics"** on page 578 lists the methods of processing statistics data.

Introduction to CICS statistics

CICS statistics contain information about the CICS system as a whole—for example, its performance and usage of resources. Statistics data is therefore useful both for performance tuning and for capacity planning.

Statistics are collected during CICS online processing for later offline analysis. The statistics domain writes statistics records to a Data Management Facility (DMF) data set. The records are of System Management Facility (SMF) type 110, subtype 0002.[10]

Types of statistics data

CICS produces five types of statistics: **interval, end-of-day, requested, requested reset**, and **unsolicited**.

Interval statistics
are gathered by CICS during a specified interval. CICS writes the interval statistics to the DMF data set automatically at the expiry of that interval if:

- Statistics recording status was set ON by the STATRCD system initialization parameter (and has not subsequently been set OFF by a CEMT SET STATISTICS or EXEC CICS SET STATISTICS RECORDING command). The default value of STATRCD is OFF.

  or

- ON is specified on CEMT SET STATISTICS.

  or

- The RECORDING option of the EXEC CICS SET STATISTICS command is set to ON.

When interval statistics are written, the statistics counters are reset. See "Resetting statistics counters" on page 572.

[10] Monitoring records are also written to the DMF data set as SMF type 110 records. (Some journaling type 110 records can be written there, too.) You might find it useful to process the statistics records and the monitoring records together, because statistics provide resource and system information that is complementary to the transaction data produced by CICS monitoring.

You can change the interval duration using CEMT SET STATISTICS and the EXEC CICS SET STATISTICS command. The default interval duration is 3 hours for a cold start of CICS.

End-of-day statistics
are a special case of interval statistics. They are the statistics for the duration between the last time the statistics counters were reset and:

- The end-of-day expiry time, or
- When CICS quiesces (normal shutdown), or
- When CICS terminates (immediate shutdown)

For details of the events at which statistics counters are reset, see "Resetting statistics counters" on page 572.

The end-of-day value defines a logical point in the 24-hour operation of CICS. You can change the end-of-day value using CEMT SET STATISTICS or the EXEC CICS SET STATISTICS command. CICS writes end-of-day statistics to DMF even if, on one of the following, you have specified OFF:

- The STATRCD system initialization parameter
- The CEMT SET STATISTICS command
- The RECORDING option of the EXEC CICS SET STATISTICS command

The default end-of-day value is 12 midnight. When end-of-day statistics are written, the statistics counters are reset.

Requested statistics
are statistics which the user has asked for using one of the following commands:

- CEMT PERFORM STATISTICS RECORD
- EXEC CICS PERFORM STATISTICS RECORD
- EXEC CICS SET STATISTICS ON|OFF RECORDNOW

CICS writes requested statistics to DMF even if, on one of the following, you have specified OFF:

- The STATRCD system initialization parameter
- The CEMT SET STATISTICS command
- The RECORDING option of the EXEC CICS SET STATISTICS command

Statistics counters are not reset.

Requested reset statistics
differ from requested statistics in that all statistics are collected, and all statistics counters are reset. They are invoked by either of the commands:

- CEMT PERFORM STATISTICS RECORD ALL(RESETNOW)
- EXEC CICS PERFORM STATISTICS RECORD ALL(RESETNOW)

You can also invoke requested reset statistics when setting statistics recording status ON or OFF, using either of the commands:

- CEMT SET STATISTICS ON|OFF RECORDNOW RESETNOW
- EXEC CICS SET STATISTICS ON|OFF RECORDNOW RESETNOW

Note that it is valid to specify the RECORDNOW RESETNOW options only when there is a genuine change of recording status. For example, coding

EXEC CICS SET STATISTICS ON RECORDNOW RESETNOW when STATISTICS is already set ON causes an error response.

CICS writes requested reset statistics to DMF even if, on one of the following, you have specified OFF:

- The STATRCD system initialization parameter
- The CEMT SET STATISTICS command
- The RECORDING option of the EXEC CICS SET STATISTICS command

Unsolicited statistics
are automatically gathered by CICS for dynamically allocated and deallocated resources. CICS writes these statistics to DMF just before the resource is deleted if:

- Statistics recording status was set ON by the STATRCD system initialization parameter (and has not subsequently been set OFF by a CEMT SET STATISTICS or EXEC CICS SET STATISTICS RECORDING command).

  or

- ON is specified on CEMT SET STATISTICS.

  or

- The RECORDING option of the EXEC CICS SET STATISTICS command is set to ON.

CICS collects unsolicited statistics for:

Autoinstall
: Whenever an autoinstalled terminal entry in the TCT is deleted, CICS collects statistics covering the autoinstalled period since the last interval. This period includes any delay interval specified on the system initialization parameters AILDELAY or AIRDELAY.

  If an autoinstall terminal logs on again before the expiry of the delay interval, then the accumulation of statistics continues until the next interval. At that interval, the accumulation of statistics is restarted.

FEPI nodes
: Whenever an installed FEPI node definition is discarded, CICS collects the statistics covering the installed period since the last interval.

FEPI pools
: Whenever an installed FEPI pool definition is discarded, CICS collects the statistics covering the installed period since the last interval.

FEPI targets
: Whenever an installed FEPI target definition is discarded, CICS collects the statistics covering the installed period since the last interval.

Files
: Whenever CICS closes a file, CICS collects statistics covering the period since the last interval.

LSRPOOL files
: Whenever CICS closes a file which is in an LSRPOOL, it collects LSRPOOL file statistics (as well as the file statistics), covering the period from the last interval.

LSRPOOLs
: When CICS closes the last file in an LSRPOOL, it collects the statistics for the LSRPOOL.

  Note that the following peak values are reset at each interval collection:

  - Peak number of requests waiting for a string
  - Maximum number of concurrent active file control strings

  However, the other statistics, which are not reset at an interval collection, cover the entire period from the time the LSRPOOL is created (when the first file is opened) until the LSRPOOL is deleted (when the last file is closed).

Programs
: Whenever an installed program definition is discarded, CICS collects the statistics covering the installed period since the last interval.

System dumps
: Whenever a system dump table entry is removed, CICS collects the statistics covering the period since the last interval.

Transactions
: Whenever an installed transaction definition is discarded, CICS collects the statistics covering the installed period since the last interval.

Transaction classes
: Whenever an installed transaction class definition is discarded, CICS collects the statistics covering the installed period since the last interval.

Transaction dumps
: Whenever a transaction dump table entry is removed, CICS collects the statistics covering the period since the last interval.

For information about how to use the CEMT statistics commands, refer to the *CICS-Supplied Transactions* manual. For programming information about the EXEC CICS statistics commands, see the *CICS System Programming Reference* manual.

Resetting statistics counters

Statistics counters are reset in the following circumstances:

- At CICS startup
- When interval statistics are written (but **not** when an interval occurs and no statistics are written)
- At end of day
- When requested reset statistics are written

However, you can cause statistics counters to be reset without writing records to the DMF data set. You do this by changing the statistics recording status, using either of the commands:

- CEMT SET STATISTICS ON|OFF RESETNOW
- EXEC CICS SET STATISTICS ON|OFF RESETNOW

Note that it is valid to specify the RESETNOW option only when there is a genuine change of recording status. For example, coding EXEC CICS SET STATISTICS ON RESETNOW when STATISTICS is already set ON causes an error response.

Important

Statistics counters are reset in various ways. Specific counters may be reset to:

- 0
- 1
- A new peak value
- Not reset
- None of the above

For information about the resetting of specific statistics counters, refer to the *CICS Performance Guide*.

The EXEC CICS COLLECT STATISTICS command

In addition to the types of statistics data described above, there is an online EXEC CICS COLLECT STATISTICS function. Online statistics are collected and returned to the invoking application.

The three sample programs DFH0STAT, DFH$STCN, and DFH$STAS show how you can use the EXEC CICS COLLECT STATISTICS and EXEC CICS INQUIRE commands to produce a useful analysis of a CICS Transaction Server for VSE/ESA system. The programs produce a report showing critical system parameters from the CICS dispatcher, together with loader statistics and an analysis of the CICS storage manager. DFH0STAT is provided in COBOL; DFH$STCN and DFH$STAS are provided in assembler language; all in the VSE/ESA sublibrary PRD1.BASE.

For programming information about the COLLECT STATISTICS command, see the *CICS System Programming Reference* manual.

For information about installing and operating the sample statistics programs, see the *CICS System Definition Guide*. For information about the data produced by the programs, see the *CICS Performance Guide*.

CICS statistics record format

This section describes the format of CICS statistics SMF type 110 records in detail. You need this information if you write your own program to analyze the statistics data. The three components of a CICS statistics record are an SMF header, an SMF product section, and a CICS data section, as shown in Figure 64 on page 574. Each of these is described in the sections that follow.

SMF Header	SMF Product Section	CICS Data Section

Figure 64. Format of an SMF type 110 statistics record

SMF header and SMF product section

The SMF header describes the system creating the output. The SMF product section identifies the subsystem to which the statistics data relates, which, in the case of CICS statistics, is the CICS region. Both the SMF header and the SMF product section can be mapped by the DSECT STSMFDS, which you can generate using the DFHSTSMF macro as follows:

```
STSMFDS DFHSTSMF PREFIX=SMF
```

The label ‘STSMFDS’ is the default DSECT name, and SMF is the default PREFIX value, so you could also generate the DSECT simply by coding

```
DFHSTSMF
```

.

The STSMFDS DSECT has the format shown in Figure 65.

```
*        START THE SMF HEADER
*
STSMFDS  DSECT
SMFSTLEN DS    XL2           RECORD LENGTH
SMFSTSEQ DS    XL2           SEGMENT DESCRIPTOR
SMFSTFLG DS    X             OPERATING SYSTEM INDICATOR (see note 1)
SMFSTRTY DC    X'6E'         RECORD TYPE 110 FOR CICS
SMFSTTME DS    XL4           TIME RECORD MOVED TO SMF
SMFSTDTE DS    XL4           DATE RECORD MOVED TO SMF
SMFSTSID DS    XL4           SYSTEM IDENTIFICATION
SMFSTSSI DS    CL4'CICS'     SUBSYSTEM IDENTIFICATION
SMFSTSTY DS    XL2           RECORD SUBTYPE X'0002' FOR STATISTICS
SMFSTTRN DS    XL2           NUMBER OF TRIPLETS
         DS    XL2           RESERVED
SMFSTAPS DS    XL4           OFFSET TO PRODUCT SECTION
SMFSTLPS DS    XL2           LENGTH OF PRODUCT SECTION
SMFSTNPS DS    XL2           NUMBER OF PRODUCT SECTIONS
SMFSTASS DS    XL4           OFFSET TO DATA SECTION
SMFSTASL DS    XL2           LENGTH OF DATA SECTION
SMFSTASN DS    XL2           NUMBER OF DATA SECTIONS
*
*        THIS CONCLUDES THE SMF HEADER
*
```

Figure 65 (Part 1 of 2). Format of the SMF header and product section for statistics records

```
*        START THE SMF PRODUCT SECTION
*
SMFSTRVN DS    XL2            RECORD VERSION
SMFSTPRN DS    CL8            PRODUCT NAME (GENERIC APPLID)
SMFSTSPN DS    CL8            PRODUCT NAME (SPECIFIC APPLID)
SMFSTMFL DS    XL2            RECORD MAINTENANCE INDICATOR
         DS    XL2            RESERVED
         DS    XL2            RESERVED
SMFSTDTK DS    XL4            DOMAIN TOKEN
SMFSTDID DS    CL2            DOMAIN ID
SMFSTRQT DS    CL3            USS/EOD/REQ/INT STATISTICS TYPE
SMFSTICD DS    CL3            YES IF INCOMPLETE DATA RECORDED
SMFSTDAT DS    CL8            COLLECTION DATE MMDDYYYY
SMFSTCLT DS    CL6            COLLECTION TIME HHMMSS
         DS    XL2            RESERVED
SMFSTINT DS    CL6            INTERVAL HHMMSS. See note 3.
SMFSTINO DS    XL4            INTERVAL NUMBER. See note 3.
SMFSTRTK DS    XL8            REQUEST TOKEN
SMFSTLRT DS    CL6            LAST RESET TIME HHMMSS
SMFSTCST DS    XL8            CICS START TIME
SMFSTJBN DS    CL8            JOBNAME
SMFSTRSD DS    XL4            JOB DATE
SMFSTRST DS    XL4            JOB TIME
SMFSTUIF DS    CL8            USER IDENTIFICATION
SMFSTPDN DS    CL8            OPERATING SYSTEM PRODUCT LEVEL
*
*        THIS CONCLUDES THE SMF PRODUCT SECTION
```

Figure 65 (Part 2 of 2). Format of the SMF header and product section for statistics records

Notes:

1. CICS sets only the subsystem-related bits of the operating system indicator flag byte in the SMF header (SMFSTFLG). DMF sets the remainder of the byte according to the operating system level and other factors. For an explanation of the setting of the other bits, refer to the *CICS Operations and Utilities Guide*.
2. The copy book DFHSMFDS is also provided and can be used to map the SMF header and the SMF product sections of both subtypes of SMF type 110 records written by CICS monitoring and CICS statistics.
3. Fields SMFSTINT and SMFSTINO are only relevant if SMFSTRQT is 'INT'. Otherwise both values should be ignored.

CICS statistics data section

The format of the CICS statistics data section is shown in Figure 66.

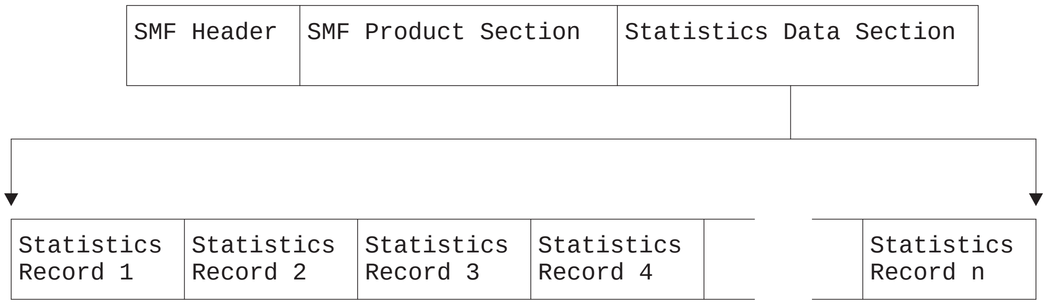


Figure 66. Format of the statistics data section

If the data records are incomplete, the flag field SMFSTICD is set to 'YES'. In this case, the statistics data section is not present.

For complete data records, the statistics data section is made up of one or more statistics data records. There are different formats of data records. Each has a common format for the first 5 bytes. These 5 bytes are described in the extract from copy book DFHSTIDS in Figure 67.

```
DFHSTIDS DSECT                    Statistics record header
*
         DS    0F                 Fullword alignment
STILEN   DS    H                  Length of the record
STID     DS    AL2                Statistics identifier
STIVERS  DS    CL1                Statistics record version
```

Figure 67. Extract from copy book DFHSTIDS

STILEN
is the length of the data record.

STID
identifies which type of statistics record you have (see Figure 68 on page 577).

You can use the STID symbolic name or value to determine which copy book to use when processing the statistics data records. For details about the relationship between the STID name or value and the copy book, see Figure 68 on page 577. For further guidance information about the fields within the statistics data records, see the *CICS Performance Guide*.

STIVERS
takes the value '1' for this release of CICS.

STID Symbolic name	STID Value	Copy book	Type of record
STISMDSA	2	DFHSMSDS	Storage manager DSA id
STISMD	5	DFHSMDDS	Storage mgr domain subpool id
STISMT	6	DFHSMTDS	Storage manager task subpool id
STIXMG	10	DFHXMGDS	Transaction manager (Globals) id
STIXMR	11	DFHXMRDS	Transaction manager (Trans) id
STIXMC	12	DFHXMCDS	Transaction manager (Tclass) id
STIFEPIP	16	DFHA22DS	FEPI pool id
STIFEPIC	17	DFHA23DS	FEPI connection id
STIFEPIT	18	DFHA24DS	FEPI target id
STIVT	21	DFHA03DS	VTAM stats id
STIAUSS	22	DFHAUSDS	Terminal Autoinstall USS id
STIPAUTO	23	DFHPGGDS	Program Autoinstall id
STIAUTO	24	DFHA04DS	Terminal Autoinstall stats id
STILDR	25	DFHLDRDS	Loader (Resid) id
STILDG	30	DFHLDGDS	Loader (Globals) id
STIDTB	33	DFHA05DS	DTB statistics id
STITCR	34	DFHA06DS	Terminal control (resid) id
STILSRR	39	DFHA08DS	LSRPOOL pool stats (resid) id
STILSRFR	40	DFHA09DS	LSRPOOL File statistics (by file)
STITDQR	43	DFHA10DS	TDQUEUE (Resid) id
STITDQG	45	DFHA11DS	TDQUEUE (globals) id
STITSQ	48	DFHA12DS	TSQUEUE statistics id
STIJCR	49	DFHA13DS	Journal control (Resid) id
STICONSR	52	DFHA14DS	ISC/IRC system entry (resid) id
STICONSS	54	DFHA21DS	ISC connection - system security
STIDS	56	DFHDSGDS	Dispatcher stats id
STIUSG	61	DFHUSGDS	User domain stats id
STITM	63	DFHA16DS	Table manager statistics id
STIST	66	DFHSTGDS	Statistics statistics id
STIFCR	67	DFHA17DS	File Control (resid) id
STICONMR	76	DFHA20DS	ISC/IRC mode entry (resid) id
STIMNR	80	DFHMNTDS	Monitoring stats (Resid) id
STIM	81	DFHMNGDS	Monitoring stats (global) id
STITDR	85	DFHTDRDS	Transaction dump (resid) id
STITDG	87	DFHTDGDS	Transaction dump (global) id
STISDR	88	DFHSDRDS	System dump (resid) id
STISDG	90	DFHSDGDS	System dump (global) id

Figure 68. Statistics data record copy books related to STID name and value

Global user exit in the CICS statistics domain

There is one global user exit point (XSTOUT) in the CICS statistics domain. The exit is invoked before the contents of a statistics data buffer is written to DMF. At this exit, the following information is available:

- The address of the statistics buffer
- The length of the statistics buffer
- The address of the statistics type

This applies to all five types of statistics: interval, end-of-day, requested, requested reset, and unsolicited statistics.

If you write a global user exit program to be invoked at this exit, you can examine this information and tell CICS either to write the contents of the buffer to DMF or to suppress its output.

For more information about global user exits in general, and about the statistics exit in particular, refer to Chapter 1, “Global user exit programs” on page 3.

Processing the output from CICS statistics

You can use to process statistics output using:

The supplied program, DFHSTUP
For information about how to run DFHSTUP, refer to the *CICS Operations and Utilities Guide*. For information about how to interpret the report produced by DFHSTUP, refer to the *CICS Performance Guide*.

Your own program
to report and analyze the data in the statistics records.

Chapter 20. The user interface to DMF

This chapter tells you how to write non-CICS programs that use the CICS Data Management Facility (DMF) to store monitoring information.

Note: For information about storing monitoring data from CICS programs, refer to Chapter 18, “CICS monitoring” on page 531.

The chapter is divided into the following sections:

1. **“Introduction”** describes the interface and the programming prerequisites to be able to use the interface.
2. **“The DFHEWTM macro”** on page 579 describes the format of the macro used to pass data to DMF.
3. **“SMF headers”** on page 581 describes the two formats of header required to describe the data passed to DMF.
4. **“Writing an interpretation program”** on page 583 contains useful information for writing a program to interpret your data.

Introduction

As well as being provided for use by CICS, DMF can also be used to store data from non-CICS programs. DMF can therefore be used as a central repository for monitoring data from the whole VSE/ESA system.

Data is passed to DMF by the DFHEWTM macro. The record must conform to the layout of OS/390 System Management Facility (SMF) records, as described in “SMF headers” on page 581

Because DMF uses MVS macros to protect its resources, any user program that wants to pass data to DMF must run in OS390 emulation—that is, the EXEC statement must specify the OS390 option. (Refer to the *VSE/ESA System Control Statements* manual for details). There are no restrictions on the AMODE of the calling program and the DFHEWTM macro may be issued from above or below the 16MB line. Similarly, the data to be passed may reside above or below the 16MB line.

To manipulate data that is passed to DMF, you can use the CICS-supplied utility program, DFHDFOU. For details of DFHDFOU, see the *CICS Operations and Utilities Guide*. However, the interpretation of any user data must be performed by your own program—see “Writing an interpretation program” on page 583.

The DFHEWTM macro

There are three DFHEWTM functions. These are the DFHEWTM calls GEN, TEST, and WRITE. DFHEWTM is provided in assembler-language only.

The GEN call

GEN defines assembler-language constants that describe the state of DMF. These may be used after the TEST call to determine whether to issue a WRITE call.

```
DFHEWTM GEN
```

The TEST call

TEST returns the current state of DMF in the field provided by the user. The value returned may be compared with the constants provided by the GEN call to determine whether to issue a WRITE call.

```
DFHEWTM TEST
    ,STATUS=field
    ,REG=n
```

REG=n
specifies a work register to be used by the macro. Any valid register may be used, except register 0.

STATUS=field
specifies the name of a 1-byte field into which the status of DMF is to be placed. The value returned will be one of:

DMF_ABEND	DMF has suffered an abend while in cross-memory mode. In this state no attempt should be made to pass data to DMF.
DMF_ACTIVE	DMF is running and can accept data.
DMF_INITIALIZING	DMF is being initialized.
DMF_SHUTDOWN	DMF is being closed.
DMF_STOPPED	The DMF partition is not running.
DMF_SUSPENDED	DMF has been started but has been temporarily suspended.

The WRITE call

WRITE causes data to be passed to DMF. Before attempting to pass the data to DMF, the macro ensures that the executing program is running with OS390 emulation active.

```
DFHEWTM WRITE
    ,RECORD
    ,SUBSYS=sid
    [,REG=n]
```

REG=n
specifies a work register to be used by the macro. Any valid register may be used, except register 0. If you do not specify a value, register 1 is used by the macro.

RECORD
specifies the record to be written. This may be the name of a field or a general-purpose register. If specified as a register, it must be enclosed in parentheses. For a description of the format of the record, see “SMF headers.”

SUBSYS=sid
specifies a 4-character identifier that can be used by your interpretation routine to identify the caller of the macro.

This value may be the name of a field or a general-purpose register. If specified as a register, it must be enclosed in parentheses.

The WRITE call sets a return code in register 15 to indicate the result of the operation. Table 130 shows the possible return codes.

Table 130. Return codes set by the WRITE call

Decimal	Hex	Description
0	0	The record was written without an error.
8	8	The record was not written because the record length specified in the RDW was less than 18 bytes.
16	10	The record was not written because DMF was not active.
24	18	The record was not written because the record has been lost, or an error (other than there being no space available, when the return code is `X'28'`) has prevented DMF from writing it to the data space.
36	24	The record was not written because the record type specified is not currently being recorded.
40	28	The record was not written because there is insufficient space available in the DMF data space to hold it.
44	2C	The record was not written because the macro was issued from a program not running with OS390 emulation.

SMF headers

Data records written to DMF must contain header information that conforms to the format prescribed for SMF records. The header may take two forms—which one you choose depends on whether you want to include record sub-types to describe your records. CICS uses sub-types to differentiate between records of the same record-type—for example, between monitoring and statistics records.

There are no supplied macros to create the DSECTs described below.

Notes:

1. Record types 0 through 127, which are SMF-formatted records, are reserved for IBM products. For record types 0 through 127, you must supply the record descriptor word and the record type field in the standard SMF record header. The DFHEWTM macro supplies the remaining information.
2. Record types 128 through 255 are available for user-written records. When using the DFHEWTM macro to write user records you must provide the standard SMF record header, including the record descriptor word, the date, time and system identifier.

SMF header for records without sub-types

Table 131. SMF header for records without sub-types

Offset	Name	Lngth	Format	Description
0 0	SMFMLEN	2	Binary	Record length (maximum size of 32756). This field and the next field (total of 4 bytes) form the record descriptor word (RDW). This field must contain the logical record length including the RDW. The next field should be set to hexadecimal zeroes.
2 2	SMFMSEG	2	Binary	Reserved.
4 4	SMFMFLG	1	Binary	System indicator. Set to `X'84'` for VSE.
5 5	SMFMRTY	1	Binary	Record type. (Hexadecimal values are 0–FF).
6 6	SMFMTME	4	Binary	Time since midnight, in hundredths of a second, when record was submitted to DMF.
10 A	SMFMDTE	4	Packed	Date record was submitted to DMF, in the form `0cyydddF`. (Where `F` is the sign, `c` is a century indicator 0=1900, 1=2000, 2=2100, etc; `yy` is the year of the century, and `ddd` is the day number.)
14 E	SMFMSID	4	EBCDIC	System identification (taken from DMF start-up option SID).

SMF header for records with sub-types

Table 132 (Page 1 of 2). SMF header for records with sub-types

Offset	Name	Lngth	Format	Description
0 0	SMFMLEN	2	Binary	Record length (maximum size of 32756). This field and the next field (total of 4 bytes) form the record descriptor word (RDW). This field must contain the logical record length including the RDW. The next field should be set to hexadecimal zeroes.
2 2	SMFMSEG	2	Binary	Reserved.
4 4	SMFMFLG	1	Binary	System indicator. Set to `X'C4'` for VSE.
5 5	SMFMRTY	1	Binary	Record type. (Hexadecimal values are 0–FF).

Table 132 (Page 2 of 2). SMF header for records with sub-types

Offset	Name	Lngth	Format	Description
6 6	SMFMTME	4	Binary	Time since midnight, in hundredths of a second, when record was submitted to DMF.
10 A	SMFMDTE	4	Packed	Date record was submitted to DMF, in the form `0cyydddF`. (Where `F` is the sign, `c` is a century indicator 0=1900, 1=2000, 2=2100, etc; `yy` is the year of the century, and `ddd` is the day number.)
14 E	SMFMSID	4	EBCDIC	System identification (taken from DMF start-up option SID).
18 12	SMFMSSI	4	EBCDIC	Subsystem identification (taken from the SUBSYS parameter specified on the DFHEWTM macro).
22 16	SMFMSTY	2	Binary	Record sub-type. (Hexadecimal values are 0-FF).

Writing an interpretation program

Once data has been collected by DMF, and has been off-loaded to a sequential file as described in the *CICS Operations and Utilities Guide*, you can start to process it. You could use DFHJUP to select only your records from the sequential file, or to simply ignore data that your interpretation program is not interested in. For examples of how to do this, see the *CICS Operations and Utilities Guide*.

You should use sequential access methods to read your data. Use the following information to create the DTF to use for reading your data:

```
Record format: VARBLK
Block size:    32767
```

A good source of information regarding an interpretation routine is the CICS-supplied sample program DFH$MOLS, which is supplied in assembler form in PRD1.BASE.

Part 6. Customizing CICS security processing

Table 133. Security road map

If you want to...	Refer to...
Write an interface to an ESM	Chapter 21, “Invoking an external security manager” on page 587
Write a transaction to be invoked when a user’s terminal-timeout period expires	Chapter 22, “Writing a “good night” program” on page 597

Chapter 21. Invoking an external security manager

CICS provides an interface to an external security manager (ESM), which may be the Basic Security Manager (BSM) supplied by VSE/ESA, a vendor product, or user-written. This chapter gives an overview of the CICS–ESM interface, and describes how you can use the VSE/ESA router exit to pass control to a user-written ESM. It describes how ESM exit programs can access CICS-related information. Finally, it lists the control points at which CICS invokes the ESM.

For definitive information about security processing, you should refer to the *CICS Security Guide*.

The chapter is divided into the following sections:

1. **“An overview of the CICS–ESM interface”**
2. **“The VSE/ESA router”**
3. **“How ESM exit programs access CICS-related information”** on page 590
4. **“CICS security control points”** on page 592
5. **“Early verification processing”** on page 594

An overview of the CICS–ESM interface

CICS security uses, via the RACROUTE macro, the VSE/ESA system authorization facility (SAF) interface to route authorization requests to the ESM. Any ESM used by CICS Transaction Server for VSE/ESA must conform to the SAF RACROUTE interface. Normally, if a RACROUTE-conforming ESM is present, the VSE/ESA router passes control to it. However, you can modify the action of the VSE/ESA router by invoking the router exit. The router exit can be used, for example, to do pre-processing before a vendor-supplied ESM is invoked, or to pass control to a user-written ESM. (If you want to use your own security manager, you **must** supply a VSE/ESA router exit routine.)

The control points at which CICS issues a RACROUTE macro to route authorization requests are described in “CICS security control points” on page 592.

The VSE/ESA router

SAF provides your installation with centralized control over security processing, by using a system service called the VSE/ESA router. The VSE/ESA router provides a common system interface for all products providing resource control. The resource-managing components and subsystems (such as CICS) call the VSE/ESA router as part of certain decision-making functions in their processing, such as access control checking and authorization-related checking. These functions are called **control points**. This single SAF interface encourages the use of common control functions shared across products and across systems.

If a RACROUTE-conforming ESM is available in the system, the VSE/ESA router may pass control to the ESM’s router, which in turn invokes the appropriate ESM function. (The parameter information and the ESM router table, which associates router invocations with ESM functions, determine the appropriate function.) However, before calling the ESM router, the VSE/ESA router calls an optional, installation-supplied security-processing exit, if one has been installed.

The VSE/ESA router exit

The VSE/ESA router provides an optional installation exit. You can use the router exit to pass control to your own ESM, or for preprocessing before a vendor-supplied ESM is invoked.

The VSE/ESA router exit routine is invoked whenever CICS (or another component of your system) issues a RACROUTE macro. The router passes a parameter list (generated by the RACROUTE macro) to the exit routine. In addition, the exit receives the address of a 152-byte work area.

On entry to the exit routine, register 1 contains the address of the area described in Table 134.

Table 134. Area addressed by register 1, on entry to exit routine

Offset	Length	Description
0	4	**Parameter list address:** points to the VSE/ESA router parameter list. (See “The VSE/ESA router parameter list.”)
4	4	**Work area address:** points to a 152-byte work area that the exit can use.

The exit must be named ICHRTX00 and must be located in the shared virtual area (SVA).

Note: During signon processing, CICS issues the RACROUTE REQUEST=VERIFY macro with the ENVIR=VERIFY option, in problem-program state. (For an explanation of why CICS does this, see “Early verification processing” on page 594.) The ESM requires RACROUTE calls with the ACEE option to be issued in supervisor state. Therefore, if you use an ICHRTX00 exit that intercepts CICS RACROUTE calls, and replaces them with its own RACROUTE requests, your exit program should not assume that a REQUEST=VERIFY call was made in supervisor state.

When intercepting a REQUEST=VERIFY call, your exit program should check the settings of the two high-order bits of the byte at offset 3 in the RACINIT parameter list. If ENVIR=VERIFY was specified on the call (as in CICS early verification), these bits are both set on. If this is the case, your exit program should not issue any further RACROUTE macros. To do so could cause abends in the ESM.

The VSE/ESA router parameter list

The VSE/ESA router parameter list is generated when the RACROUTE macro is issued, and describes the security processing request by providing the request type. If the router exit routine exists, the router passes the parameter list to this exit. (If it does not exist, and if an ESM is active, the router passes the parameter list to the ESM router.)

You can map the VSE/ESA router parameter list using the ICHSAFP macro. Its format is shown in the *RACF External Security Interface (RACROUTE) Macro Reference* manual. (For VSE considerations, refer to the *VSE/ESA Planning* manual.)

Router exit return codes

Your exit routine must return a return code in register 15. The hexadecimal values of the return code are shown in Table 135.

Table 135. VSE/ESA router exit return codes

Code	Meaning
0	The exit has completed successfully. Control proceeds to the ESM front-end routine for further security processing and an invocation of the ESM.
C8	The exit has completed successfully. The VSE/ESA router translates this return code to a router return code of '0' and returns control to the issuer of the RACROUTE macro (CICS), bypassing ESM processing. (See the next section.)
CC	The exit has completed successfully. The VSE/ESA router translates this return code to a router return code of '4' and returns control to CICS, bypassing ESM processing. (See the next section.)
D0	The exit has completed successfully. The VSE/ESA router translates this return code to a router return code of '8' and returns control to CICS, bypassing ESM processing. (See the next section.)
Other	If the exit routine sets any return code other than those described above, the VSE/ESA router returns control directly to CICS and passes the untranslated code as the router return code. Further ESM processing is bypassed.

Passing control to a user-supplied ESM

Normally, a caller (such as CICS) invokes the VSE/ESA router and passes it request type, requester, and subsystem parameters via the RACROUTE exit parameter list. Using these parameters, the VSE/ESA router calls the router exit which, on completing its processing, passes a return code to the router. If the return code is '0', as defined above, the router invokes the ESM. The ESM reports the result of that invocation to the router by entering return and reason codes in register 15 and register 0 respectively. The router converts the ESM return and reason codes to router return and reason codes and passes them to the caller. The router provides additional information to the caller by placing the unconverted ESM return and reason codes in the first and second words of the router input parameter list.

You can make the VSE/ESA router exit pass control to a user-written ESM. If you do so you must provide CICS with the ESM return and reason codes that it expects to receive. You set the router exit return code, as defined in Table 135, so that any vendor-supplied ESM is not invoked; and you code the exit so that it places the ESM return and reason codes in the first and second fullwords of the router input parameter list. ESM return and reason codes are documented in the *RACF External Security Interface (RACROUTE) Macro Reference* manual. (For VSE considerations, refer to the *VSE/ESA Planning* manual.)

Note: Remember that it is possible for a subsystem other than CICS to call the VSE/ESA router by issuing a RACROUTE macro. (Application programs too, may issue RACROUTE macros directly.) Your router exit program can establish whether the caller is CICS by checking the "eyecatcher" fields (UXPARROW, UXPDFHXS, and UXPBLKID) in the installation data parameter list—see "The installation data parameter list" on page 590.

How ESM exit programs access CICS-related information

When CICS invokes the ESM, it passes information about the current CICS environment, for use by an ESM exit program, in an **installation data parameter list**.

The ESM parameter list

CICS (or another caller) passes information to your external security manager in the ESM parameter list, the address of which can be calculated using field SAFPRACP of the VSE/ESA router parameter list.

When the caller is CICS, the “INSTLN” field of the ESM parameter list points to the installation data parameter list, which contains CICS-related information that can be used by ESM exit programs.

The format of the ESM parameter list, and the actual name of the “INSTLN” field, vary, depending on which CICS security event is being processed. (The “request type” field (SAFPREQT) of the router parameter list shows why the ESM is being called by indicating the RACROUTE REQUEST type.) Table 136 shows how some formats of the ESM parameter list can be mapped using VSE/ESA macros.

Table 136. Mapping the ESM parameter list

RACROUTE REQUEST type	Parameter list mapping macro	INSTLN field name
VERIFY	IRRPRIPL	INITIPTR (X'10')
AUTH	ICHACHKL	ACHKIN31 (X'20')
FASTAUTH	Not available	Offset X'18'
LIST	Not available	Offset X'0C'
EXTRACT	Not available	None

Note: The INSTLN field points to the installation parameter list only if you specify INSTLN on the ESMEXITS system initialization parameter. The default value of this parameter is NOINSTLN, which means that no installation data is passed.

The installation data parameter list

The installation data parameter list gives your ESM exit programs access to the following information:

- The CICS security event being processed.
- Details of the current CICS environment. That is:
  - The applid of the CICS region
  - The common work area (CWA)
  - The transaction being invoked
  - The program being executed
  - The CICS terminal identifier
  - The VTAM LU name
  - The terminal user area

You can map the installation parameter list using the macro DFHXSUXP. The DSECT DFHXSUXP contains the following fields:

UXPLEN A halfword containing the length of this parameter list in bytes.

UXPARROW Arrow “eyecatcher” (>).

UXPDFHXS The name of the owning component (DFHXS).

UXPBLKID The name of the block identifier (UXPARMS).

UXPPHASE Address of a 1-byte code that indicates the reason for the call to the ESM (that is, the security event being processed). The code can have one of the following values:

DEFAULT_SIGN_ON (X'01')	Signon of default userid.
PRESET_SIGN_ON (X'02')	Signon of preset security terminal.
IRC_SIGN_ON (X'03')	Link signon for IRC (MRO) links.
LU61_SIGN_ON (X'04')	Link signon for LUTYPE6.1 links.
LU62_SIGN_ON (X'05')	Link signon for APPC links.
XRF_SIGN_ON (X'06')	XRF tracking of signon.
ATTACH_SIGN_ON (X'07')	Attach-time signon of link user.
NON_TERMINAL_SIGN_ON (X'08')	Non-terminal ADD_USER.
USER_SIGN_ON (X'10')	Normal user signon.
DELETE_SIGN_OFF (X'22')	Sign-off when terminal deleted.
LINK_SIGN_OFF (X'25')	Sign-off when link is closed.
XRF_SIGN_OFF (X'26')	XRF tracking of sign-off.
ATTACH_SIGN_OFF (X'27')	End-of-task sign-off of link user.
NON_TERMINAL_SIGN_OFF (X'28')	Non-terminal DELETE.
USER_SIGN_OFF (X'30')	Normal user sign-off.
TIMEOUT_SIGN_OFF (X'31')	Sign-off forced by TIMEOUT expiry.
USRDELAY_SIGN_OFF (X'32')	Sign-off forced by USRDELAY expiry.
DEFERRED_SIGN_OFF (X'33')	Sign-off deferred until task end.
USER_ATTACH_CHECK (X'40')	Transaction attach check for user.
LINK_ATTACH_CHECK (X'41')	Transaction attach check for link.
EDF_ATTACH_CHECK (X'42')	Transaction attach check for CEDF.
USER_COMMAND_CHECK (X'50')	Command checking for user.
LINK_COMMAND_CHECK (X'51')	Command checking for link.
EDF_COMMAND_CHECK (X'52')	Command checking for EDF.
USER_RESOURCE_CHECK (X'60')	Resource checking for user.
LINK_RESOURCE_CHECK (X'61')	Resource checking for link.
EDF_RESOURCE_CHECK (X'62')	Resource checking for EDF.
USER_SURROGATE_CHECK (X'68')	Surrogate checking for user.
LINK_SURROGATE_CHECK (X'69')	Surrogate checking for link.
EDF_SURROGATE_CHECK (X'6A')	Surrogate checking for EDF.
USER_QUERY_CHECK (X'70')	Query checking for user.
LINK_QUERY_CHECK (X'71')	Query checking for link.

EDF_QUERY_CHECK (X'72')	Query checking for EDF.
INITIALIZE_SECURITY (X'80')	Initialization of CICS security.
REBUILD_SECURITY (X'81')	CEMT or command-level SECURITY REBUILD.
XRF_TRACK_INITIALIZE (X'82')	XRF tracking of initial or rebuild.

UXPSUBSY	Address of an area containing the CICS subsystem identifier.
UXPAPPL	Address of an area containing the CICS application ID.
UXPCWA	Address of the Common Work Area.
UXPTRAN	Address of an area containing the transaction identifier.
UXPPROG	Address of an area containing the program name. The address may be zero if no program name can be identified.
UXPTERM	Address of an area containing the terminal identifier. The address may be zero if no terminal is associated with the request.
UXPLUNAM	Address of an area containing the VTAM LU name. The address may be zero if no terminal is associated with the request, or the area may be blank if the terminal is not a VTAM terminal.
UXPTCTUA	Address of the TCT user area.
UXPTCTUL	Address of a fullword containing the length of the TCTUA.
UXPCOMM	Address of a 2-word communication area.

CICS security control points

The following list summarizes the RACROUTE macros used by CICS to invoke the ESM, and the control points at which they are issued.

RACROUTE
The “front end” to the macros described below, it invokes the VSE/ESA router.

RACROUTE REQUEST=VERIFY
Issued at operator signon (with the parameter ENVIR=CREATE), and at sign-off (with the parameter ENVIR=DELETE). This macro creates or destroys an access control environment element (ACEE). It is issued at the following CICS control points:

Normal signon through EXEC CICS SIGNON
Signon of the default userid DFLTUSER
Signon of preset security terminals
Signon of MRO sessions
Signon of LUTYPE6.1 sessions
Signon of APPC sessions
Signon for XRF tracking of the above
Signon of the userid on attach requests (for all values of ATTACHSEC except LOCAL)
Normal sign-off through EXEC CICS SIGNOFF
Sign-off when deleting a terminal
Sign-off when TIMEOUT expires
Sign-off of MRO sessions
Sign-off of LUTYPE6.1 sessions
Sign-off of APPC sessions

Sign-off for XRF tracking of the above
Sign-off of the userid on attach requests (for all values of ATTACHSEC except LOCAL)

RACROUTE REQUEST=VERIFYX
This creates or deletes an ACEE in a single call. It is issued at the following CICS control points:

- Signon, as an alternative to VERIFY, when an optimized signon is performed for subsequent signons across an LU6.2 link with ATTACHSEC(VERIFY).
- When an invalid password, or a passticket is presented, or an EXEC CICS VERIFY PASSWORD command is issued.

RACROUTE REQUEST=FASTAUTH
Issued during resource checking, on behalf of a user who is identified by an ACEE. It is the high-performance form of REQUEST=AUTH, using in-storage resource profiles, and is issued at the following CICS control points:

When attaching local transactions
When checking link security for transaction attach
Transaction validation for MRO tasks
CICS resource checking
Link security check for a CICS resource
Transaction validation for EDF
Transaction validation for the transaction being tested (by EDF)
Remote DL/I PSB scheduling resource check
QUERY SECURITY with the RESTYPE option

RACROUTE REQUEST=AUTH
This is a higher path length form of resource checking. It is used:

- After a call to FASTAUTH indicates an access failure that requires logging.
- When a QUERY SECURITY request with the RESCLASS option is used. This indicates a request for a resource for which CICS has not built in-storage profiles. (If CICS **has** in fact built in-storage profiles, REQUEST=AUTH uses them.)

RACROUTE REQUEST=LIST
Issued to create and delete the in-storage profile lists needed by REQUEST=FASTAUTH. (One REQUEST=LIST macro is required for each resource class.) It is issued at the following CICS control points:

When CICS security is being initialized
When an EXEC CICS REBUILD SECURITY is issued
When XRF tracks either of these events.

RACROUTE REQUEST=EXTRACT
Issued (with the parameters SEGMENT=SESSION,CLASS=APPCLU) during verification of APPC BIND security, at the following CICS control point:

BIND of APPC sessions.

It is also issued (with the parameters SEGMENT=CICS,CLASS=USER) during signon, at all the control points listed under RACROUTE REQUEST=VERIFY.

For a detailed description of these macros, see the *RACF External Security Interface (RACROUTE) Macro Reference* manual. (For VSE considerations, refer to the *VSE/ESA Planning* manual.)

Early verification processing

The CICS signon routine invokes the SAF interface, using the RACROUTE REQUEST=VERIFY macro with the ENVIR=VERIFY option in problem-program state. Some external security manager products can get control through the SAF exit interface, and perform an **early verification** routine. To discover whether your security manager supports this function, see the documentation supplied with your ESM.

CICS defers the creation of the accessor environment element until the RACROUTE REQUEST=VERIFY macro with the ENVIR=CREATE option is issued to perform the **normal verification** routine. The ENVIR=CREATE version of the macro is issued by the security manager domain running in supervisor state.

CICS passes the following information on the ENVIR=VERIFY version of the RACROUTE REQUEST=VERIFY macro:

USERID
The userid of the user signing on to the CICS region.

GROUP
The group name, if specified, of the group into which the user wants to sign on.

PASSWRD
The user’s password to verify the userid.

NEWPASS
A new value, if specified, for the user’s password. This changes the existing password and is to be used for subsequent signons.

OIDCARD
The contents, if supplied, of an operator identification card.

APPL
The APPLID of the CICS region on which the user is signing on. Which APPLID is passed depends on what is specified as system initialization parameters.

INSTLN
A pointer to a vector of CICS-related information, which you can map using the DFHXSUXP mapping macro. This pointer is valid only if ESMEXITS=INSTLN is specified as a system initialization parameter for the CICS region.

The installation data referenced by the INSTLN parameter includes a pointer, UXPCOMM, to a two-word communications area that can be used to pass information between the two phases of the signon verification process—between the early verification routine initiated by ENVIR=VERIFY, and the normal verification routine initiated by ENVIR=CREATE.

CICS maintains a separate communications area for each task, in CICS-key storage.

Writing an early verification routine

An early verification routine, written for the `ENVIR=VERIFY` option, receives control from SAF in the usual way from the external security manager whose entry point is addressed by field SAFVRACR in the SAF vector table. It receives control in the same state as its caller, as follows:

- Problem-program state
- Task mode (usually the CICS quasi-reentrant TCB)
- PSW partition storage
- 31-bit addressing mode
- Primary address translation mode

Register 13 points to a standard 18-word save area. Register 1 points to a 2-word parameter list, where:

- The first word is the address of the SAF parameter list for the VERIFY function.
- The second word is the address of a 152-byte work area.

Using CICS API commands in an early verification routine

An early verification routine can use CICS application programming interface (API) commands, provided it obeys the following interface rules:

- The routine must be written in assembler.
- Entry to the routine must be via the DFHEIENT macro, which saves the caller's registers and establishes a CICS early verification API environment.
- Exit from the routine must be via the DFHEIRET macro, which releases the CICS early verification API environment and restores the caller's registers.
- The routine *must* be link-edited with the special security domain API stub, DFHXSEAI, *instead of* the normal CICS API stub, DFHEAI0. The CICS early verification stub causes linkage to a special interface routine that is aware of the SAF interface linkage requirements, and saves the current CICS command environment. In addition, the standard EXEC interface stub DFHEAI should also be included, immediately before the early verification routine:

  ```
  INCLUDE DFHEAI
  INCLUDE verify-program
  INCLUDE DFHXSEAI
  ENTRY   verify-program
  ```

The DFHEIENT and DFHEIRET macros are inserted by the CICS translator unless you specify

```
*ASM XOPTS(NOPROLOG,NOEPILOG)
```

as the first statement of the program. The DFHEIENT macro assumes that register 15 points to its first executable instruction.

Upon return from the DFHEIENT macro, a CICS storage area mapped by the DFHEISTG macro has been established. The pointer DFHEIBP (and the register specified in the EIBREG parameter of DFHEIENT) contains the address of an EXEC interface block (EIB). DFHEICAP contains the pointer to the original parameter list supplied by the SAF interface.

Return and reason codes from the early verification routine

Before returning control, the early verification routine should set a return code and reason code in fields SAFPRRET and SAFPRREA of the SAF parameter list. It should also pass a value to be returned as the SAF return code in a register that is specified in the RCREG keyword of the DFHEIRET macro that is used to exit the program. These return codes are examined by the CICS signon function, and any non-zero value in SAFPRRET is interpreted as a verification failure and causes the signon to fail. A zero return code allows the signon to proceed, and eventually CICS issues a `RACROUTE REQUEST=VERIFY,ENVIR=CREATE` macro in supervisor state and under control of the CICS resource-owning TCB. It is only at this invocation that CICS accepts an ACEE address from the external security manager.

Chapter 22. Writing a “good night” program

You can use the GNTRAN system initialization parameter to specify a “good night” transaction that you want CICS to invoke when a user’s terminal-timeout period expires. The default value for GNTRAN is `'NO'`, which means that CICS does not schedule a “good night” transaction, but instead tries to sign off the terminal user. (Whether or not the sign off is successful depends on the value of the SIGNOFF attribute on the terminal’s RDO TYPETERM resource definition.)

Note: Any transaction that you specify on the GNTRAN parameter must be able to handle the type of communication area it is passed when terminal timeout occurs. The CICS sign-off transaction, CESF, can do this, but CESN and all other CICS-supplied transactions cannot.

For further information about GNTRAN, see the *CICS System Definition Guide*.

Writing your own “good night” program allows you to include functions in addition to, or instead of, sign-off. For example, your program could prompt the terminal user to enter their password, and allow the session to continue if the correct response is received. CICS supplies a sample “good night” program, DFH0GNIT, that demonstrates this, and a sample transaction definition, GNIT, that points to DFH0GNIT.

CICS passes the “good night” program a parameter list in the communications area shown in Figure 69. If a terminal times out during a pseudoconversational transaction, your program could, using information in the parameter list:

- Ask for and check a response from the user
- Restore the screen left by the timed-out transaction
- Restore the cursor position
- Receive the communications area of the timed-out transaction, which is passed to the “good night” transaction as an input message
- Return with the TRANSID of the next transaction in the conversation

```
DFHSNGS
DFHSNGS_FIXED                DS    0CL64    Fixed part of parameter list
GNTRAN_START_TRANSID         DS    CL4      TRANSID that invoked GNTRAN
GNTRAN_PSEUDO_CONV_FLAG      DS    CL1      Pseudoconversational flag
GNTRAN_SCREEN_TRUNCATED      DS    CL1      Screen buffer truncation flag
GNTRAN_TRANSLATE_TIOA        DS    CL1      Uppercase translation required?
                             DS    CL9      Reserved
GNTRAN_TIMEOUT_TIME          DS    CL8      Time of terminal timeout
GNTRAN_TIMEOUT_REASON        DS    CL1      Reason for timeout
                             DS    CL11     Reserved
GNTRAN_PSEUDO_CONV_TRANSID   DS    CL4      Next transaction ID
GNTRAN_SCREEN_LENGTH         DS    FL2      Length of screen buffer
GNTRAN_CURSOR_POSITION       DS    FL2      Cursor position
GNTRAN_SCREEN_WIDTH          DS    FL2      Width of screen
GNTRAN_SCREEN_HEIGHT         DS    FL2      Height of screen
GNTRAN_USER_FIELD            DS    CL16     Available to user program
DFHSNGS_VARIABLE             DS    0X       Variable part of parameter list
GNTRAN_SCREEN_BUFFER         DS    0X       Contents of screen buffer
```

Figure 69. Communications area passed to the “good night” program (assembler)

GNTRAN_START_TRANSID
The identifier of the transaction that started the “good night” transaction. If it was started by CICS because of a terminal timeout, GNTRAN_START_TRANSID is set to `'CEGN'`. Your program should examine this field to check that timeout processing is appropriate (that is, that the “good night” transaction was started because of a terminal timeout and for no other reason).

GNTRAN_PSEUDO_CONV_FLAG
A flag indicating whether the terminal timed out during a pseudoconversational transaction.

Y	The terminal timed out between transactions that form part of a pseudoconversational application.
N	The terminal did not time out between transactions that form part of a pseudoconversational application.

GNTRAN_SCREEN_TRUNCATED
A flag indicating whether the 3270 screen buffer had to be truncated.

Y	The screen buffer was truncated.
N	The screen buffer was not truncated.

GNTRAN_TRANSLATE_TIOA
A flag indicating whether the TIOA input to GNTRAN requires uppercase translation.

Y	The TIOA input needs uppercase translation.
N	The TIOA input does not need uppercase translation.

GNTRAN_TIMEOUT_TIME
The time that the terminal timed out, in CICS ABSTIME format.

GNTRAN_TIMEOUT_REASON
The reason for the timeout:

T	No input from the terminal.
X	An XRF takeover.

GNTRAN_PSEUDO_CONV_TRANSID
The identifier of the next transaction, if the terminal timed out during a pseudoconversational sequence. (If the terminal did *not* time out during a pseudoconversational sequence, the value of this field is meaningless.)

GNTRAN_SCREEN_LENGTH
The length of the screen buffer.

GNTRAN_CURSOR_POSITION
The cursor position.

GNTRAN_SCREEN_WIDTH
The width of the screen in use when the terminal timed out.

GNTRAN_SCREEN_HEIGHT
The height of the screen in use when the terminal timed out.

You can use GNTRAN_SCREEN_WIDTH and GNTRAN_SCREEN_HEIGHT to decide whether to use the ERASE DEFAULT or ERASE ALTERNATE option when restoring the user’s screen.

GNTRAN_USER_FIELD
This field is available for use by your “good night” user program. It is initialized to binary zeroes and is not changed by CICS. You can use it to help develop a pseudoconversational “good night” transaction.

GNTRAN_SCREEN_BUFFER
A variable length field containing the contents of the screen buffer.

The sample “good night” program, DFH0GNIT

The sample “good night” program is a pseudoconversational COBOL program named DFH0GNIT. Copy books of the communications area passed to the “good night” program are supplied in assembler language, COBOL, PL/I, and C. The names of the supplied program, copy books, and mapsets are summarized in Table 137. All are supplied in the VSE/ESA sublibrary PRD1.BASE.

Table 137. Sample “good night” program, copy books, and mapsets

Language	PRD1.BASE member name
Program source:	
COBOL only	DFH0GNIT.C
Copy books:	
Assembler	DFHSNGSD.A
COBOL	DFHSNGSO.C
PL/I	DFHSNGSL.P
C	DFHSNGSH.H
Mapsets:	
Assembler	DFH$GMAP.A
COBOL	DFH0GMAP.C

What the sample program does

The DFH0GNIT sample program:

1. Checks that it has been invoked for a terminal timeout, by testing the GNTRAN_START_TRANSID field of the communications area passed by CICS. If this contains anything other than `'CEGN'`, it quits.
2. If a flag within GNTRAN_USER_FIELD shows that this is the first invocation for this timeout:
   a. If GNTRAN_PSEUDO_CONV_FLAG indicates that the terminal timed out during a pseudoconversation, issues EXEC CICS RECEIVE to retrieve the communications area.
   b. Saves the length of the communications area in another field within GNTRAN_USER_FIELD.
   c. Writes the communication area, if any, to a temporary storage queue.
   d. Displays a screen asking the user to input his or her password, and sets the flag indicating that this has been done.

   e. Issues EXEC CICS RETURN with TRANSID GNIT and the COMMAREA option, to continue the timeout process as a pseudoconversation.

3. If this is **not** the first invocation for this timeout:

   a. Recovers the original communication area, if any, from the temporary storage queue.

   b. Checks the password received from the user, and redisplays the timeout screen with an error message if it is incorrect.

4. If the number of incorrect responses exceeds the maximum specified to your external security manager, DFH0GNIT returns immediately with TRANSID CESF, which tries to sign off the userid.

5. If the correct password is entered, DFH0GNIT:

   - Restores the screen contents
   - Restores the cursor position

   If the terminal timed out during a pseudoconversational transaction, DFH0GNIT also:

   - Restores the communications area of the timed-out transaction
   - Returns with the TRANSID of the next transaction in the interrupted conversation

Customizing the sample program

You can write your "good night" program in any of the languages supported by CICS, with full access to the CICS application and system programming interfaces.

If you customize the supplied program, or write your own "good night" program, note the following:

- Like the sample, your program should be pseudoconversational, because it could be invoked simultaneously for many users (if, for example, many terminals time out during the lunch period). If your program is conversational, CICS maximum number of tasks (MXT) could quickly be reached.

  When you are continuing your timeout program's pseudoconversation, always specify the name of your 'good night' transaction (for example, GNIT) as the next TRANSID. If you do not, CICS does not know that you are still handling the timeout, and results may be unpredictable.

- Your program should always start, like the sample program, by testing the GNTRAN_START_TRANSID field of the communications area passed by CICS. If it finds that the "good night" transaction was started for any reason other than a terminal timeout (for example, by an EXEC CICS START request), timeout processing may not be appropriate.

- To obtain the communications area of the timed-out transaction in a pseudoconversation, your program must issue an EXEC CICS RECEIVE command. (The communication area passed to it on invocation is **not** that of the timed-out transaction, but contains information about the timed-out transaction.)

- If your program tries to sign off the terminal user, the result depends on what is specified on the SIGNOFF option of the terminal's RDO TYPETERM resource definition:

YES	The terminal is signed off, but not logged off.
NO	The terminal remains logged on and signed on.
LOGOFF	The terminal is both signed off and logged off.

- Specify the identifier (TRANSID) of your “good night” transaction on the GNTRAN system initialization parameter.

  If you have customized the sample program, DFH0GNIT, specify the supplied sample transaction definition, GNIT.

  If you have written your own “good night” program, named something other than DFH0GNIT, you must create and install a transaction definition that points to your program, and specify this definition on the GNTRAN system initialization parameter.

Part 7. Examining and modifying resource attributes

Table 138. Resource attributes road map

If you want to...	Refer to...
Customize the DFHCSDUP resource definition utility by means of user programs	Chapter 23, "User programs for the system definition utility program (DFHCSDUP)" on page 605
Write a program that invokes the CEDA transaction	Chapter 24, "The programmable interface to the RDO transaction, CEDA" on page 621

Chapter 23. User programs for the system definition utility program (DFHCSDUP)

This chapter tells you how to write programs for use with the CICS system definition utility program (DFHCSDUP). It is divided into the following sections:

1. **“An overview of DFHCSDUP”** contains background information.
2. **“DFHCSDUP as a batch program”** on page 606 describes the DFHCSDUP EXTRACT command, and tells you how to write a user program to be invoked from DFHCSDUP.
3. **“Invoking DFHCSDUP from a user program”** on page 611 tells you how to write a program from which DFHCSDUP itself can be invoked.

An overview of DFHCSDUP

The CICS system definition utility program (DFHCSDUP) is a component of resource definition online (RDO). DFHCSDUP is an offline utility program that allows you to read from and write to a CICS system definition (CSD) file, either while CICS is running or while it is inactive.

Using DFHCSDUP, you can do the following:

- Add a group to the end of a named list in a CSD file.
- Append a group list from one CSD file to a group list in another, or in the same, CSD file.
- Copy all of the resource definitions in one group to another group in the same, or in a different, CSD file.
- Define a single resource, or a group of resources, on the CSD.
- Alter the definition of a single resource, on the CSD.
- Delete from the CSD a single resource definition, all of the resource definitions in a group, or all of the group names in a list.
- Extract requested data from the CSD and pass it to a named user program for processing.
- Initialize a new CSD file, and add to it the CICS-supplied resource definitions.
- List selected resource definitions, groups, and lists.
- Migrate the contents of a table from a CICS load library to a CSD file.
- Remove a single group from a list on the CSD file.
- Apply service to a CSD file when necessary.
- Upgrade the CICS-supplied resource definitions in a primary CSD file for a new release of CICS.
- Verify a CSD file by removing internal locks on groups and lists.

You can invoke DFHCSDUP in two ways:

- As a batch program. The next section refers to this method.
- From a user program. “Invoking DFHCSDUP from a user program” on page 611 describes this method.

DFHCSDUP as a part of the resource definition process is described in the *CICS Resource Definition Guide*. Guidance information about the execution JCL for DFHCSDUP, and the formats of the DFHCSDUP commands, are given in the *CICS Operations and Utilities Guide*.

DFHCSDUP as a batch program

This section refers to DFHCSDUP as a batch program. It describes the DFHCSDUP EXTRACT command, and the three sample programs that can be invoked during EXTRACT processing.

Writing a program to be invoked during EXTRACT processing

The DFHCSDUP LIST command produces reports about the current status of the CSD file that vary only according to the input parameters you provide. Another DFHCSDUP command, EXTRACT, causes the CSD data you select to be passed unformatted to a user program. The user program can then create reports of the CSD data that meet local requirements. For example, you could cross-refer related definitions (such as TERMINALs and TYPETERMs), or you could sort the data by attribute values, such as security keys or processing priorities. The user program could also write the requested resource attributes to a data set to be used as input to a database product, such as SQL or DL/I.

The user program must be linked RMODE(24), AMODE(24). It receives control in 24-bit primary-space translation mode. The contents of the access registers are unpredictable. The program must return control in 24-bit primary addressing mode, and it must restore any access registers that it modifies (in addition to restoring the general purpose registers).

There are three sample programs that can be invoked from DFHCSDUP during EXTRACT processing. The sample programs, and how to replace them with your own versions, are described on page 609.

The EXTRACT command

The EXTRACT command takes requested data from the CSD and passes it to a user program for processing. The command has the following format:

```
EXTRACT {GROUP(name)|LIST(name)} USERPROGRAM(name) [OBJECTS]
```

GROUP
selects only those resource definitions within the named group. You can specify a generic group name, as on the DFHCSDUP LIST command.

LIST
selects only those resource definitions within the groups contained in the named list. You can specify a generic list name only if you do not specify the OBJECTS option.

OBJECTS
returns the detail of each resource definition. You can extract resource definition data at two levels of detail:

1. If you omit the OBJECTS option, the command extracts one of the following:
   - The names of all the resource definitions within the specified group
   - The names of all the groups within the specified list.
2. If you specify the OBJECTS option, all the attributes of the resource definitions are also extracted.

USERPROGRAM
is the name of the user-written program that is to process the data retrieved by the EXTRACT command. You must supply a USERPROGRAM value.

When the user program is invoked

The user program can be invoked at nine different points during the processing of the EXTRACT command by DFHCSDUP. However, your program is invoked at all of these points only if you specify both LIST and OBJECTS on the EXTRACT command. The invocation points are as follows:

1. At the beginning of EXTRACT processing. This is to allow for activities such as file opening and storage acquisition.
2. At the beginning of LIST processing, but only if you have specified a LIST value on the EXTRACT command.
3. At the start of every group being processed by the EXTRACT command.
4. At the start of each object (that is, resource type—TERMINAL, PROGRAM, and so on) that is being processed, to allow for selection on an object or group basis.

   Note: If you have specified LIST but not OBJECTS on the EXTRACT command, this invocation does not occur.
5. For every keyword (attribute) in the extracted object, but only if you have specified OBJECTS on the EXTRACT command. This is to allow for the detailed processing that may be necessary for cross-referencing.
6. At the end of every object—that is, when all of the keywords within an object have been processed. This is to allow for the processing of data built up from the detailed items, and it occurs once for each object.
7. At the end of every group, to allow for processing of the accumulated data.
8. At the end of LIST processing, if you have specified a LIST value on the EXTRACT command.
9. When EXTRACT processing is complete, to allow for closing of files, release of storage, and so on.

Parameters passed from DFHCSDUP to the user program

On every invocation of the user program, DFHCSDUP passes a parameter list addressed by general register 1. The parameter list consists of a series of fullwords that address the fields described in more detail below. The addresses set in the parameter list vary, depending on the point that EXTRACT processing has reached.

The parameter list contains the following fields:

Function Type Ptr
The address of a halfword field that contains a code defining the point in EXTRACT processing reached.

The function codes are as follows:

0	Initial call.
2	List start call.
4	Group start call.
6	Object start call.
8	Keyword detail call.
10	Object end call.
12	Group end call.
14	List end call.
16	Final call.

Workarea Ptr
This is the address of a field containing the address of a fullword to be used by the user application to store the address of any user-acquired work area.

Back translated command Ptr
The address of a fullword that contains the address of a 75-byte area of storage that contains the EXTRACT command that is being processed.

List name Ptr
The address of an 8-byte field that identifies the RDO list from which the current object is taken. This value is set only on the ‘list start’ and ‘list end’ calls.

Group name Ptr
The address of an 8-byte field that identifies the RDO group from which the current object is taken. This value is set on the ‘group start’, ‘group end’, ‘object start’, ‘object end’, and ‘keyword’ calls.

Object type Ptr
The address of a 12-byte field that identifies the type of object (such as TRANSACTION, PROGRAM, and so on), and is set only on the ‘object start’, ‘object end’, and ‘keyword’ calls.

Object name Ptr
The address of an 8-byte field that contains the name of the object, and is set only on the ‘object start’, ‘object end’, and ‘keyword’ calls.

Keyword name Ptr
The address of a 12-byte field that contains the name of the keyword being processed, and is set only on ‘keyword’ calls.

Keyword length Ptr
The address of a halfword field that contains the length of the value associated with the keyword, and is set only on ‘keyword’ calls.

Keyword Value Ptr
The address of the storage area that contains the value associated with the keyword, and is set only on ‘keyword’ calls.

Note: Fields not set with a pointer value contain a null value.

The sample EXTRACT programs

There are two CICS-supplied sample programs that can be invoked during DFHCSDUP EXTRACT processing. One of these is provided in COBOL, PL/I, and assembler language, and the other is provided in COBOL only. They are outlined in Table 139.

Table 139. Sample EXTRACT user programs for the DFHCSDUP utility program

Program names	**Languages**	**Description**
DFH$CRFA DFH0CRFC DFH$CRFP	Assembler COBOL PL/I	Produces a cross-reference listing of the resource definitions defined in the group or list you specify on the EXTRACT command.
DFH0CBDC	COBOL	Writes the list or group of resource definitions you specify on the EXTRACT command in the form of DEFINE commands, suitable for use as a backup copy of the resources extracted.

You can use the sample programs as supplied, or as models on which to base your own programs.

Only the assembler-language version, DFH$CRFA, is supplied in executable form. The source statements for each of these programs are supplied in the VSE/ESA sublibrary PRD1.BASE.

Note that the sample programs require you to specify the OBJECTS keyword on the DFHCSDUP EXTRACT command.

The output data definition names (DLBLs) for the sample programs are as follows:

CRFOUT	CSD cross-referencing program.
CBDOUT	CSD backup utility program.

The sample programs are discussed in the next two sections.

The CSD cross-referencing program

The CICS-supplied sample CSD cross-referencing program produces a cross-reference listing of objects and keywords on the CSD. The data gathered by the EXTRACT command is passed to the sample program, where it is saved in a cross-reference table. On the final call to this sample program, the contents of the table are printed in collating sequence.

The program must be run against an EXTRACT command of the form:

```
EXTRACT GROUP(group name) OBJECTS USERPROGRAM(program-name)
```

or:

```
EXTRACT LIST(list name) OBJECTS USERPROGRAM(program-name)
```

Note that the sample program requires you to specify the OBJECTS keyword.

For this program only, in addition to the EXTRACT command, you must define, in a sequential data set, the objects and keywords for which you want a cross-reference listing. The data set is read by the sample program using the filename CRFINPT.

CRFINPT is a sequential file containing 80-byte records. Each record contains one object or keyword to be cross-referenced. You can cross-reference any valid resource type or attribute known to CEDA. For example, your CRFINPT file may contain the following entries (one per line):

PROGRAM
TRANSACTION
TYPETERM
DSNAME

For each record in the file, a report is produced detailing the different values assigned to the keyword, where they are defined, and where they are used. Note that keyword values longer than 44 characters are truncated.

You should define CRFINPT as CISIZE=80, RECSIZE=80, and BLKFACTOR=1.

The CSD backup utility program

The CICS-supplied sample CSD backup utility program, DFH0CBDC, produces a file of DFHCSDUP DEFINE control statements. The file can be used:

- For later editing and commenting to document CSD resources
- For distribution, in part or as a whole, to other CICS installations
- To recreate or add resource definitions to any CSD using DFHCSDUP

The program must be run against an EXTRACT command of the form:

```
EXTRACT GROUP(group name) OBJECTS USERPROGRAM(DFH0CBDC)
```

or:

```
EXTRACT LIST(list name) OBJECTS USERPROGRAM(DFH0CBDC)
```

Note that the sample program requires you to specify the OBJECTS keyword.

Note the following points when using DFH0CBDC:

- It can deal with only one set of data during each invocation of DFHCSDUP; if two EXTRACT commands are issued, the second set of data overwrites the first.
- In the file produced by DFH0CBDC, any DEFINE statements that relate to CICS-supplied resources are preceded by an asterisk (*) in column 1; in other words, they are commented out. This is important if you use the file as input to define resources to a CSD. (The CICS-supplied definitions are already present in the CSD, having been produced automatically when it was initialized.)

- If you remove an asterisk from column 1 (to reinstate the DEFINE statement), do so by deleting it, **not** by overtyping it with a blank. This ensures that the resulting command is no more than 72 characters long; if it is longer than this, errors occur when the output is passed back through DFHCSDUP.

Assembling and link-editing EXTRACT programs

You must assemble (or compile) and link-edit DFHCSDUP user programs as batch programs, not as CICS applications, and you need link-edit control statements appropriate to the language in which they are written.

Note: DFHCSDUP user programs should not be translated, or unpredictable results could occur.

When you compile the COBOL versions of the sample programs, you must specify the compiler attributes NORENT and NORES.

When you link-edit the programs, you must specify the following link-edit control statements:

- An ENTRY statement that defines the entry name as DFHEXTRA
- An INCLUDE statement for a CICS-supplied stub that must be included in your user program

These requirements are explained in more detail in the *CICS System Definition Guide*, which provides sample job streams for link-editing DFHCSDUP user programs written in each of the three languages (assembler, COBOL, and PL/I).

Invoking DFHCSDUP from a user program

It is possible to invoke DFHCSDUP from a user program. This method enables you to create a flexible interface to the utility. By specifying the appropriate entry parameters, your program can cause DFHCSDUP to pass control to an exit routine at any of five exit points. The exits can be used, for example, to pass commands to DFHCSDUP, or to respond to messages produced by DFHCSDUP processing.

Entry parameters for DFHCSDUP

Your program tells DFHCSDUP that it has been called by a user program by passing a value of zero in register 1. Your program passes a parameter list addressed by register 0. It may pass up to five parameters, as described below:

OPTIONS
A list of character strings, separated by commas. (The information passed here is that which would otherwise be passed on the PARM keyword of the EXEC statement of JCL.) A maximum of four options can be specified:

CSD({READWRITE|READONLY})
specifies whether you require read-write or read-only access to the CSD.

PAGESIZE(nnnn)
specifies the number of lines per page on output listings. Valid values for nnnn are 4 through 9999. The default value is 60.

NOCOMPAT|COMPAT
specifies whether DFHCSDUP is to be invoked in compatibility mode. By default, it is invoked in noncompatibility mode. For details of compatibility mode, see the *CICS Resource Definition Guide*.

UPPERCASE
specifies that output listings are to be printed entirely in uppercase characters. The default is to print in mixed case.

FILENAMES
A list of filenames that, if specified, are substituted for those normally used by DFHCSDUP.

HDING
The starting page number of any listing produced by DFHCSDUP. You can use this parameter to ensure that subsequent invocations produce logically numbered listings. If this parameter is not specified, the starting page number is set to 1.

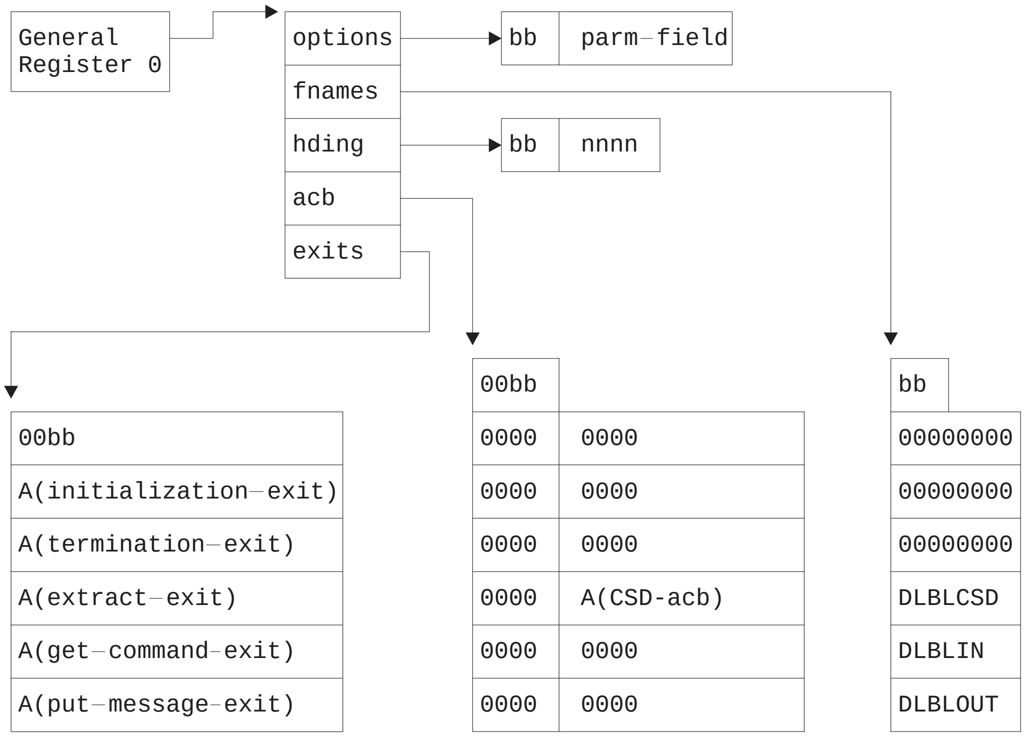
The length of the page number data (field ‘bb’ in Figure 70 on page 613) must be 0 or 4. The page number, if supplied, must be four numeric EBCDIC characters. The field, if present, is updated upon exit from DFHCSDUP with a number one greater than that of the last page printed.

ACB
The address of a data control block for use internally by DFHCSDUP. Any ACB that you specify is used internally, instead of that normally used by DFHCSDUP.

Note that if you specify both replacement filenames and a replacement ACB, the alternative ACB is used, but the alternative filenames are disregarded.

EXITS
The addresses of a set of user exit routines to be invoked during processing of DFHCSDUP.

The structure of the parameter list is shown in Figure 70 on page 613.



```
bb is a two-byte field containing the length of the functional data
00 represents two bytes of binary zeros
A() means "address of"
```

Figure 70. Entry parameters for DFHCSDUP

You should note the following:

- Each parameter contains a length field, followed by some functional data.
- The functional data for the FILENAMES, ACB, and EXITS parameters contains multiple subentries.
- The parameters OPTIONS, FILENAMES, and HDING are aligned on a halfword boundary, and the first two bytes ‘bb’ contain the binary number of **bytes** in the following functional data.
- The parameters ACB and EXITS are aligned on a fullword boundary, and the first four bytes ‘00bb’ contain the binary number of **fullwords** in the following functional data.
- If the ‘bb’ field for any parameter is zero, the parameter is ignored.
- If a subentry in the functional data is all binary zeros, it is ignored.
- If any subentry is not within the length indicated by ‘bb’, it is ignored.
- In the FILENAMES functional data, each subentry consists of an 8-byte field containing a 7-byte filename to replace a default filename used by DFHCSDUP. DFHCSDUP does not use the first three subentries of the FILENAMES parameter. The fourth, fifth, and sixth subentries, if present, replace the filenames of DFHCSD, SYSIPT, and SYSLST, respectively.

- In the ACB functional data, each subentry consists of two fullwords. The first word is not used by CICS. The second word contains the address of an open ACB. You must ensure that the ACB has been opened with the correct attributes, which are:

PRIMARY CSD	AM=VSAM,MACRF=(KEY,DIR,SEQ,IN,OUT),STRNO=3

  DFHCSDUP does not use the first three subentries of the ACB parameter. The fourth subentry, if present, is used instead of the internal ACB for DFHCSD.

- In the EXITS parameter, each subentry consists of a single fullword containing the address of an exit routine. You must specify the exit routines in the order shown in Figure 70 on page 613. (The user exits are described in "The user exit points in DFHCSDUP.")

Responsibilities of the user program

Before invoking DFHCSDUP, your calling program must ensure that:

- AMODE(24) and RMODE(24) are in force.
- System/370™ register conventions are obeyed. That is:

Register 0	contains the address of the parameter list.
Register 1	contains zero.
Register 14	contains the return address.
Register 15	contains the entry address of DFHCSDUP.

- If the EXITS parameter is passed, any programming environment needed by the exit routines has been initialized.
- Any ACB passed for use by DFHCSDUP is OPEN.

The user exit points in DFHCSDUP

There are five user exit points in DFHCSDUP. By specifying the appropriate entry parameters, you can cause DFHCSDUP to pass control to an exit routine at any of these points.

None of the user exits supports XPI calls.

Parameters passed to the user exit routines

The address of a parameter list is passed to the user exit routine in register 1. The list contains some standard parameters that are passed to all of the exit routines, and may also contain some exit-specific parameters that are unique to the exit point from which the exit routine is being invoked.

The format of the parameter list is identical to that used by CICS global user exits. For a description of the standard parameters, see "DFHUEPAR standard parameters" on page 8. Explanations of the exit-specific parameters are included in the descriptions of the individual exits, which follow.

The initialization exit

The initialization exit is invoked once during DFHCSDUP initialization. Its purpose is to allow a routine to perform exit-related initialization. For example, the routine may obtain its own global work area and save its address in UEPGAA and its length in the halfword pointed to by UEPGAL. These values are retained by DFHCSDUP and become available at the other exit points.

Table 140. Initialization exit

When invoked	Invoked once, on entry to DFHCSDUP.	
Exit-specific parameters	**None**	
Return codes	**UERCNORM (X'00')**	Continue processing.
	UERCERR	Irrecoverable error. This causes DFHCSDUP to terminate with a return code of '8'.

The get-command exit

The purpose of the get-command exit is to read in command lines. If it is specified, no commands are read from the SYSIPT data stream.

On invocation, your exit routine must supply the address and length of a **complete** command. It must return control with either the normal return code ‘UERCNORM’ or with the code ‘UERCDONE’, signifying that it has no more commands to pass. After it has processed each command, DFHCSDUP reinvokes the exit until return code ‘UERCDONE’ is received.

Table 141. Get-command exit

When invoked	Invoked multiple times, at the point where DFHCSDUP would otherwise read commands from the SYSIPT data stream.	
Exit-specific parameters	**UEPCMDA**	Address of a fullword containing a pointer to a command.
	UEPCMDL	Address of a halfword containing the length of the command text. The maximum length that can be specified is 1536 bytes.
Return codes	**UERCNORM (X'00')**	Continue processing.
	UERCDONE (X'04')	No more commands to process. (This is equivalent to reaching end-of-file on the SYSIPT data stream.)
	UERCERR	Irrecoverable error. This causes DFHCSDUP to terminate with a return code of ‘8’.

The extract exit

The extract exit is invoked at various points during processing of the EXTRACT command. The points are listed on page 607.

Notes:

1. If you do not specify an EXTRACT user exit routine on the entry linkage to DFHCSDUP, or on the USERPROGRAM keyword, a syntax error occurs.
2. A user exit routine specified on the USERPROGRAM keyword is used in preference to one specified on the entry linkage.

Table 142 (Page 1 of 2). Extract exit

When invoked	Invoked multiple times during processing of the EXTRACT command.
Exit-specific parameters	**EXTRACT_FUNCTION_CODE_PTR** Address of a halfword containing a code that defines the point in EXTRACT processing reached. The EXTRACT function codes are listed on page 608. **EXTRACT_WORK_AREA_PTR** Address of a fullword containing the address of the EXTRACT work area. **EXTRACT_BACKTRAN_COMMAND_PTR** Address of a fullword containing the address of the EXTRACT command being processed. **EXTRACT_CSD_LIST_NAME_PTR** Address of an 8-byte field containing the name of the list whose data is being extracted. This value is set only on ‘list start’ and ‘list end’ calls. **EXTRACT_CSD_GROUP_NAME_PTR** Address of an 8-byte field containing the name of the group whose data is being extracted. This value is set on ‘group start’, ‘group end’, ‘object start’, ‘object end’, and ‘keyword’ calls. **EXTRACT_CSD_OBJECT_TYPE_PTR** Address of a 12-byte field that identifies the type of object (such as TRANSACTION, PROGRAM, and so on). This value is set only on ‘object start’, ‘object end’, and ‘keyword’ calls.

Table 142 (Page 2 of 2). Extract exit

	EXTRACT_CSD_OBJECT_NAME_PTR Address of an 8-byte field containing the name of the object. This value is set only on ‘object start’, ‘object end’, and ‘keyword’ calls. **EXTRACT_KEYWORD_NAME_PTR** Address of an 12-byte field containing the name of the keyword being processed. This value is set on ‘keyword’ calls only. **EXTRACT_KEYWORD_LENGTH_PTR** Address of a halfword containing the length of the value associated with the keyword. This value is set on ‘keyword’ calls only. **EXTRACT_KEYWORD_VALUE_PTR** Address of a character string which contains the value associated with the keyword. This value is set on ‘keyword’ calls only. Note that these parameters are similar to those passed when DFHCSDUP is invoked as a batch program. (See “Parameters passed from DFHCSDUP to the user program” on page 608.) However, when DFHCSDUP is invoked from a user program, the parameter list also includes the standard parameters mentioned under “Parameters passed to the user exit routines” on page 614.
Return codes	**UERCNORM (X'00')** Continue processing. **UERCERR** Irrecoverable error. This causes DFHCSDUP to terminate with a return code of ‘8’.

The put-message exit

The put-message exit is invoked whenever a message is to be issued. You could use this exit to provide messages in the operator’s national language.

Even if this exit is supplied, messages are always additionally written to the default output file (that is, to the SYSLST data stream, or to the replacement filename specified on the entry linkage to DFHCSDUP).

Table 143. Put-message exit

When invoked	Invoked when a message is to be issued.	
Exit-specific parameters	**UEPMNUM**	Address of a 4-character field containing the message number.
	UEPMDOM	Reserved.
	UEPINSN	Address of a 2-byte field containing the number of insert fields.
	UEPINSA	Address of the following message structure:
	See structure below. The exit-specific parameters provide a message number and insert fields only, to enable you to provide messages in the language of your operators. The structure pointed to by UEPINSA is repeated as many times as UEPINSN requires.	
Return codes	**UERCNORM (X'00')**	Continue processing.
	UERCERR	Irrecoverable error. This causes DFHCSDUP to terminate with a return code of ‘8’.

```
                DS  F    Reserved
INS_1_TEXT_PTR  DS  A    Address of insert 1
INS_1_LEN_PTR   DS  A    Address of a fullword containing
                         the length of insert 1
                DS  F    Reserved
                DS  F    Reserved
INS_2_TEXT_PTR  DS  A    Address of insert 2
INS_2_LEN_PTR   DS  A    Address of a fullword containing
                         the length of insert 2
                DS  F    Reserved
                ...
                DS  F    Reserved
INS_n_TEXT_PTR  DS  A    Address of insert n
INS_n_LEN_PTR   DS  A    Address of a fullword containing
                         the length of insert n
                DS  F    Reserved
```

The termination exit

The purpose of the termination exit is to allow you to perform final housekeeping duties. It is invoked before a normal or an abnormal termination of DFHCSDUP.

Table 144. Termination exit

When invoked	Invoked once, before termination of DFHCSDUP.	
Exit-specific parameters	**UEPTRMFL**	A 1-byte field that indicates the mode of termination. Its possible values are: **0** Normal termination. **1** Abnormal termination.
Return codes	**UERCNORM (X'00')**	Continue processing.
	UERCERR	Irrecoverable error. This causes DFHCSDUP to terminate with a return code of ‘8’.

The sample program, DFH$CUS1

The CICS-supplied sample program, DFH$CUS1, illustrates how DFHCSDUP can be invoked from a user program. It is written to accept input from a console, and write messages to the console.

Note that DFH$CUS1 uses a different ACB name from that normally used by DFHCSDUP. Ensure that the required DLBL is provided before running the program.

Chapter 24. The programmable interface to the RDO transaction, CEDA

This chapter describes a programmable interface to the resource definition online (RDO) transaction, CEDA. The functions provided by RDO can be invoked from application programs, by a command such as:

```
EXEC CICS LINK PROGRAM('DFHEDAP')
               COMMAREA(CEDAPARM)
```

where DFHEDAP is the name of the entry point in the RDO program, and CEDAPARM is a user-defined name of a parameter list consisting of five 31-bit addresses (each contained in a fullword) as follows:

1. Address of a field containing the RDO command in source form.
2. Address of a halfword binary field specifying the length of the command. The maximum length of the input command is 1022 bytes.
3. Address of a 1-byte indicator field defined as follows:

X'80'	Display output at terminal instead of returning it to caller.
X'00'	Do not display output at terminal.

4. Address of a field in which output is to be placed by DFHEDAP.
5. Address of a halfword binary field specifying the maximum length of output that the application can handle.

If the indicator in address 3 is X'80', output is displayed at the terminal. In this case, you can enter any number of CEDA commands at the terminal, in response to the output displayed on your screen. Control is returned to your application program when you press PF3.

However, if the indicator is X'00' (output is not to be displayed at the terminal), DFHEDAP returns control to your application program immediately after processing the RDO command specified in the first address. At the same time, DFHEDAP returns the output as one or two concatenated, structured fields. The output from a single request comprises one field for the translation stage and one or none for the execution stage. Each field has the format:

- Binary halfword containing inclusive length of field.
- Binary halfword containing the number of messages produced.
- Binary halfword containing the highest message-severity: ‘0’ and ‘4’ continue to execution; ‘8’ and ‘12’ do not continue to execution.
- Variable-length data containing:
  - For the translation stage: diagnostic messages if there are any.
  - For the execution stage: data that would normally appear on the CEDA screen, including messages. Each line begins with a new line (NL) character and, otherwise, consists of blanks and uppercase alphanumeric characters.

The format of this data is not guaranteed from release to release, but it is the same as that displayed by CEDA. (Analysis of this data should not normally be necessary. Typically, your program is interested only in whether or not the command was successful.) If the total output is longer than the maximum length specified by the user, it is truncated.

Notes:

1. An attempt to start CEDA from an application program by an EXEC CICS START command must fail. This is because CEDA's first action is to request input from its associated terminal, whereas an automatically initiated transaction must first send data to the terminal.

   An attempt to start CEDA under CECI by an EXEC CICS START command fails for similar reasons.
2. The RDO command passed in address 1 of the CEDAPARM parameter list must be valid. (For example, spelling errors such as PRORGAM for PROGRAM are not corrected automatically when you use the programmable interface.)

Use of the programmable interface

Remember that you can use the offline utility program, DFHCSDUP, to examine and amend CSD files; and that DFHCSDUP can be invoked from a user program. (See "Invoking DFHCSDUP from a user program" on page 611.)

Using DFHCSDUP is the recommended method for updating CSD files in bulk.

You should only use the interface described in this chapter where the required function includes the INSTALL command, which is not available from DFHCSDUP.

Using DFHEDAP in a DTP environment

The LINK DFHEDAP function is intended to be used in a single environment. It is not supported within a distributed transaction programming (DTP) environment—using it such an environment can result in abends.

In a DTP environment, CICS may attempt to propagate SYNCPOINT and SYNCPOINT ROLLBACK requests across sessions to other systems. These requests are issued by CEDA modules that are invoked by the use of LINK DFHEDAP. Note that the issuing of SYNCPOINT ROLLBACK means that LINK DFHEDAP cannot be used in a DTP environment that owns LU6.1 links.

Generally, a session should be in SEND state to initiate a SYNCPOINT, but the session may not remain in SEND state once a LINK DFHEDAP command is issued. (For information about valid commands and states, see the *CICS Distributed Transaction Programming Guide*. This book also explains the APPC architecture rules on a session's state after SYNCPOINT and SYNCPOINT ROLLBACK requests are made.)

The code invoked by LINK DFHEDAP can result in wrong sequence of commands. For example, if the code invoked by DFHEDAP issues a SYNCPOINT ROLLBACK from a back-end application program whose session is in SEND state (and which has never issued a SYNCPOINT), the session will be put into RECEIVE state. If the code invoked by DFHEDAP then issues a SYNCPOINT, an abend occurs. This can be prevented by all DTP applications issuing a SYNCPOINT request when they get into SEND state (on all of their sessions) and before they issue the LINK DFHEDAP command.

Do not attempt to use LINK DFHEDAP when more than a pair of DTP application programs are involved—that is, one front end and one back end.

The general rules for using LINK DFHEDAP within a simple DTP environment (one front end and one back end) are that all sessions in a DTP environment should be in SEND state when the LINK DFHEDAP command is issued, and they should revert to SEND state in the event of a SYNCPOINT ROLLBACK being issued by the DFHEDAP code.

Part 8. Appendixes

Table 145. Appendixes road map

If you want to...	Refer to...
Match the entries in your VTAM LOGON mode table to the TYPETERMs and model TERMINAL definitions that you specify to CICS	Appendix A, "Coding entries in the VTAM LOGON mode table" on page 627
Check the default actions of the DFHZNAC program that invokes the node error program	Appendix B, "Default actions of the node abnormal condition program" on page 653
Use the sample program, DFH$TDWT, to send messages from a TD queue to a terminal	Appendix C, "Transient data write-to-terminal program (DFH$TDWT)" on page 669
Translate lower- and mixed-case characters to uppercase	Appendix D, "Uppercase translation of national characters" on page 671
Look at an example global user exit program	Appendix E, "The example program for the XTSEREQ global user exit, DFH$XTSE" on page 673

Appendix A. Coding entries in the VTAM LOGON mode table

This appendix shows you what to code in your VTAM LOGON mode table for a terminal to be automatically installed. It is divided into the following sections:

Overview

CICS uses the logmode data when processing an automatic installation (autoinstall) request. Automatic installation functions properly only if the logmode entries that you define to VTAM have matches among the TYPETERMs and model TERMINAL definitions that you specify to CICS. "Matching models and LOGON mode entries" on page 637 and "LOGON mode definitions for CICS-supplied autoinstall models" on page 649 show examples of matching definitions.

The following tables show, for a variety of possible terminal devices, what you must code on the VTAM MODEENT macros that define your logmode table if you want to use autoinstall. Between them they show the values that must be specified for each of the operands of the MODEENT macro. Where all bit settings of an operand's value have significance for CICS, the data is shown in hexadecimal form. If some of an operand's bit settings are not significant to CICS, its data bytes are shown as bit patterns. The bit settings that have significance for CICS are shown set to the values that CICS expects. Those bits that have no significance to CICS are shown as periods. Thus, for example:

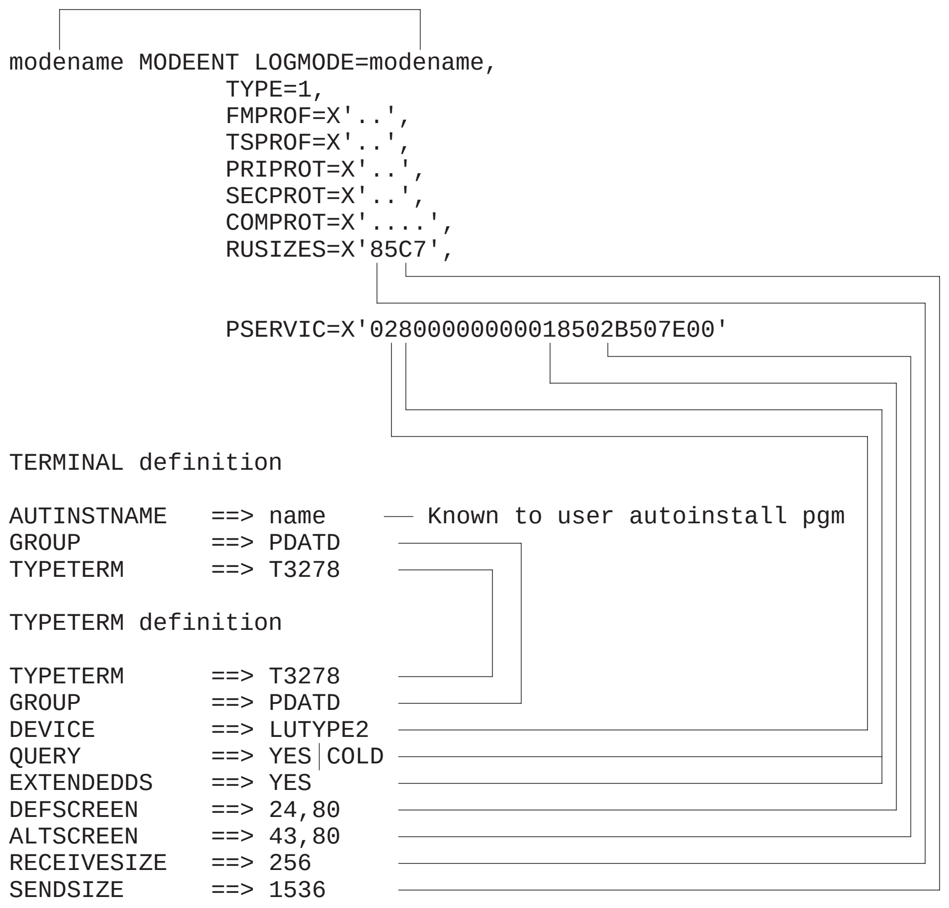
```
01..0011
```

shows that six bits in the subject byte must be given specific values; the remaining two have no significance.

Some of the examples shown here correspond exactly to entries in the CICS-supplied LOGON mode table called ISTINCLM. Where this is so, the table gives the name of the entry in ISTINCLM.

The PSERVIC setting shows fields called aaaaaaaa, bbbbbbbb, and so on. The contents of these vary for LUTYPE0, LUTYPE2, and LUTYPE3 devices, according to how you specify certain attributes of the terminals. You can work out the values you need by looking at "PSERVIC screen size values for LUTYPE0, LUTYPE2, and LUTYPE3 devices" on page 636.

Relationship between TERMINAL, TYPETERM, and MODEENT values



```
modename MODEENT LOGMODE=modename,
               TYPE=1,
               FMPROF=X'..',
               TSPROF=X'..',
               PRIPROT=X'..',
               SECPROT=X'..',
               COMPROT=X'....',
               RUSIZES=X'85C7',

               PSERVIC=X'028000000000018502B507E00'

TERMINAL definition

AUTINSTNAME   ==> name    —— Known to user autoinstall pgm
GROUP         ==> PDATD
TYPETERM      ==> T3278

TYPETERM definition

TYPETERM      ==> T3278
GROUP         ==> PDATD
DEVICE        ==> LUTYPE2
QUERY         ==> YES|COLD
EXTENDEDDS    ==> YES
DEFSCREEN     ==> 24,80
ALTSCREEN     ==> 43,80
RECEIVESIZE   ==> 256
SENDSIZE      ==> 1536
```

Figure 71. The relationship between TERMINAL, TYPETERM, and MODEENT values

TYPETERM device types and pointers to related LOGON mode data

Search Table 146 for the TYPETERM device type that corresponds to the terminal you want to autoinstall. When you find the right one, use the number to its right to locate, in Table 147 on page 631, what has to be coded on the VTAM MODEENT macros.

Note that Table 146 is a complete list of TYPETERM device types; not all of these can be used with autoinstall. Those that cannot are marked with an asterisk (*). For details about coding TYPETERM definitions, and for a list of terminals that can be autoinstalled, see the *CICS Resource Definition Guide*.

Table 146 (Page 1 of 3). TYPETERM device types, with cross-references to VTAM logmode entries

TYPETERM device type	**Reference number in Table 147 on page 631**
DEVICE(APPC)	24
DEVICE(BCHLU)	17
DEVICE(BCHLU) SESSIONTYPE(BATCHDI)	15
DEVICE(BCHLU) SESSIONTYPE(USERPROG)	16
DEVICE(CONTLU)	10
DEVICE(INTLU)	11
DEVICE(LUTYPE2)	18
DEVICE(LUTYPE2) TERMMODEL(1)	18
DEVICE(LUTYPE3)	19
DEVICE(LUTYPE3) TERMMODEL(1)	19
DEVICE(LUTYPE4)	12
DEVICE(SCSPRINT)	11, 13
DEVICE(TLX)	8
DEVICE(TLX) SESSIONTYPE(CONTLU)	8
DEVICE(TLX) SESSIONTYPE(INTLU)	9
DEVICE(TWX)	8
DEVICE(TWX) SESSIONTYPE(CONTLU)	8
DEVICE(TWX) SESSIONTYPE(INTLU)	9
DEVICE(3270)	2
DEVICE(3270) BRACKET(NO)	1
DEVICE(3270) TERMMODEL(1)	2
DEVICE(3270) TERMMODEL(1) BRACKET(NO)	1
DEVICE(3270P)	2
DEVICE(3270P) BRACKET(NO)	1
DEVICE(3270P) TERMMODEL(1)	2
DEVICE(3270P) TERMMODEL(1) BRACKET(NO)	1
DEVICE(3275)	2

Table 146 (Page 2 of 3). TYPETERM device types, with cross-references to VTAM logmode entries

TYPETERM device type	Reference number in Table 147 on page 631
DEVICE(3275) BRACKET(NO)	1
DEVICE(3275) TERMMODEL(1)	2
DEVICE(3275) TERMMODEL(1) BRACKET(NO)	1
DEVICE(3600)	16, 22, 23
DEVICE(3600) SESSIONTYPE(PIPELINE) *	21
DEVICE(3600) SESSIONTYPE(PIPELN) *	21
DEVICE(3614) *	3
DEVICE(3650) SESSIONTYPE(PIPELINE) *	21
DEVICE(3650) SESSIONTYPE(PIPELN) *	21
DEVICE(3650) SESSIONTYPE(USERPROG) BRACKET(YES)	6
DEVICE(3650) SESSIONTYPE(USERPROG) BRACKET(NO)	7
DEVICE(3650) SESSIONTYPE(3270)	5
DEVICE(3650) SESSIONTYPE(3270) BRACKET(NO)	4
DEVICE(3650) SESSIONTYPE(3653)	5
DEVICE(3650) SESSIONTYPE(3653) BRACKET(NO)	4
DEVICE(3767)	11
DEVICE(3767C)	10
DEVICE(3767I)	11
DEVICE(3770)	17
DEVICE(3770) SESSIONTYPE(BATCHDI)	15
DEVICE(3770) SESSIONTYPE(USERPROG)	16
DEVICE(3770B)	17
DEVICE(3770B) SESSIONTYPE(BATCHDI)	15
DEVICE(3770B) SESSIONTYPE(USERPROG)	16
DEVICE(3770C)	10
DEVICE(3770I)	11
DEVICE(3790)	20
DEVICE(3790) SESSIONTYPE(BATCHDI)	14
DEVICE(3790) SESSIONTYPE(SCSPRT)	13
DEVICE(3790) SESSIONTYPE(SCSPRINT)	13
DEVICE(3790) SESSIONTYPE(USERPROG)	16
DEVICE(3790) SESSIONTYPE(3277CM)	18

Table 146 (Page 3 of 3). TYPETERM device types, with cross-references to VTAM logmode entries

TYPETERM device type	Reference number in Table 147
DEVICE(3790) SESSIONTYPE(3284CM)	19
DEVICE(3790) SESSIONTYPE(3286CM)	19

VTAM MODEENT macro operands

Table 147 shows the VTAM LOGON mode table entry for each TYPETERM you might define. You should have reached this table by looking up the TYPETERM device types in Table 146 on page 629.

Look down the left hand side of the table for the reference number (RN) that brought you here from Table 146 on page 629. When you find it, look across to the middle column. This shows the macro operands that affect the way CICS handles automatic installation. Your MODEENT macro entries for devices to be installed must match what is specified there. Any MODEENT macro entries not shown in the table, such as PSERVIC for some reference numbers, are not tested by CICS. Any bit settings that do not matter to CICS during bind analysis for autoinstalled terminals appear as periods (.).

Note: Some fields in the PSERVIC data for LUTYPE0, LUTYPE2, and LUTYPE3 devices have values that depend on the ALTSCREEN and DEFSCREEN characteristics of the device. For this reason, you have to consult “PSERVIC screen size values for LUTYPE0, LUTYPE2, and LUTYPE3 devices” on page 636 to find out the values you need to specify instead of aaaaaaaa, bbbbbbbb, cccccccc, dddddddd, and eeeeeeee.

The right-hand column in the table names entries in the CICS-supplied LOGON mode table that could meet your needs. The CICS-supplied table is called ISTINCLM. For further VTAM information, refer to *VTAM Network Implementation Guide*.

Table 147 (Page 1 of 5). LOGON mode table and ISTINCLM entries

RN	VTAM MODEENT macro entries that are needed for related CICS TYPETERM definitions	Suitable supplied entries

1	FMPROF=X'02'
	TSPROF=X'02'
	PRIPROT=X'70'
	SECPROT=X'40'
	COMPROT=B'0000.000 00000.00'	

2	FMPROF=X'02'
	TSPROF=X'02'
	PRIPROT=X'71'
	SECPROT=X'40'
	COMPROT=B'0010.000 00000.00'
		DSILGMOD
		D4B32781
		D4B32782
		D4B32783
		D4B32784
		D4B32785
		NSX32702
		S3270

Table 147 (Page 2 of 5). LOGON mode table and ISTINCLM entries

RN	VTAM MODEENT macro entries that are needed for related CICS TYPETERM definitions	Suitable supplied entries

3	FMPROF=X'04'
	TSPROF=X'04'
	PRIPROT=X'B0'
	SECPROT=X'B0'
	COMPROT=B'0000.000 00000.00'	

4	FMPROF=X'04'
	TSPROF=X'03'
	PRIPROT=X'B0'
	SECPROT=X'90'
	COMPROT=B'0100.000 00000.00'	

5	FMPROF=X'04'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'90'
	COMPROT=B'0110.000 00000.00'	

6	FMPROF=X'04'
	TSPROF=X'04'
	PRIPROT=X'31'
	SECPROT=X'30'
	COMPROT=B'0110.000 00000.00'
		INTRUSER

7	FMPROF=X'04'
	TSPROF=X'04'
	PRIPROT=X'B0'
	SECPROT=X'30'
	COMPROT=B'0100.000 00000.00'	

8	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'90'
	COMPROT=B'0011.000 01000.00'
	PSERVIC=B'00000001 00000000 00000000 0000000.
	. . . . 00000000 00000000 00000000
	00000000 . . . . 00000000 00000000'	

9	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'90'
	COMPROT=B'0011.000 10000.00'
	PSERVIC=B'00000001 00000000 00000000 0000000.
	. . . . 00000000 00000000 00000000
	00000000 . . . . 00000000 00000000'
		SCS

10	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'90'
	COMPROT=B'0011.000 01000.00'
	PSERVIC=X'01'	

Table 147 (Page 3 of 5). LOGON mode table and ISTINCLM entries

RN	VTAM MODEENT macro entries that are needed for related CICS TYPETERM definitions	Suitable supplied entries

11	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'90'
	COMPROT=B'0011.000 10000.00'
	PSERVIC=X'01'
		SCS
		
		See note 2

12	FMPROF=X'07'
	TSPROF=X'07'
	PRIPROT=X'B1'
	SECPROT=X'B0'
	COMPROT=B'0101.000 10000.01'
	PSERVIC=B'00000100 10101000 01000000 10100000
	. . . . 10101000 01000000 10100000
	00000000 . . . . 00001100 00000000'	

13	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'B0'
	COMPROT=B'0011.000 10000.00'
	PSERVIC=X'01'
		SCS3790
		
		See note 2

14	FMPROF=X'03'
	TSPROF=X'04'
	PRIPROT=X'B1'
	SECPROT=X'B0'
	COMPROT=B'0111.000 10000.00'
	PSERVIC=B'00000001 00110001 00011000 0100000.
	. . . . 00000000 10010010 00000000
	00000000 . . . . 00000000 01010000'	

15	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'B0'
	COMPROT=B'0111.000 10000.00'
	PSERVIC=B'00000001 00110001 00001100 0111000.
	. . . . 00000000 11010010 00000000
	00000000 . . . . 00000000 11010000'	

16	FMPROF=X'04'
	TSPROF=X'04'
	PRIPROT=X'B1'
	SECPROT=X'B0'
	COMPROT=B'0111.000 10000.00'
		See note 3

17	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=X'90'
	COMPROT=B'0111.000 10000.00'
	PSERVIC=B'00000001 00100000 00000000 0000000.
	. . . . 00000000 11000010 00000000
	00000000 . . . . 00000000 11000000'	

Table 147 (Page 4 of 5). LOGON mode table and ISTINCLM entries

RN	VTAM MODEENT macro entries that are needed for related CICS TYPETERM definitions	Suitable supplied entries

18	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=B'10..0000'
	COMPROT=B'0011.000 10000.00'
	PSERVIC=B'00000010 10000000 00000000 00000000
	00000000 00000000 aaaaaaaa bbbbbbbb
	cccccccc dddddddd eeeeeeee'
		D329001
		D4A32771
		D4A32772
		D4A32781
		D4A32782
		D4A32783
		D4A32784
		D4A32785
		D4C32771
		D4C32772
		D4C32781
		D4C32782
		D4C32783
		D4C32784
		D4C32785
		D6327801
		D6327802
		D6327803
		D6327804
		D6327805
		EMUDPCX
		EMU3790
		SNX32702
		
		See note 1

19	FMPROF=X'03'
	TSPROF=X'03'
	PRIPROT=X'B1'
	SECPROT=B'10..0000'
	COMPROT=B'0011.000 10000.00'
	PSERVIC=B'00000011 10000000 00000000 00000000
	00000000 00000000 aaaaaaaa bbbbbbbb
	cccccccc dddddddd eeeeeeee'
		BLK3790
		DSC2K
		DSC4K
		D6328902
		D6328904
		
		See note 1

20	FMPROF=X'04'
	TSPROF=X'03'
	PRIPROT=X'31'
	SECPROT=X'B0'
	COMPROT=B'0111.000'	

21	FMPROF=X'04'
	TSPROF=X'04'
	PRIPROT=X'50'
	SECPROT=X'10'
	COMPROT=B'0000.000 00000.00'	

22	FMPROF=X'04'
	TSPROF=X'04'
	PRIPROT=X'B0'
	SECPROT=X'B0'
	COMPROT=B'0100.000 00000.00'
		IBMS3650

Table 147 (Page 5 of 5). LOGON mode table and ISTINCLM entries

RN	VTAM MODEENT macro entries that are needed for related CICS TYPETERM definitions	Suitable supplied entries

23	FMPROF=X'04'
	TSPROF=X'04'
	PRIPROT=X'B1'
	SECPROT=X'B0'
	COMPROT=B'0111.000 00000.00'	

24	TYPE=X'00'
	FMPROF=X'13'
	TSPROF=X'07'
	PRIPROT=X'B0'
	SECPROT=X'B0'
	COMPROT=B'101.000 10110.01'
	PSERVIC='00000110 00000010
	. . . . 00000000 00000000 00000000
	. . . . 00000000 00000000 00000000
	. . . . 0010..00 00000000'	

Notes:

1. PSERVIC (RN 18 and 19): BYTE 2 BIT 0 should be set on where extended data stream (EXTDS) support is required.
2. RN 11 or 13 is used to determine the MODEENT macro operands for device SCSPRINT. However, if you have specified any of the attributes EXTENDEDDS, COLOR, PROGSYMBOLS, HILIGHT, SOSI, OUTLINE, QUERY(COLD), or QUERY(ALL) for the TYPETERM, then the COMPROT parameter of RN 13 should be modified to read COMPROT=B'0111.000 10000.00'.
3. This LOGMODE may be used for either device type 4700 in half duplex mode or device types BCHLU, 3770, 3770B and 3790 with SESSIONTYPE(USERPROG). To enable these devices to be autoinstalled with the correct model, the model names list supplied to the autoinstall exit will list the names of models defined as DEVICE(3600) after the names of all other eligible models. The exit can be coded to select a name from the end of the list for a 4700 half duplex device.

PSERVIC screen size values for LUTYPE0, LUTYPE2, and LUTYPE3 devices

Table 148 is to help you decide what screen size values you should specify on the PSERVIC operand of the VTAM MODEENT macro, for LUTYPE0, LUTYPE2, and LUTYPE3 devices.

If, on your CICS TYPETERM definition, you code the values shown in columns 1 through 4 of Table 148, the screen size values in the CICS model bind image are as shown in column 5. The values you code for screen sizes on the PSERVIC operand must match this.

Table 148. Autoinstall model device definition options

Device-type	DEFSCRN	ALTSCRN	QUERY	MODEL BIND
0,2,3	00,00	?	?	INVALID
0,2,3	12,40	,	?	0000000001
0,2,3	12,40	00,00	?	0C2800007E
0,2,3	12,40	YY,YY	?	0C28YYYY7F
0,2,3	24,80	,	NO	0000000002
3	24,80	,	COLD/ALL	0000000002
0,2	24,80	,	COLD/ALL	0000000003
0,2,3	24,80	00,00	?	185000007E
0,2,3	24,80	YY,YY	?	1850YYYY7F
0,2,3	XX,XX	,	?	XXXX00007E
0,2,3	XX,XX	00,00	?	XXXX00007E
0,2,3	XX,XX	YY,YY	?	XXXXYYYY7F

Where:

0	=	Local non-SNA 3270
2	=	LUTYPE2
3	=	LUTYPE3
,	=	Blanks (the default)
XX,XX	=	A screen size that is not 12,40 or 24,80
YY,YY	=	A screen size that is not 00,00 or blanks
?	=	Any (that is, QUERY=ALL|COLD|NO, and ALTSCRN=any)

CICS treats some differently-coded PSERVIC screen size specifications as equivalent. See Table 149 on page 637.

Table 149. Equivalent PSERVIC screen size values

Bytes 20—24 of CICS model bind	Valid screen size values on PSERVIC definition
0000 0000 01	0000 0000 00 0000 0000 01 0C28 0000 7E
0000 0000 02	0000 0000 00 0000 0000 02 1850 0000 7E

0000 0000 03	0000 0000 00
	0000 0000 03
	1850 0000 03

xxxx 0000 7E Plus, if xxxx=1850	0000 0000 00 xxxx 0000 7E 0000 0000 02
xxxx yyyy 7F	0000 0000 00 xxxx yyyy 7F

Where:
xxxx = 2 bytes containing the default screen size, in hexadecimal
yyyy = 2 bytes containing the alternate screen size, in hexadecimal

Matching models and LOGON mode entries

This section contains a set of VTAM LOGON mode table definitions, and their matching CICS autoinstall definitions. Each entry consists of a VTAM logmode definition, the matching CICS TYPETERM and model TERMINAL definitions, and (for information) the BIND that CICS sends based on the specified model definition.

Note that the CICS-specific attributes are purely arbitrary. Only device attributes affect the match algorithm. It is the responsibility of the autoinstall user program to distinguish between matching models.

```
*****************************************************************
1) LOCAL NON-SNA 3277 / 3278 / 3279 (without special features)
*****************************************************************
MT32772  MODEENT LOGMODE=MT32772,  3277/8      MODEL 2
               TYPE=1,
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               PSERVIC=X'000000000000000000000200'
        OR
               PSERVIC=X'00000000000018502B507F00' Others
        OR
               PSERVIC=X'000000000000185000007E00' Model 2, no Altscreen
```

```
TERMINAL definition
************************
AUTINSTNAME   ==> M3278A
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3278
INSERVICE     ==> YES

TYPETERM definition
************************
TYPETERM      ==> T3278
GROUP         ==> PDATD
DEVICE        ==> 3270
TERMMODEL     ==> 2
LIGHTPEN      ==> YES
AUDIBLEALARM  ==> YES
UCTRAN        ==> YES
IOAREALEN     ==> 2000,2000
ERRLASTLINE   ==> YES
ERRINTENSIFY  ==> YES
USERAREALEN   ==> 32
ATI           ==> YES
TTI           ==> YES
AUTOCONNECT   ==> NO
LOGONMSG      ==> YES

BIND SENT BY CICS depends on PSERVIC value on LOGMODE definition above:
EITHER            :    01020271 40200000 00000080 00000000
                       00000000 00000002 00009300 00300000
OR                :    01020271 40200000 00000080 00000000
                       00000018 502B507F 00009300 00300000
OR                :    01020271 40200000 00000080 00000000
Real Model 2           00000018 5000007E 00009300 00300000

*****************************************************************
2) LOCAL SNA 3277/78/79 (without special features) LUTYPE2
*****************************************************************
S32782   MODEENT LOGMODE=S32782,   SNA LUTYPE2 3270
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'3080',
               RUSIZES=X'8585',
               PSERVIC=X'028000000000185018507F00'

TERMINAL definition
************************
AUTINSTNAME   ==> M32782
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T32782
INSERVICE     ==> YES
```

```
TYPETERM definition
*************************
TYPETERM      ==> T32782
GROUP         ==> PDATD
DEVICE        ==> LUTYPE2
TERMMODEL     ==> 2
LIGHTPEN      ==> YES
AUDIBLEALARM  ==> YES
UCTRAN        ==> YES
IOAREALEN     ==> 256,256
ERRLASTLINE   ==> YES
ERRINTENSIFY  ==> YES
USERAREALEN   ==> 32
ATI           ==> YES
TTI           ==> YES
LOGONMSG      ==> YES
DISCREQ       ==> YES
RECEIVESIZE   ==> 256
BUILDCHAIN    ==> YES

BIND SENT BY CICS :         010303B1 B0308000 0085C780 00028000
                            00000018 5018507F 00000000 00000000

******************************************************************
3) 3770 BATCH LU (3777)
******************************************************************
BATCH    MODEENT LOGMODE=BATCH,    3770 BATCH
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'7080',
               PSERVIC=X'01310C70E100D20000E100D0'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3770
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3770
INSERVICE     ==> YES
```

```
TYPETERM definition
*************************
TYPETERM      ==> T3770
GROUP         ==> PDATD
DEVICE        ==> 3770
SESSIONTYPE   ==> BATCHDI
PAGESIZE      ==> 12,80
DISCREQ       ==> YES
AUTOPAGE      ==> YES
RECEIVESIZE   ==> 256
SENDSIZE      ==> 256
IOAREALEN     ==> 256,2048
BUILDCHAIN    ==> YES
BRACKET       ==> YES
ATI           ==> YES
TTI           ==> YES
AUTOCONNECT   ==> NO
HORIZFORM     ==> YES
VERTFORM      ==> YES
LDCLIST       ==> LDC2
Needs LDC declaration in TCT :
LDC2   DFHTCT TYPE=LDC,LOCAL=INITIAL
       DFHTCT TYPE=LDC,LDC=BCHLU
       DFHTCT TYPE=LDC,LOCAL=FINAL

BIND SENT BY CICS :          010303B1 B0708000 00000080 0001310C
                             70E100D2 0000E100 D0000000 00000000

*******************************************************************
4) 6670 LUTYPE4
*******************************************************************
S6670    MODEENT LOGMODE=S6670,    6670 LUTYPE4
               TYPE=1,
               FMPROF=X'07',
               TSPROF=X'07',
               RUSIZES=X'8585',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'5081',
               PSERVIC=X'04A840A000A840A000000C00'

TERMINAL definition
*************************
AUTINSTNAME   ==> M6670
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T6670
INSERVICE     ==> YES
```

```
TYPETERM definition
*************************
TYPETERM      ==> T6670
GROUP         ==> PDATD
DEVICE        ==> LUTYPE4
BUILDCHAIN    ==> YES
DISCREQ       ==> YES
RECEIVESIZE   ==> 256
UCTRAN        ==> YES
IOAREALEN     ==> 256,4096
FORMFEED      ==> YES
HORIZFORM     ==> YES
VERTFORM      ==> YES
ATI           ==> YES
TTI           ==> YES
PAGESIZE      ==> 50,80
AUTOPAGE      ==> YES
LOGONMSG      ==> NO
LDCLIST       ==> LDC1

Needs LDC declaration in TCT :
LDCS     DFHTCT TYPE=LDC,LDC=SYSTEM
LDC1     DFHTCT TYPE=LDC,LOCAL=INITIAL
         DFHTCT TYPE=LDC,DVC=(BLUCON,01),PROFILE=DEFAULT,LDC=PC,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(BLUPRT,02),PROFILE=BASE,LDC=PP,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(BLUPRT,08),PROFILE=BASE,LDC=P8,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(BLUPRT,08),PROFILE=DEFAULT,LDC=DP,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(BLUPCH,03),PROFILE=JOB,LDC=PM,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(BLUPCH,03),PROFILE=DEFAULT,LDC=DM,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(WPMED1,04),PROFILE=WPRAW,LDC=P1,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(WPMED1,04),PROFILE=DEFAULT,LDC=D1,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(WPMED2,05),PROFILE=OII1,LDC=P2,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(WPMED2,05),PROFILE=DEFAULT,LDC=D2,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(WPMED3,06),PROFILE=OII2,LDC=P3,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,DVC=(WPMED4,07),PROFILE=OII3,LDC=P4,
               PGESIZE=(50,80),PGESTAT=AUTOPAGE
         DFHTCT TYPE=LDC,LOCAL=FINAL

BIND SENT BY CICS :         010707B1 B0508100 00858580 0004A840
                            A000A840 A000000C 00000000 00000000
```

```
*****************************************************************
5) 3790 FULL FUNCTION LU
*****************************************************************
S3790A   MODEENT LOGMODE=S3790A,   3790 FULL FUNCTION LU
               TYPE=1,
               FMPROF=X'04',
               TSPROF=X'04',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               RUSIZES=X'8585',
               COMPROT=X'7080'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3790A
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3790A
INSERVICE     ==> YES

TYPETERM definition
*************************
TYPETERM      ==> T3790A
GROUP         ==> PDATD
DEVICE        ==> 3790
SENDSIZE      ==> 256
RECEIVESIZE   ==> 256
SESSIONTYPE   ==> USERPROG
BRACKET       ==> YES
IOAREALEN     ==> 256
ATI           ==> YES
TTI           ==> YES

BIND SENT BY CICS :          010404B1 B0708000 00858580 00000000

*****************************************************************
6) 3790 BATCH DATA INTERCHANGE
*****************************************************************
S3790B   MODEENT LOGMODE=S3790B,   3790 BATCH
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'04',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'7080',
               RUSIZES=X'8585',
               PSERVIC=X'013118400000920000E10050'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3790B
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3790B
INSERVICE     ==> YES
TERMPRIORITY  ==> 50
```

```
TYPETERM definition
*************************
TYPETERM      ==> T3790B
GROUP         ==> PDATD
DEVICE        ==> 3790
SESSIONTYPE   ==> BATCHDI
AUTOPAGE      ==> YES
BUILDCHAIN    ==> YES
OBOPERID      ==> YES
IOAREALEN     ==> 256,2048
RELREQ        ==> YES
SENDSIZE      ==> 256
RECEIVESIZE   ==> 256
ATI           ==> YES
TTI           ==> YES
LDCLIST       ==> LDC2

Needs LDC declaration in TCT :
LDC2   DFHTCT TYPE=LDC,LOCAL=INITIAL
       DFHTCT TYPE=LDC,LDC=BCHLU
       DFHTCT TYPE=LDC,LOCAL=FINAL

BIND SENT BY CICS :          010304B1 B0708000 00858580 00013118
                             40000092 0000E100 50000000 00000000

*******************************************************************
7) 3790 SCSPRT
*******************************************************************
S3790C   MODEENT LOGMODE=S3790C,   3790 WITH SCS
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'3080',
               RUSIZES=X'8585',
               PSERVIC=X'010000000000000000000000'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3790C
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3790C
INSERVICE     ==> YES

TYPETERM definition
*************************
TYPETERM      ==> T3790C    Note that CEDA changes DEVICE=3790,
GROUP         ==> PDATD     SESSIONTYPE=SCSPRT to DEVICE=SCSPRINT,
DEVICE        ==> 3790      SESSIONTYPE=blanks, PRINTERTYPE=3284.
SESSIONTYPE   ==> SCSPRT
BRACKET       ==> YES
SENDSIZE      ==> 256
RECEIVESIZE   ==> 256
ATI           ==> YES
TTI           ==> YES

BIND SENT BY CICS :          010303B1 B0308000 00858580 00010000
```

```
*****************************************************************
8) 3767 INTERACTIVE (FLIP-FLOP) LU
*****************************************************************
S3767    MODEENT LOGMODE=S3767,    3767 INTERACTIVE
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               PSERVIC=X'010000000000000000000000'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3767
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TERMPRIORITY  ==> 60
TYPETERM      ==> T3767
INSERVICE     ==> YES

TYPETERM definition
*************************
TYPETERM      ==> T3767
GROUP         ==> PDATD
DEVICE        ==> 3767
VERTFORM      ==> YES
HORIZFORM     ==> YES
RELREQ        ==> YES
DISCREQ       ==> YES
IOAREALEN     ==> 256
AUTOPAGE      ==> NO
PAGESIZE      ==> 12,80
ATI           ==> YES
TTI           ==> YES
BRACKET       ==> YES
RECEIVESIZE   ==> 256
SENDSIZE      ==> 256

BIND SENT BY CICS :          010303B1 90308000 00000080 00010000

*****************************************************************
9) 3650 INTERPRETER LU
     (SESTYPE = USERPROG  BRACKET = YES)
*****************************************************************
S3650A   MODEENT LOGMODE=S3650A,   3650 SESTYPE=USERPROG
               TYPE=1,             BRACKET=YES
               FMPROF=X'04',
               TSPROF=X'04',
               PRIPROT=X'31',
               SECPROT=X'30',
               COMPROT=X'6000'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3650A
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3650A
INSERVICE     ==> YES
```

```
TYPETERM definition
*************************
TYPETERM      ==> T3650A
GROUP         ==> PDATD
DEVICE        ==> 3650
SESSIONTYPE   ==> USERPROG
ROUTEDMSGS    ==> SPECIFIC
FMHPARM       ==> YES
RELREQ        ==> YES
DISCREQ       ==> YES
BRACKET       ==> YES
RECEIVESIZE   ==> 256
IOAREALEN     ==> 256,256
ATI           ==> YES
TTI           ==> YES
AUTOCONNECT   ==> NO

BIND SENT BY CICS :         01040431 30600000 00000080 00000000

*****************************************************************
10) 3650 HOST CONVERSATIONAL (3270) LU
*****************************************************************
S3650B   MODEENT LOGMODE=S3650B,   3650 SESTYPE=3270
               TYPE=1,             AND SESTYPE=3653
               FMPROF=X'04',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'6000'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3650B1
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3650B1
INSERVICE     ==> YES

TYPETERM definition
*************************
TYPETERM      ==> T3650B1
GROUP         ==> PDATD
DEVICE        ==> 3650
OBFORMAT      ==> YES
SESSIONTYPE   ==> 3270
RELREQ        ==> YES
DISCREQ       ==> YES
IOAREALEN     ==> 256
BRACKET       ==> YES
RECEIVESIZE   ==> 240
ATI           ==> NO
TTI           ==> YES

BIND SENT BY CICS :         010403B1 90600000 00000080 00000000
```

```
******************************************************************
11) 3650 HOST CONVERSATIONAL (3653) LU
     (N.B. LOGMODE SAME AS HC (3270) LU)
******************************************************************
S3650B   MODEENT LOGMODE=S3650B,   3650 SESTYPE=3270
               TYPE=1,             AND SESTYPE=3653
               FMPROF=X'04',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'6000'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3650B2
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3650B2
INSERVICE     ==> YES

TYPETERM definition
*************************
TYPETERM      ==> T3650B2
GROUP         ==> PDATD
DEVICE        ==> 3650
SESSIONTYPE   ==> 3653
RELREQ        ==> YES
DISCREQ       ==> NO
BRACKET       ==> YES
IOAREALEN     ==> 256
RECEIVESIZE   ==> 240
ROUTEDMSGS    ==> NONE
ATI           ==> NO
TTI           ==> YES

BIND SENT BY CICS :          010403B1 90600000 00000080 00000000

******************************************************************
12) 3650 HOST COMMAND PROCESSOR LU
     (SESTYPE = USERPROG  BRACKET = NO)
******************************************************************
S3650C   MODEENT LOGMODE=S3650C,   3650 SESTYPE=USERPROG
               TYPE=1,             BRACKET=NO
               FMPROF=X'04',
               TSPROF=X'04',
               PRIPROT=X'B0',
               SECPROT=X'30',
               COMPROT=X'4000'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3650C
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3650C
INSERVICE     ==> YES
```

```
TYPETERM definition
*************************
TYPETERM      ==> T3650C
GROUP         ==> PDATD
DEVICE        ==> 3650
SESSIONTYPE   ==> USERPROG
BRACKET       ==> NO
RELREQ        ==> NO
DISCREQ       ==> NO
RECEIVESIZE   ==> 256
IOAREALEN     ==> 256
ATI           ==> YES
TTI           ==> YES

BIND SENT BY CICS :          01040430 30400000 00000080 00000000

*****************************************************************
13) 8815 SCANMASTER (APPC SINGLE SESSION)
*****************************************************************
SIN62  MODEENT LOGMODE=SIN62,      8815 SCANMASTER.
               TYPE=0,
               FMPROF=X'13',
               TSPROF=X'07',
               PRIPROT=X'B0',
               SECPROT=X'B0',
               COMPROT=X'50B1',
               PSNDPAC=X'00',
               SRCVPAC=X'00',
               SSNDPAC=X'00',
               RUSIZES=X'8585',
               PSERVIC=X'060200000000000000002C00'

TERMINAL definition
*************************
AUTINSTNAME  ==> MLU62
AUTINSTMODEL ==> ONLY
GROUP        ==> PDATD
TYPETERM     ==> SINLU62
INSERVICE    ==> YES

TYPETERM definition
*************************
TYPETERM     ==> SINLU62
GROUP        ==> PDATD
DEVICE       ==> APPC
RECEIVESIZE  ==> 2048
SENDSIZE     ==> 2048
ATI          ==> YES
TTI          ==> YES
Note: There is no RDO keyword equivalent of the MACRO
keyword 'FEATURE=SINGLE', because this is assumed with
RDO DEFINE TYPETERM when DEVICE=APPC.

BIND SENT BY CICS :          001307B0 B050B100 00858580 00060200
                             00000000 0000002C 00000800 00000000
                             0000001D 00090240 40404040 40404009
                             03006765 71D98A6C 300704C3 C9C3E2E6
                             F1000000 00000000 00000000 00000000
```

```
******************************************************************
14) 3290 (SDLC)
******************************************************************
S3290    MODEENT LOGMODE=S3290,    3290 SDLC
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'8787',
               PSERVIC=X'028000000000018503EA07F00'

TERMINAL definition
*************************
AUTINSTNAME   ==> M3290
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TYPETERM      ==> T3290
INSERVICE     ==> YES

TYPETERM definition
*************************
TYPETERM      ==> T3290
GROUP         ==> PDATD
DEVICE        ==> LUTYPE2
TERMMODEL     ==> 2
ALTSCREEN     ==> 62,160
DEFSCREEN     ==> 24,80
AUDIBLEALARM  ==> YES
UCTRAN        ==> YES
IOAREALEN     ==> 2000,2000
ERRLASTLINE   ==> YES
ERRINTENSIFY  ==> YES
USERAREALEN   ==> 32
ATI           ==> YES
TTI           ==> YES
LOGONMSG      ==> YES
ERRHILIGHT    ==> BLINK
RECEIVESIZE   ==> 1024

BIND SENT BY CICS :          010303B1 90308000 00878780 00028000
                             00000018 503EA07F 00000000 00000000

******************************************************************
15) 3601 WITH A 3604 ATTACHED
******************************************************************
S3600    MODEENT LOGMODE=S3600,    3601
               TYPE=1,
               FMPROF=X'04',
               TSPROF=X'04',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'7000',
               RUSIZES=X'0000'
```

```
TERMINAL definition
*************************
AUTINSTNAME   ==> M3600
AUTINSTMODEL  ==> ONLY
GROUP         ==> PDATD
TERMPRIORITY  ==> 50
TYPETERM      ==> T3600
INSERVICE     ==> YES

TYPETERM definition
*************************
TYPETERM      ==> T3600
GROUP         ==> PDATD
DEVICE        ==> 3600
AUTOPAGE      ==> NO
PAGESIZE      ==> 6,40
RELREQ        ==> YES
DISCREQ       ==> NO
IOAREALEN     ==> 256
SENDSIZE      ==> 224
RECEIVESIZE   ==> 256
USERAREALEN   ==> 100
ATI           ==> NO
TTI           ==> YES
BRACKET       ==> YES
LDCLIST       ==> BMSLLDC1

Needs LDC declaration in TCT :
BMSLLDC1 DFHTCT TYPE=LDCLIST,
                LDC=(DS,JP,PB=5,LP,MS)
         DFHTCT TYPE=LDC,
                LDC=(DS=1),
                DVC=3604,
                PGESIZE=(6,40),
                PGESTAT=PAGE
         DFHTCT TYPE=LDC,LDC=SYSTEM

BIND SENT BY CICS :          010404B1 B0700000 00000080 00000000
```

LOGON mode definitions for CICS-supplied autoinstall models

This section contains VTAM LOGON mode table definitions that match the CICS-supplied TYPETERM and model TERMINAL definitions for autoinstall. The first six entries are example definitions; that is, they are not supplied with VTAM.

```
DFHLU3   MODEENT LOGMODE=DFHLU3,   LU TYPE 3 PRINTER.
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'3080',
               RUSIZES=X'8585',
               PSERVIC=X'038000000000000000000200'
```

```
DFHSCSP  MODEENT LOGMODE=DFHSCSP,  LU TYPE 1 SCS PRINTER
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'7080',
               RUSIZES=X'8585',
               PSERVIC=X'01000001000000000000000'
DFHLU62T MODEENT LOGMODE=DFHLU62T, APPC SINGLE-SESSION
               TYPE=0,
               FMPROF=X'13',
               TSPROF=X'07',
               PRIPROT=X'B0',
               SECPROT=X'B0',
               COMPROT=X'50B1',
               RUSIZES=X'8888',
               PSERVIC=X'0602000000000000000002C00'
DFH3270  MODEENT LOGMODE=DFH3270,  3270
               TYPE=1,
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               RUSIZES=X'0000'
DFH3270P MODEENT LOGMODE=DFH3270P, 3284/3286 BISYNC 3270P (QUERY)
               TYPE=1,
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               RUSIZES=X'0000'
DFHLU2   MODEENT LOGMODE=DFHLU2,   SNA LUTYPE2 3270
               TYPE=1,
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'B0',
               COMPROT=X'3080',
               RUSIZES=X'85C7',
               PSERVIC=X'028000000000000000000300'
```

The following entries are those LOGMODE definitions supplied by VTAM that match CICS-supplied TYPETERM definitions.

```
DFHLU0E2 MODEENT LOGMODE=NSX32702,  LU0 model 2 queryable
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               RUSIZES=X'0000',
               PSERVIC=X'008000000000185000007E00'
```

```
DFHLU0M2 MODEENT LOGMODE=D4B32782,  LU0 model 2 nonqueryable
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               RUSIZES=X'0000',
               PSERVIC=X'000000000000185000007E00'

DFHLU0M3 MODEENT LOGMODE=D4B32783,  LU0 model 3 nonqueryable
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               RUSIZES=X'0000',
               PSERVIC=X'000000000000185020507F00'

DFHLU0M4 MODEENT LOGMODE=D4B32784,  LU0 model 4 nonqueryable
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               RUSIZES=X'0000',
               PSERVIC=X'00000000000018502B507F00'

DFHLU0M5 MODEENT LOGMODE=D4B32785,  LU0 model 5 nonqueryable
               FMPROF=X'02',
               TSPROF=X'02',
               PRIPROT=X'71',
               SECPROT=X'40',
               COMPROT=X'2000',
               RUSIZES=X'0000',
               PSERVIC=X'00000000000018501B847F00'

DFHLU2E2 MODEENT LOGMODE=SNX32702,  LU2 model 2 queryable
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'87F8',
               PSERVIC=X'028000000000185000007E00'

DFHLU2E3 MODEENT LOGMODE=SNX32703,  LU2 model 3 queryable
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'87F8',
               PSERVIC=X'028000000000185020507F00'
```

```
DFHLU2E4 MODEENT LOGMODE=SNX32704,  LU2 model 4 queryable
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'87F8',
               PSERVIC=X'0280000000018502B507F00'
DFHLU2M2 MODEENT LOGMODE=D4A32782,  LU2 model 2 nonqueryable
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'87C7',
               PSERVIC=X'020000000000185000007E00'
DFHLU2M3 MODEENT LOGMODE=D4A32783,  LU2 model 3 nonqueryable
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'87C7',
               PSERVIC=X'020000000000185020507F00'
DFHLU2M4 MODEENT LOGMODE=D4A32784,  LU2 model 4 nonqueryable
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'87C7',
               PSERVIC=X'02000000000018502B507F00'
DFHLU2M5 MODEENT LOGMODE=D4A32785,  LU2 model 5 nonqueryable
               FMPROF=X'03',
               TSPROF=X'03',
               PRIPROT=X'B1',
               SECPROT=X'90',
               COMPROT=X'3080',
               RUSIZES=X'87C7',
               PSERVIC=X'02000000000018501B847F00'
```

Appendix B. Default actions of the node abnormal condition program

This appendix describes the default actions of the node abnormal condition program, DFHZNAC. The actions vary, depending on the terminal error code and system sense codes received from VTAM. In most cases, DFHZNAC issues messages and sets one or more “action flags” in the communication area passed to the node error program, DFHZNEP. DFHZNEP then has the opportunity to change the default actions (though not the messages) by setting or resetting flags. (Note, however, that in some circumstances, the actions actually taken can vary from the actions set, depending on the state of the node at the time of the error.)

For more information about DFHZNAC and DFHZNEP, see Chapter 9, “Writing a node error program” on page 391.

The appendix is divided into the following sections:

1. **“Default actions for terminal error codes”**
2. **“CICS messages associated with VTAM errors”** on page 659
3. **“Default actions for system sense codes”** on page 665
4. **“Action flag settings and meanings”** on page 667

Default actions for terminal error codes

Terminal error codes from VTAM are put in a 1-byte field (TWAEC) of the communications area passed to DFHZNEP.

Table 150 shows the message issued and action flags set by DFHZNAC for each terminal error code.

For error codes with CICS messages associated with them, see the *VSE/ESA Messages and Codes Volume 3* manual for descriptions of the corresponding error conditions.

The figures in the “**Action flags set**” column are translated into bit settings and explained in Table 153 on page 667.

Table 150 (Page 1 of 7). Messages issued and flags set by DFHZNAC for specific error codes

Error code	Symbolic label	Message	Action flags set
X'10'	TCZSRCTU	DFHZC2405	18
X'11'	TCZSRCBF	DFHZC2403	2 5 18 24
X'13'	TCZSRCVH	DFHZC2416	18 24
X'14'	TCZLRCER	DFHZC2404	2 3 9 10 11 23 24
X'15'	TCZSRCPF	DFHZC2407	2 3 9 10 11 24
X'16'	TCZDMIT	DFHZC3492	None
X'18'	TCZLRCNR	DFHZC2404	2 3 9 10 11 23 24
X'19'	TCZSRCTS	DFHZC2406	9 10 11 18

Table 150 (Page 2 of 7). Messages issued and flags set by DFHZNAC for specific error codes

Error code	Symbolic label	Message	Action flags set
X'1A'	TCZSRCVE	DFHZC2408	2 3 9 10 11 18 24
X'1D'	TCZSRCVI	DFHZC2417	2 24
X'1E'	TCZSRCV2	DFHZC2408	2 3 9 10 11 24
X'20'	TCZVTAMI	DFHZC2417	None
X'21'	TCZLUCF1	DFHZC4902	3 9 10 11 22 24
X'22'	TCZLUCF2	DFHZC4903	3 9 10 11 22 24
X'23'	TCZFSMBE	DFHZC4904	3 9 10 11 22 24
X'24'	TCZFSMCS	DFHZC4905	3 9 10 11 22 24
X'25'	TCZFSMCR	DFHZC4906	3 9 10 11 24
X'26'	TCZSDLER	DFHZC4907	3 9 10 11 24
X'28'	TCZRVLER	DFHZC4909	3 9 10 11 24
X'29'	TCZRVLRB	DFHZC4910	3 9 10 11 24
X'2A'	TCZRLPEX	DFHZC4911	2 3 9 10 11 24
X'2B'	TCZRLPBD	DFHZC4912	2 3 9 10 11 22 24
X'2C'	TCZRLPDR	DFHZC4913	2 3 9 10 11 24
X'2D'	TCZRLPIL	DFHZC4914	2 3 9 10 11 22 24
X'2E'	TCZRLPEC	DFHZC4915	2 3 9 10 11 22 24
X'2F'	TCZRLPRR	DFHZC4916	2 3 9 10 11 24
X'30'	TCZRLPIF	DFHZC4917	2 3 9 10 11 24
X'31'	TCZRLPIR	DFHZC4918	2 3 9 10 11 24
X'32'	TCZRLXCL	DFHZC4922	20
X'33'	TCZIVIND	DFHZC4919	2 3 9 10 11 22 24
X'34'	TCZIVDAT	DFHZC4920	2 3 9 10 11 22 24
X'35'	TCZRTMT	DFHZC4930	2 3 9 10 11 24
X'37'	TCZXSHRA	DFHZC3470	9 10 11 24
X'3C'	TCZXUVAR	DFHZC3488	2 3 9 10 11 18 24
X'3D'	TCZXMSG	None	None
X'40'	TCZINCPY	DFHZC2489	3 9 11
X'41'	TCZTOLRQ	DFHZC2490	2 3 9 10 11 15 24
X'42'	TCZUNPRT	DFHZC2497 [1]	None
X'43'	TCZCPYNS	DFHZC2434	3 11
X'44'	TCZSRCDE	DFHZC2456	2 3 9 10 11 18 24
X'45'	TCZCHMX	DFHZC3400	3 10 11 22
X'46'	TCZOCIR	DFHZC3402	3 9 10 11
X'47'	TCZGMMS	None [2]	13
X'48'	TCZOPSIN	DFHZC3461	None
X'49'	TCZCLSIN	DFHZC3462	None

Table 150 (Page 3 of 7). Messages issued and flags set by DFHZNAC for specific error codes

Error code	Symbolic label	Message	Action flags set
X'4A'	TCZOPACB	DFHZC3463	None
X'4B'	TCZICPUT	DFHZC2498	None
X'4C'	TCZDSPCL	DFHZC3481	2 3 9 10 11 24
X'4E'	TCZUNBFE	DFHZC3479	2 3 9 10 11 24
X'4F'	TCZCNOS0	None	None
X'50'	TCZSDRE3	DFHZC3417	3 9 10 11 24
X'51'	TCZBDPRI	DFHZC3418	3 9 10 11 24
X'52'	TCZBDUAC	DFHZC3419	2 3 5 24
X'53'	TCZBDTOS	DFHZC3420	20
X'54'	TCZUNBIS	DFHZC3434	2 3 9 10 11 24
X'55'	TCZEMWBK	DFHZC3440	None
X'56'	TCZXRFVS	DFHZC6598	None
X'57'	TCZRELIS	DFHZC3464	20
X'58'	TCZERMGR	DFHZC3433	None
X'59'	TCZROCT	DFHZC2443	2 3 9 10 11 24
X'5A'	TCZSBIRV	DFHZC3421	20
X'5B'	TCZNSP01	DFHZC3422	2 3 9 10 11 18 24
X'5C'	TCZNSP02	DFHZC3424	9 10 11 15 24
X'5D'	TCZPRDTO	DFHZC0101	None
X'5E'	TCZBRUAC	DFHZC3454	2 3 5 18 24
X'5F'	TCZBDSQP	DFHZC3455	2 3 5 18 24
X'60'	TCZUNCMD	DFHZC2421	2 3 9 10 11 24
X'62'	TCZVTAMQ	None 3	24
X'63'	TCZVTAMO	DFHZC3441	None
X'64'	TCZVTAMA	DFHZC3443	None
X'65'	TCZINVRR	DFHZC2448	2 3 10 11 22 23 24
X'66'	TCZSIGR	DFHZC3452	None
X'67'	TCZVTAMK	DFHZC3442	None
X'69'	TCZSEXOS	DFHZC3466	20 23
X'6A'	TCZTIOAE	DFHZC3444	1 2 3 9 10 11 23 24
X'6B'	TCZNOTNA	DFHZC3495	24
X'6C'	TCZPSAF	DFHZC0155	3 6 9 10 11 24
X'6D'	TCZPSAR	DFHZC0156	None
X'6F'	TCZSDAS	DFHZC2351	2 3
X'70'	TCZCLRRV	DFHZC3468	9 10 11 15 24
X'71'	TCZPSLE	DFHZC0147	3 6 9 10 11 24
X'72'	TCZPSVF	DFHZC0148	9 10 11 24

Table 150 (Page 4 of 7). Messages issued and flags set by DFHZNAC for specific error codes

Error code	Symbolic label	Message	Action flags set
X'73'	TCZSDSE4	DFHZC2437	3 9 11
X'74'	TCZSDSE5	DFHZC2423	3 9 10 11 24
X'75'	TCZSESE1	DFHZC2424	3 9 10 11 15 24
X'76'	TCZLGNA	DFHZC2487	3
X'77'	TCZDMRY	DFHZC2488	None
X'78'	TCZSDRE2	DFHZC2430	3 9 11 22
X'79'	TCZPSRAF	DFHZC0145	3 6 9 10 11 24
X'7A'	TCZPSRAC	DFHZC0144	11
X'7C'	TCZPSANR	DFHZC0157	3 9 10 11 24
X'7D'	TCZRABUS	DFHZC4949	2 3 9 10 11 24
X'80'	TCZSRCSP	DFHZC2414	None
X'81'	TCZSSXNR	DFHZC2432	None
X'82'	TCZSSXUC	DFHZC2419	2 3 9 10 11 23 24
X'83'	TCZSSXAR	DFHZC2450	None
X'84'	TCZSSXIB	DFHZC2446	2 3 9 10 11 23 24
X'85'	TCZUNEGR	DFHZC3409	2 3 9 10 11 23 24
X'88'	TCZLEXCI	DFHZC2467	2 3 9 10 11 23 24
X'89'	TCZLEXUS	DFHZC2468	2 3 9 10 11 23 24
X'8A'	TCZLUSRR	DFHZC4937	2 3 5 24
X'8B'	TCZLUSRF	DFHZC4938	2 3 5 24
X'8C'	TCZLUPUN	DFHZC4939	2 3 5 24
X'8D'	TCZLUPLK	DFHZC4941	2 3 5 24
X'8E'	TCZLUPEX	DFHZC4942	2 3 5 24
X'8F'	TCZLUSKN	DFHZC4940	2 3 5 24
X'90'	TCZLGCER	DFHZC2422	1 2 3 6 9 10 11 23 24
X'91'	TCZRSTLE	DFHZC2429	3 10 11
X'92'	TCZSDSE6	DFHZC2428	3 9 11
X'93'	TCZRACET	DFHZC2455	2 3 9 10 11 15 22 24
X'94'	TCZRACES	DFHZC2426	2 3 9 10 11 22
X'95'	TCZSDSE8	DFHZC2445	3 9 11
X'96'	TCZRVSZ1	DFHZC2435	3 10 11 24
X'97'	TCZRVSZ3	DFHZC2436	3 10 11
X'98'	TCZACT01	DFHZC2439	2 18
X'99'	TCZSDSE7	DFHZC2459	3 9 11
X'9A'	TCZDOMCF	DFHZC2447	3 9 10 11 23
X'9B'	TCZRACNL	DFHZC2486	3
X'9D'	TCZRSPER	DFHZC3465	1 2 3 9 10 11 23 24

Table 150 (Page 5 of 7). Messages issued and flags set by DFHZNAC for specific error codes

Error code	Symbolic label	Message	Action flags set
X'9E'	TCZDEVND	DFHZC3472	None
X'A0'	TCZNOISC	DFHZC3480	23 24
X'A1'	TCZRVSZ2	DFHZC2438	3 10 11
X'A2'	TCZPRGE	DFHZC4945	3 9 10 11 24
X'A3'	TCZBKTSE	DFHZC2444	2 3 9 10 11 24
X'A7'	TCZBOEB	DFHZC2449	2 3 11 18 22 24
X'A8'	TCZFMHLE	DFHZC2471	2 3 4 10 11 22 24
X'A9'	TCZRACRF	DFHZC2472	11
X'AA'	TCZSDSE9	DFHZC2473	3 9 11
X'AB'	TCZLUERR	DFHZC3470	9 10 11 24
X'AC'	TCZVRDAC	DFHZC3474	9 10 11 24
X'AD'	TCZNRLUF	DFHZC3475	9 10 11 24
X'AE'	TCZRCLUF	DFHZC3476	9 10 11 24
X'AF'	TCZCLEAN	DFHZC3477	9 10 11 24
X'B1'	TCZRPLAC	DFHZC2401	2 3 9 10 11 23 24
X'B2'	TCZSDAUC	DFHZC2425	3 9 10 11 15 24
X'B3'	TCZBDBND	DFHZC4929	2 3 5 24
X'B4'	TCZRSNE	DFHZC2402	3 11
X'B5'	TCZSAXUC	DFHZC2420	2 3 9 10 11 23 24
X'B6'	TCZNSEED	DFHZC4924	2 3 5 24
X'B7'	TCZASINC	DFHZC4925	2 3 5 22 24
X'B8'	TCZEVBAD	DFHZC4926	2 3 5 22 24
X'B9'	TCZFMH12	DFHZC4927	2 3 5 22 24
X'BA'	TCZRACSF	DFHZC2114	11
X'BB'	TCZSEXUC	DFHZC2418	2 3 9 10 11 23 24
X'BC'	TCZINIIR	DFHZC3410	2 3 9 10 11
X'BD'	TCZDESGM	DFHZC4928	24
X'BE'	TCZBFAIL	DFHZC4944	2 3 5 22 24
X'BF'	TCZCPFAL	DFHZC3490	24
X'C0'	TCZDWEGF	DFHZC3499	None
X'C1'	TCZSRCAT	DFHZC2400	2 3 9 10 11 23 24
X'C2'	TCZLUINP	DFHZC3486	24
X'C3'	TCZCPFAL	DFHZC3490	24
X'C5'	TCZSRCNA	DFHZC2427	2
X'C6'	TCZPASSD	DFHZC3484	None
X'C7'	TCZPSPRE	DFHZC3485	24
X'C8'	TCZLUINH	DFHZC3489	18 24

Table 150 (Page 6 of 7). Messages issued and flags set by DFHZNAC for specific error codes

Error code	Symbolic label	Message	Action flags set
X'C9'	TCZNPSAU	DFHZC3487	24
X'CB'	TCZSRCTC	DFHZC2431	2 3 9 10 11
X'CC'	TCZSRCCI	DFHZC2451	2 3 9 10 11
X'CD'	TCZSRCCX	DFHZC2454	2 3 9 10 11
X'CE'	TCZVHOLD	DFHZC3469	9 10 11 24
X'CF'	TCZVRNOP	DFHZC3471	9 10 11 24
X'D0'	TCZTXCS	DFHZC2409	2 3 9 10 11 15 24
X'D1'	TCZTXCU	DFHZC2410	2 3 9 10 11 18 24
X'D3'	TCZDMPD	DFHZC2463	None
X'D4'	TCZCXRR	DFHZC2453	1 2 3 9 10 11
X'D5'	TCZCXE2	DFHZC2452	3 9 10 11 18 24
X'D6'	TCZSXC2	DFHZC2441	None
X'D7'	TCZSXC1	DFHZC2440	None
X'D8'	TCZRNCH	DFHZC2457	2 3 9 10 11 24
X'D9'	TCZYX43	DFHZC2469	2 3 9 10 11
X'DA'	TCZSXC3	DFHZC2470	9 10 11 24
X'DB'	TCZPIPL	DFHZC2117	9 10 11 23 24
X'DC'	TCZPXE1	DFHZC2442	None
X'DD'	TCZPXE2	DFHZC2458	None
X'DF'	TCZDMGF	DFHZC3482	None
X'E0'	TCZDMSN	DFHZC2411	None
X'E1'	TCZDMRA	DFHZC2412	None
X'E2'	TCZDMCL	DFHZC2413	2
X'E3'	TCZCNCL	DFHZC2485	3 9 10 11
X'E4'	TCZAIER	DFHZC2433	None
X'E6'	TCZDMLG	DFHZC2404	None
X'E8'	TCZDMSLE	DFHZC3416	2 3
X'E9'	TCZSTIND	DFHZC2102	3
X'EA'	TCZSTLER	DFHZC3432	2 3
X'EB'	TCZSTRMH	DFHZC3428	3
X'EC'	TCZSTRMM	DFHZC3429	2 3
X'ED'	TCZSTON	DFHZC3430	2 3
X'EF'	TCZSTIN	DFHZC3431	2 3
X'F1'	TCZBDMOD	DFHZC4931	18 24
X'F2'	TCZEXRVT	DFHZC2469	2 3 9 10 11
X'F3'	TCZICTYP	DFHZC4932	2 3 22 24
X'F4'	TCZIDBA	DFHZC4933	2 3 22 24

Table 150 (Page 7 of 7). Messages issued and flags set by DFHZNAC for specific error codes

Error code	Symbolic label	Message	Action flags set
X'F5'	TCZISYNL	DFHZC4934	2 3 22 24
X'F6'	TCZIUOW	DFHZC4935	2 3 22 24
X'F7'	TCZIFMHL	DFHZC4936	2 3 22 24
X'F8'	TCZFSMRB	DFHZC4943	3 9 10 11 24
X'F9'	TCZINVAT	DFHZC4946	2 3 22 24
X'FA'	TCZLUSEC	DFHZC4947	2 3 22 24
X'FB'	TCZPSUNB	DFHZC0125	None
X'FC'	TCZPSOPN	DFHZC0131	None
X'FD'	TCZPSRC	DFHZC0146	None
X'FE'	TCZPSRF	DFHZC0150	3 6 9 10 11 15 24
X'FF'	TCZPSPE	DFHZC0149	None

Notes:

1. See message DFHZC2497 or DFHZC3493, depending on the device type.
2. “Good morning” message to be sent.
3. Cancel task, and close VTAM session owing to quick close or abend.

CICS messages associated with VTAM errors

Table 151 (Page 1 of 6). CICS messages associated with VTAM errors

Message	Symbolic label	Error code	Action flags set
DFHZC0101	TCZPRDTO	X'5D'	None
DFHZC0125	TCZPSUNB	X'FB'	None
DFHZC0131	TCZPSOPN	X'FC'	None
DFHZC0144	TCZPSRAC	X'7A'	11
DFHZC0145	TCZPSRAF	X'79'	3 6 9 10 11 24
DFHZC0146	TCZPSRC	X'FD'	None
DFHZC0147	TCZPSLE	X'71'	3 6 9 10 11 24
DFHZC0148	TCZPSVF	X'72'	9 10 11 24
DFHZC0149	TCZPSPE	X'FF'	None
DFHZC0150	TCZPSRF	X'FE'	3 6 9 10 11 15 24
DFHZC0155	TCZPSAF	X'6C'	3 6 9 10 11 24
DFHZC0156	TCZPSAR	X'6D'	None
DFHZC0157	TCZPSANR	X'7C'	3 9 10 11 24
DFHZC2102	TCZSTIND	X'E9'	3
DFHZC2114	TCZRACSF	X'BA'	11
DFHZC2117	TCZPIPL	X'DB'	9 10 11 23 24

Table 151 (Page 2 of 6). CICS messages associated with VTAM errors

Message	Symbolic label	Error code	Action flags set
DFHZC2351	TCZSDAS	X'6F'	2 3
DFHZC2400	TCZSRCAT	X'C1'	2 3 9 10 11 23 24
DFHZC2401	TCZRPLAC	X'B1'	2 3 9 10 11 23 24
DFHZC2402	TCZRSNE	X'B4'	3 11
DFHZC2403	TCZSRCBF	X'11'	2 5 18 24
DFHZC2404	TCZLRCER	X'14'	2 3 9 10 11 23 24
DFHZC2404	TCZLRCNR	X'18'	2 3 9 10 11 23 24
DFHZC2404	TCZDMLG	X'E6'	None
DFHZC2405	TCZSRCTU	X'10'	18
DFHZC2406	TCZSRCTS	X'19'	9 10 11 18
DFHZC2407	TCZSRCPF	X'15'	2 3 9 10 11 24
DFHZC2408	TCZSRCVE	X'1A'	2 3 9 10 11 18 24
DFHZC2408	TCZSRCV2	X'1E'	2 3 9 10 11 18 24
DFHZC2409	TCZTXCS	X'D0'	2 3 9 10 11 15 24
DFHZC2410	TCZTXCU	X'D1'	2 3 9 10 11 18 24
DFHZC2411	TCZDMSN	X'E0'	None
DFHZC2412	TCZDMRA	X'E1'	None
DFHZC2413	TCZDMCL	X'E2'	2
DFHZC2414	TCZSRCSP	X'80'	None
DFHZC2416	TCZSRCVH	X'13'	18 24
DFHZC2417	TCZSRCVI	X'1D'	2 24
DFHZC2417	TCZVTAMI	X'20'	None
DFHZC2418	TCZSEXUC	X'BB'	2 3 9 10 11 23 24
DFHZC2419	TCZSSXUC	X'82'	2 3 9 10 11 23 24
DFHZC2420	TCZSAXUC	X'B5'	2 3 9 10 11 23 24
DFHZC2421	TCZUNCMD	X'60'	2 3 9 10 11 24
DFHZC2422	TCZLGCER	X'90'	1 2 3 6 9 10 11 23 24
DFHZC2423	TCZSDSE5	X'74'	3 9 10 11 24
DFHZC2424	TCZSESE1	X'75'	3 9 10 11 15 24
DFHZC2425	TCZSDAUC	X'B2'	3 9 10 11 15 24
DFHZC2426	TCZRACES	X'94'	2 3 9 10 11 22
DFHZC2427	TCZSRCNA	X'C5'	2
DFHZC2428	TCZSDSE6	X'92'	3 9 11
DFHZC2429	TCZRSTLE	X'91'	3 10 11
DFHZC2430	TCZSDRE2	X'78'	3 9 11 22
DFHZC2431	TCZSRCTC	X'CB'	2 3 9 10 11
DFHZC2432	TCZSSXNR	X'81'	None
DFHZC2433	TCZAIER	X'E4'	None

Table 151 (Page 3 of 6). CICS messages associated with VTAM errors

Message	Symbolic label	Error code	Action flags set
DFHZC2434	TCZCPYNS	X'43'	3 11
DFHZC2435	TCZRVSZ1	X'96'	3 10 11 24
DFHZC2436	TCZRVSZ3	X'97'	3 10 11
DFHZC2437	TCZSDSE4	X'73'	3 9 11
DFHZC2438	TCZRVSZ2	X'A1'	3 10 11
DFHZC2439	TCZACT01	X'98'	2 18
DFHZC2440	TCZSXC1	X'D7'	None
DFHZC2441	TCZSXC2	X'D6'	None
DFHZC2442	TCZPXE1	X'DC'	None
DFHZC2443	TCZROCT	X'59'	2 3 9 10 11 24
DFHZC2444	TCZBKTSE	X'A3'	2 3 9 10 11 24
DFHZC2445	TCZSDSE8	X'95'	3 9 11
DFHZC2446	TCZSSXIB	X'84'	2 3 9 10 11 23 24
DFHZC2447	TCZDOMCF	X'9A'	3 9 10 11 23
DFHZC2448	TCZINVRR	X'65'	2 3 10 11 22 23 24
DFHZC2449	TCZBOEB	X'A7'	2 3 11 18 22 24
DFHZC2450	TCZSSXAR	X'83'	None
DFHZC2451	TCZSRCCI	X'CC'	2 3 9 10 11
DFHZC2452	TCZCXE2	X'D5'	3 9 10 11 18 24
DFHZC2453	TCZCXRR	X'D4'	1 2 3 9 10 11
DFHZC2454	TCZSRCCX	X'CD'	2 3 9 10 11
DFHZC2455	TCZRACET	X'93'	2 3 9 10 11 15 22 24
DFHZC2456	TCZSRCDE	X'44'	2 3 9 10 11 18 24
DFHZC2457	TCZRNCH	X'D8'	2 3 9 10 11 24
DFHZC2458	TCZPXE2	X'DD'	None
DFHZC2459	TCZSDSE7	X'99'	3 9 11
DFHZC2463	TCZDMPD	X'D3'	None
DFHZC2467	TCZLEXCI	X'88'	2 3 9 10 11 23 24
DFHZC2468	TCZLEXUS	X'89'	2 3 9 10 11 23 24
DFHZC2469	TCZYX43	X'D9'	2 3 9 10 11
DFHZC2469	TCZEXRVT	X'F2'	2 3 9 10 11
DFHZC2470	TCZSXC3	X'DA'	9 10 11 24
DFHZC2471	TCZFMHLE	X'A8'	2 3 4 10 11 22 24
DFHZC2472	TCZRACRF	X'A9'	11
DFHZC2473	TCZSDSE9	X'AA'	3 9 11
DFHZC2485	TCZCNCL	X'E3'	3 9 10 11
DFHZC2486	TCZRACNL	X'9B'	3
DFHZC2487	TCZLGNA	X'76'	3

Table 151 (Page 4 of 6). CICS messages associated with VTAM errors

Message	Symbolic label	Error code	Action flags set
DFHZC2488	TCZDMRY	X'77'	None
DFHZC2489	TCZINCPY	X'40'	3 9 11
DFHZC2490	TCZTOLRQ	X'41'	2 3 9 10 11 15 24
DFHZC2497 [1]	TCZUNPRT	X'42'	None
DFHZC2498	TCZICPUT	X'4B'	None
DFHZC3400	TCZCHMX	X'45'	3 10 11 22
DFHZC3402	TCZOCIR	X'46'	3 9 10 11
DFHZC3409	TCZUNEGR	X'85'	2 3 9 10 11 23 24
DFHZC3410	TCZINIIR	X'BC'	2 3 9 10 11
DFHZC3416	TCZDMSLE	X'E8'	2 3
DFHZC3417	TCZSDRE3	X'50'	3 9 10 11 24
DFHZC3418	TCZBDPRI	X'51'	3 9 10 11 24
DFHZC3419	TCZBDUAC	X'52'	2 3 5 24
DFHZC3420	TCZBDTOS	X'53'	20
DFHZC3421	TCZSBIRV	X'5A'	20
DFHZC3422	TCZNSP01	X'5B'	2 3 9 10 11 18 24
DFHZC3424	TCZNSP02	X'5C'	9 10 11 15 24
DFHZC3428	TCZSTRMH	X'EB'	3
DFHZC3429	TCZSTRMM	X'EC'	2 3
DFHZC3430	TCZSTON	X'ED'	2 3
DFHZC3431	TCZSTIN	X'EF'	2 3
DFHZC3432	TCZSTLER	X'EA'	2 3
DFHZC3433	TCZERMGR	X'58'	None
DFHZC3434	TCZUNBIS	X'54'	2 3 9 10 11 24
DFHZC3440	TCZEMWBK	X'55'	None
DFHZC3441	TCZVTAMO	X'63'	None
DFHZC3442	TCZVTAMK	X'67'	None
DFHZC3443	TCZVTAMA	X'64'	None
DFHZC3444	TCZTIOAE	X'6A'	1 2 3 9 10 11 23 24
DFHZC3452	TCZSIGR	X'66'	None
DFHZC3454	TCZBRUAC	X'5E'	2 3 5 18 24
DFHZC3455	TCZBDSQP	X'5F'	2 3 5 18 24
DFHZC3461	TCZOPSIN	X'48'	None
DFHZC3462	TCZCLSIN	X'49'	None
DFHZC3463	TCZOPACB	X'4A'	None
DFHZC3464	TCZRELIS	X'57'	20
DFHZC3465	TCZRSPER	X'9D'	1 2 3 9 10 11 23 24
DFHZC3466	TCZSEXOS	X'69'	20 23

Table 151 (Page 5 of 6). CICS messages associated with VTAM errors

Message	Symbolic label	Error code	Action flags set
DFHZC3468	TCZCLRRV	X'70'	9 10 11 15 24
DFHZC3469	TCZVHOLD	X'CE'	9 10 11 24
DFHZC3470	TCZXSHRA	X'37'	9 10 11 24
DFHZC3470	TCZLUERR	X'AB'	9 10 11 24
DFHZC3471	TCZVRNOP	X'CF'	9 10 11 24
DFHZC3472	TCZDEVND	X'9E'	None
DFHZC3474	TCZVRDAC	X'AC'	9 10 11 24
DFHZC3475	TCZNRLUF	X'AD'	9 10 11 24
DFHZC3476	TCZRCLUF	X'AE'	9 10 11 24
DFHZC3477	TCZCLEAN	X'AF'	9 10 11 24
DFHZC3479	TCZUNBFE	X'4E'	2 3 9 10 11 24
DFHZC3480	TCZNOISC	X'A0'	23 24
DFHZC3481	TCZDSPCL	X'4C'	2 3 9 10 11 24
DFHZC3482	TCZDMGF	X'DF'	None
DFHZC3484	TCZPASSD	X'C6'	None
DFHZC3485	TCZPSPRE	X'C7'	24
DFHZC3486	TCZLUINP	X'C2'	24
DFHZC3487	TCZNPSAU	X'C9'	24
DFHZC3488	TCZXUVAR	X'3C'	2 3 9 10 11 18 24
DFHZC3489	TCZLUINH	X'C8'	18 24
DFHZC3490	TCZCPFAL	X'BF'	24
DFHZC3490	TCZCPFAL	X'C3'	24
DFHZC3492	TCZDMIT	X'16'	None
DFHZC3495	TCZNOTNA	X'6B'	24
DFHZC3499	TCZDWEGF	X'C0'	None
DFHZC4902	TCZLUCF1	X'21'	3 9 10 11 22 24
DFHZC4903	TCZLUCF2	X'22'	3 9 10 11 22 24
DFHZC4904	TCZFSMBE	X'23'	3 9 10 11 22 24
DFHZC4905	TCZFSMCS	X'24'	3 9 10 11 22 24
DFHZC4906	TCZFSMCR	X'25'	3 9 10 11 24
DFHZC4907	TCZSDLER	X'26'	3 9 10 11 24
DFHZC4909	TCZRVLER	X'28'	3 9 10 11 24
DFHZC4910	TCZRVLRB	X'29'	3 9 10 11 24
DFHZC4911	TCZRLPEX	X'2A'	2 3 9 10 11 24
DFHZC4912	TCZRLPBD	X'2B'	2 3 9 10 11 22 24
DFHZC4913	TCZRLPDR	X'2C'	2 3 9 10 11 24
DFHZC4914	TCZRLPIL	X'2D'	2 3 9 10 11 22 24
DFHZC4915	TCZRLPEC	X'2E'	2 3 9 10 11 22 24

Table 151 (Page 6 of 6). CICS messages associated with VTAM errors

Message	Symbolic label	Error code	Action flags set
DFHZC4916	TCZRLPRR	X'2F'	2 3 9 10 11 24
DFHZC4917	TCZRLPIF	X'30'	2 3 9 10 11 24
DFHZC4918	TCZRLPIR	X'31'	2 3 9 10 11 24
DFHZC4919	TCZIVIND	X'33'	2 3 9 10 11 22 24
DFHZC4920	TCZIVDAT	X'34'	2 3 9 10 11 22 24
DFHZC4922	TCZRLXCL	X'32'	20
DFHZC4924	TCZNSEED	X'B6'	2 3 5 24
DFHZC4925	TCZASINC	X'B7'	2 3 5 22 24
DFHZC4926	TCZEVBAD	X'B8'	2 3 5 22 24
DFHZC4927	TCZFMH12	X'B9'	2 3 5 22 24
DFHZC4928	TCZDESGM	X'BD'	24
DFHZC4929	TCZBDBND	X'B3'	2 3 5 24
DFHZC4930	TCZRTMT	X'35'	2 3 9 10 11 24
DFHZC4931	TCZBDMOD	X'F1'	18 24
DFHZC4932	TCZICTYP	X'F3'	2 3 22 24
DFHZC4933	TCZIDBA	X'F4'	2 3 22 24
DFHZC4934	TCZISYNL	X'F5'	2 3 22 24
DFHZC4935	TCZIUOW	X'F6'	2 3 22 24
DFHZC4936	TCZIFMHL	X'F7'	2 3 22 24
DFHZC4937	TCZLUSRR	X'8A'	2 3 5 24
DFHZC4938	TCZLUSRF	X'8B'	2 3 5 24
DFHZC4939	TCZLUPUN	X'8C'	2 3 5 24
DFHZC4940	TCZLUSKN	X'8F'	2 3 5 24
DFHZC4941	TCZLUPLK	X'8D'	2 3 5 24
DFHZC4942	TCZLUPEX	X'8E'	2 3 5 24
DFHZC4943	TCZFSMRB	X'F8'	3 9 10 11 24
DFHZC4944	TCZBFAIL	X'BE'	2 3 5 22 24
DFHZC4945	TCZPRGE	X'A2'	3 9 10 11 24
DFHZC4946	TCZINVAT	X'F9'	2 3 22 24
DFHZC4947	TCZLUSEC	X'FA'	2 3 22 24
DFHZC4949	TCZRABUS	X'7D'	2 3 9 10 11 24
DFHZC6598	TCZXRFVS	X'56'	None
None	TCZXMSG	X'3D'	None
None	TCZCNOS0	X'4F'	None
None [2]	TCZGMMS	X'47'	13
None [3]	TCZVTAMQ	X'62'	24

Default actions for system sense codes

Table 152 shows the message issued and action flags set by DFHZNAC for each inbound system sense code received. See the *VSE/ESA Messages and Codes Volume 3* manual for a description of the conditions that correspond to the system sense codes. The figures in the “**Action flags set**” column are translated into bit settings and explained in Table 153 on page 667.

Table 152 (Page 1 of 2). Messages issued and flags set by DFHZNAC for specific sense codes

Sense code	Message	Action flags set
X'0001' See note 1 on page 667.	DFHZC3401	2
X'0002' See note 1 on page 667.	DFHZC3415	2, 3, 10, 11
X'0003' See note 1 on page 667.	DFHZC3449	None
X'0004' See note 1 on page 667.	DFHZC3450	None
X'0007' See note 1 on page 667.	DFHZC3451	None. See note 2 on page 667.
X'00FF'	DFHZC3446	2, 3, 9, 10, 11, 21, 23
X'0801'	DFHZC2476	3, 9, 10, 11
X'0802'	DFHZC2461	None
X'0806'	DFHZC3426	None
X'0807'	DFHZC3411	None
X'080B'	DFHZC2462	2, 3, 9, 10, 11, 15, 24
X'080E'	DFHZC3448	23
X'080F'	DFHZC3436	9, 10, 11
X'0811'	DFHZC2464	9, 10, 11
X'0812'	DFHZC2465	2, 3
X'081B'	DFHZC2483	2, 3. See note 3 on page 667.
X'081C'	DFHZC2466	2, 3, 9, 10, 11
X'0824'	DFHZC2475	3, 9, 10, 11
X'0825'	DFHZC2484	2, 3, 9, 10, 11
X'0826'	DFHZC3423	2, 3, 9, 10, 11
X'0827'	DFHZC2480	3
X'0829'	DFHZC3407	1, 2, 3, 10, 11, 24
X'082A'	None. See note 4 on page 667.	9
X'082B'	DFHZC3408	2, 3, 10, 11, 13

Table 152 (Page 2 of 2). Messages issued and flags set by DFHZNAC for specific sense codes

Sense code	Message	Action flags set
X'082D'	DFHZC3413	None
X'082E'	DFHZC3412	None
X'082F'	DFHZC3414	2, 3, 9, 10, 11
X'0831'	DFHZC3438	None
X'0833'	DFHZC3427	None
X'0847'	DFHZC3439	None
X'084A'	None. See note 5 on page 667.	None
X'084C'	DFHZC3467	9, 10, 11
X'0860'	DFHZC3459	None
X'0863'	DFHZC3460	9, 10, 11
X'0864'	DFHZC2475	3, 9, 10, 11
X'0865'	DFHZC2465	3, 9, 10, 11
X'0866'	DFHZC2475	3, 9, 10, 11
X'0867'	None. See note 6 on page 667.	9, 10, 11
X'0868'	DFHZC3456	2, 9, 10, 11
X'0869'	DFHZC3457	2, 9, 10, 11
X'08FF'	DFHZC3447	2, 3, 9, 10, 11, 24
X'1000'	DFHZC3494	2, 3, 9, 10, 11
X'1001'	DFHZC2481	2, 3, 9, 10, 11, 14
X'1002'	DFHZC2481	2, 3, 9, 10, 11, 14
X'1003'	DFHZC2479	2, 3, 9, 10, 11, 14
X'1005'	DFHZC3406	2, 3, 4, 9, 10, 11, 14
X'1008'	DFHZC2478	None
X'1009'	DFHZC3458	2, 9, 10, 11
X'10FF'	DFHZC3446	2, 3, 9, 10, 11, 21, 23
X'2003'	DFHZC3405	2, 3, 9, 10, 11, 15, 24
X'20FF'	DFHZC3445	2, 3, 9, 10, 11, 23, 24
X'400B'	DFHZC2477	1, 3, 11
X'40FF'	DFHZC3453	2, 3, 9, 10, 11, 23, 24
X'8000'	DFHZC3435	2, 3, 9, 10, 11, 18, 24
X'8002'	DFHZC3435	2, 3, 9, 10, 11, 18, 24
X'8004'	DFHZC3435	2, 3, 9, 10, 11, 18, 24
X'8005'	DFHZC3435	2, 3, 9, 10, 11, 18, 24
X'80FF'	DFHZC3435	2, 3, 9, 10, 11, 18, 23, 24
X'FFFF'	DFHZC2460	2, 3, 9, 10, 11, 23, 24

Notes:

1. The system sense code is in the form of an LUSTATUS command code.
2. No action flags are set if a task is attached or if outstanding operations are to complete. Otherwise, flag 21 is set.
3. Action flags 2 and 3 are set for negative response received for a SEND that requested a definite response.
4. Presentation space error.
5. Presentation error on read. Display buffer alteration, due to operator intervention, detected on a READ command to a compatibility-mode logical unit.
6. Function abend received from a device. A negative response to a chain was sent, but purged.

Action flag settings and meanings

Table 153 shows the “action flags” that can be set by DFHZNAC in the communication area passed to DFHZNEP. The flags set by DFHZNAC represent the default actions that will be taken if the settings are not changed by DFHZNEP.

The figures in the “**Flag**” column refer to those in columns 3 of Table 150 on page 653 and Table 152 on page 665.

Table 153. Meanings of action flags set by DFHZNAC

Flag	Field	Bit mask	Hex bit setting	Action
1	TWAOPT1	1...	X'80'	Print action flags
2		.1..	X'40'	Print VTAM RPL
3		..1.	X'20'	Print TCTTE
4		...1	X'10'	Print TIOA
5		.... 1...	X'08'	Print BIND area
6		.... .1..	X'04'	System dump if no task attached
9	TWAOPT2	1...	X'80'	Abort any send for this terminal
10		.1..	X'40'	Abort any receive for this terminal
11		..1.	X'20'	Abend any task attached to TCTTE
12		...1	X'10'	Cancel any task attached to TCTTE
13		.... 1...	X'08'	Good Morning message to be sent
14		.... .1..	X'04'	Purge any BMS pages for this TCTTE
15		.... ..1.	X'02'	SIMLOGON required
17	TWAOPT3	1...	X'80'	Set INTLOG now allowed
18		.1..	X'40'	Set no internal general logons
20		...1	X'10'	Normal CLSDST (no reset allowed)
21		.... 1...	X'08'	Normal CLSDST (reset allowed)
22		.... .1..	X'04'	Send negative response
23		.... ..1.	X'02'	AOS - keep node out of service
24		1	X'01'	CLSDST node

Appendix C. Transient data write-to-terminal program (DFH$TDWT)

DFH$TDWT is a sample program that sends transient data messages to a terminal or printer. You can use it to send messages from a single transient data queue, or from several queues, to one terminal.

In the destination control table (DCT), you can specify that particular categories of message (for example, those from the abnormal condition program (DFHACP), and signon and sign-off messages) should be sent to destinations defined as INDIRECT. If these INDIRECT destinations are defined (by means of the INDDEST operand) so that they refer to the same intrapartition destination with a transaction identifier and a trigger level of 1, the receipt of a single message in any of the specified categories causes the transaction to be started. The program thus invoked displays or prints the message. The transaction that invokes the DFH$TDWT sample program is TDWT.

To use the sample program, your CICS system must include automatic transaction initiation and an intrapartition transient data set. Both the source code and the object code for the DFH$TDWT sample program is provided in the VSE/ESA sublibrary PRD1.BASE.

For detailed information about defining transient data destinations in the DCT, see the *CICS Resource Definition Guide*.

Resource definitions required

To use the DFH$TDWT sample program as supplied, you need the following resource definitions installed on your CICS region:

- A RDO PROGRAM definition for the DFH$TDWT program
- A RDO TRANSACTION definition for the TDWT transaction
- A RDO TERMINAL definition for the L86P terminal
- A DCT entry for the intrapartition destination L86P
- DCT entries for the intrapartition destinations indirect to the destination L86P

The CSD resource definitions for the program and transaction are provided in the DFH$UTIL group.

Note: DFH$UTIL is *not* a member of the default startup group list DFHLIST.

The DCT entry for the intrapartition destination L86P is provided in the sample DCT, DFHDCT2$.

However, you must define the other resources:

- Add to the CSD a terminal definition for the L86P terminal and install the definition in your CICS region.
- Add to the DCT entries for the intrapartition destinations that are indirect to the destination L86P. Initialize your CICS region with this DCT specified on the DCT system initialization parameter.

For example:

```
DFHDCT TYPE=INDIRECT,DESTID=CSMT,INDDEST=L86P
DFHDCT TYPE=INDIRECT,DESTID=CSTL,INDDEST=L86P
DFHDCT TYPE=INDIRECT,DESTID=CSML,INDDEST=L86P
```

Appendix D. Uppercase translation of national characters

Uppercase translation in CICS can be done either by using the UCTRAN option on the PROFILE and TYPETERM definitions, or by using the EXEC CICS SET TERMINAL(termid) UCTRANST command.

However, some languages have characters which are not part of the set of EBCDIC characters translated by UCTRAN, and so are never translated to uppercase, regardless of what you have specified on your resource definitions. To translate these national characters, you have two options:

- Use the XZCIN global user exit
- Modify the translation table in DFHTCTDY.

Whichever method you use, the *Character Data Representation Architecture Level 1 - Registry* manual is a useful reference for information on code pages.

Using the XZCIN global user exit

XZCIN is described on page 190. To use it for uppercase translation, you must supply your own translation routine, which is then invoked when terminal input occurs.

Using DFHTCTDY

CICS provides the source for DFHTCTDY in VSE/ESA sublibrary PRD1.BASE; you can use this to modify the translation table to translate your national characters. Figure 72 on page 672 shows a suggested way to code the assembler source statements used to generate DFHTCTDY.

```
         MACRO
         NATLANG
DFHUCTRT CSECT                         Resume UCTRAN table CSECT
.*
.* This example translates lowercase 'a' ( EBCDIC X'81') to
.* uppercase 'A' (EBCDIC X'C1') for a US code page.
.*
         ORG  TCZUCTAB+X'81'           Reset the counter to the
                                       character to be translated.
         DC   X'C1'                    Declare the replacement
                                       character as a constant.
.*
.* Repeat the above two statements for each extra character you wish
.* to be translated.
.*
         ORG  ,                        Reset the location counter
&SYSLOC  LOCTR                         Resume previous location counter
         MEND                          End of macro definition
         DFHTCT TYPE=INITIAL,SUFFIX=DY,                               *
               ACCMETH=(VTAM),                                        *
               DUMMY=DUMMY
         NATLANG                       Execute NATLANG
         DFHTCT TYPE=FINAL
         END DFHTCTBA
```

Figure 72. Suggested coding for national language character translation

If you use this method, you must reassemble your modified copy of DFHTCTDY, keeping the 'DY' suffix. The 'DY' suffix is necessary because, even if you use RDO for all your terminals and have TCT=NO specified in your SIT or its overrides, CICS uses DFHTCTDY by default to create control blocks for RDO-defined and autoinstalled terminals.

If you specify a suffix other than 'DY' on the TCT system initialization parameter, you must add your translation code to the TCT you are using.

Appendix E. The example program for the XTSEREQ global user exit, DFH$XTSE

This appendix lists the example global user exit program, DFH$XTSE. The example shows you how to:

- Use EXEC CICS commands in a global user exit program
- Use EXEC CICS commands and XPI calls in the same exit program
- Modify the command parameter list in EXEC interface exits such as XTSEREQ and XICEREQ
- Modify Temporary Storage (TS) requests.

```
***********************************************************************
*                                                                     *
* MODULE NAME = DFH$XTSE                                              *
*                                                                     *
* FUNCTION =                                                          *
*   Example global user exit program to run at the XTSEREQ and        *
*   XTSEREQC exits.                                                   *
*                                                                     *
* DESCRIPTION =                                                       *
*   The program gives examples of:                                    *
*     1) Coding Exec Interface global user exits, showing how to      *
*        modify and add parameters to the Command Parameter List.     *
*     2) Issuing a mixture of EXEC CICS API and XPI calls within      *
*        the same global user exit program.                           *
*     3) Modifying Temporary Storage requests, by renaming the queue  *
*        name and allowing the SYSID to be added so that the request  *
*        is routed to a queue-owning region (QOR).                    *
*                                                                     *
* ------------------------------------------------------------------- *
*   NOTE that this program is only intended to DEMONSTRATE the use    *
*   of the TS request user exit XTSEREQ, and to show the sort of      *
*   information which can be obtained from the exit parameter list.   *
* IT SHOULD BE TAILORED BEFORE BEING USED IN A PRODUCTION ENVIRONMENT.*
* ------------------------------------------------------------------- *
*                                                                     *
* NOTES =                                                             *
*   The important notes to remember when coding similar global user   *
*   exits are:                                                        *
*                                                                     *
*   1) If the exit program modifies the Command Parameter List, you   *
*      MUST ensure that the storage used for additional fields such   *
*      as the SYSID is non-volatile. Here are examples of storage     *
*      that is safe:                                                  *
*        a) Shared storage obtained by GETMAIN.  This should be       *
*           obtained in the Request exit, and freed in the Request    *
*           Complete exit..  The shared storage address can be passed *
*           using the 4-byte token in the DFHUEPAR parameter list.    *
*        b) Shared global work area storage.                          *
*        c) Storage obtained by using the LOAD HOLD option.           *
*        d) TCTUA or CWA storage.                                     *
```

Figure 73 (Part 1 of 16). Example exit program for the XTSEREQ exit

```
*                                                                    *
*      It is not safe to use the following storage:                  *
*           Program storage (DFHEISTG) since this is freed as soon   *
*           as the exit program returns control to CICS.             *
*                                                                    *
*   2) When adding or removing a field in the command parameter list, *
*      you must remember:                                            *
*        a) To set/clear the field's existence bit in the EID        *
*        b) To set/clear the appropriate address in the Addr_List    *
*        c) To set the hi-order bit in the LAST address in the       *
*           Addr_List.                                               *
*                                                                    *
*   3) If you are planning to use the CICS API in the exit, you      *
*      must:                                                         *
*        a) Use the DFHEIENT macro to control module entry.          *
*        b) Use the DFHEIRET macro to return control to CICS. However,*
*           the exit return code MUST be set in Register 15.         *
*        c) Issue an ADDRESS EIB command before issuing any EXEC CICS *
*           commands.                                                *
*                                                                    *
*   4) If you are planning to use the API and XPI in the same        *
*      global user exit program, take care to ensure that Register   *
*      13 points to the kernel stack entry (UEPSTACK) for XPI calls,  *
*      and is restored for API calls if necessary.                   *
*                                                                    *
*                                                                    *
**********************************************************************
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
* Copybook and DSECTS required by the exit program                   *
*                                                                    *
*--------------------------------------------------------------------*
         DFHUEXIT TYPE=EP,ID=(XTSEREQ,XTSEREQC)
         DFHUEXIT TYPE=XPIENV       Exit programming interface (XPI)
         COPY  DFHTRPTY             Trace XPI definitions
         COPY  DFHTSUED             Command Level Plist definitions
*
*--------------------------------------------------------------------*
* The following DSECT maps the shared storage obtained by the        *
* EXEC CICS GETMAIN API call. This storage is used to store the      *
* modified SYSID and/or TS QNAME that is passed to CICS on return    *
* from the exit program.                                             *
*--------------------------------------------------------------------*
SHARED_STORAGE    DSECT
SHARED_EYECATCHER DS CL16
SHARED_NAME       DS CL8
SHARED_SYSID      DS CL4
*
```

Figure 73 (Part 2 of 16). Example exit program for the XTSEREQ exit

```
*-------------------------------------------------------------------*
* The TS Routing table is made up of a set of entries. Each entry    *
* can be mapped by the TABLE_ENTRY DSECT                             *
*-------------------------------------------------------------------*
TABLE_ENTRY  DSECT
ENTRY_NAME   DS CL8
NEW_NAME     DS CL8
NEW_SYSID    DS CL4
ENTRY_ACTION DS XL1
FILLER       DS CL3
*
*-------------------------------------------------------------------*
* The following definitions are for program working storage.        *
*-------------------------------------------------------------------*
DFHEISTG DSECT
RETCODE      DS XL4                   Program Return Code
TR_ERROR_N   DS X                     Error Number for Trace Entry
RESP         DS X                     API Response
         EJECT ,
*********************************************************************
*  PROGRAM REGISTER USAGE :                                          *
*  R0 - Work Register                                                *
*  R1 - Points to DFHUEPAR plist on entry                            *
*       Work Register                                                *
*  R2 - DFHUEPAR parameter List                                      *
*  R3 - Code Base Register                                           *
*  R4 -  <unused>                                                    *
*  R5 -  <unused>                                                    *
*  R6 - Subroutine Linkage Register                                  *
*  R7 - Address of TS Queue Name from Command Plist                  *
*  R8 - Command Parameter list UEPCLPS                               *
*  R9 - Address of Table_Entry in TS_Routing_Table                   *
*  R10-  <unused>                                                    *
*  R11- EIB Register                                                 *
*  R12- Work Register                                                *
*  R13- DFHEISTG for API calls                                       *
*       Kernel Stack for XPI calls                                   *
*  R14- Work Register                                                *
*  R15- Work Register                                                *
*********************************************************************
         EJECT ,
*********************************************************************
*  DFH$XTSE - Main Routine                                           *
*    This is the entry point for the exit program. Control is passed *
*    to the TS_REQUEST or TS_REQUEST_COMPLETE routines depending     *
*    on whether the exit was invoked at the XTSEREQ or XTSEREQC exit *
*    points                                                          *
*                                                                    *
```

Figure 73 (Part 3 of 16). Example exit program for the XTSEREQ exit

```
*  Registers:                                                        *
*    R1 = UEPAR plist (set on entry)                                 *
*       = Work register                                              *
*    R2 = UEPAR plist                                                *
*    R3 = Program base register (set by DFHEIENT)                    *
*    R6 = Linkage register                                           *
*    R11= EIB register                                               *
*    R13= EISTG register (set by DFHEIENT)                           *
*    R15= Work register                                              *
*         User Exit Return Code                                      *
*                                                                    *
*  Logic:                                                            *
*    DFH$XTSE:                                                       *
*      Exec Interface Entry                                          *
*      Address DFHUEPAR plist                                        *
*      Set OK Return Code                                            *
*      Address the EIB                                               *
*      Trace entry                                                   *
*      Select Exitid                                                 *
*        When(XTSEREQ) then call TS_Request                          *
*        When(XTSEREQC) then call TS_Request_Complete                *
*        Otherwise call Error(Invalid_Exit)                          *
*      End Select                                                    *
*      Trace exit                                                    *
*      Set Exit return code                                          *
*    Return                                                          *
**********************************************************************
DFH$XTSE DFHEIENT
DFH$XTSE AMODE 31
DFH$XTSE RMODE ANY
         LR    R2,R1               DFHUEPAR plist provided by caller
         USING DFHUEPAR,R2         Use R2 to address UEPAR PLIST
*
         LA    R15,UERCNORM        Set OK Response
         ST    R15,RETCODE           in working storage
*
         EXEC CICS ADDRESS EIB(R11)
         USING DFHEIBLK,R11
*
         BAL   R6,TRACE_ENTRY      Trace program entry
*
         L     R1,UEPEXN           Address of the 1 byte Exit Id
         CLI   0(R1),XTSEREQ       Is this XTSEREQ exit?
         BE    TS_REQUEST          ..Yes Branch to routine
         CLI   0(R1),XTSEREQC      Is this XTSEREQC exit?
         BE    TS_REQUEST_COMPLETE .. Yes Branch to routine
         B     ERROR1              Otherwise Branch to error routine
*
RETURN   DS    0H                  Return point
         BAL   R6,TRACE_EXIT       Trace program exit
*
         L     R15,RETCODE         Fetch return code
         DFHEIRET RCREG=15         Return to CICS
         EJECT ,
```

Figure 73 (Part 4 of 16). Example exit program for the XTSEREQ exit

```
*=====================================================================*
*  TS_REQUEST - Invoked at XTSEREQ exit point                         *
*    Determine the TS Queue Name and scan the TS_Routing_Table for    *
*    a match. If an entry exists in the table, then check the action  *
*    field and call the ROUTE_REQUEST or LOCAL_REQUEST routines.      *
*                                                                     *
*    The TS_Touting_Table is made up of entries with the following    *
*    structure:                                                       *
*                                                                     *
*   TABLE_ENTRY:                                                      *
*    ----------------------------------------------------------       *
*   | Entry_Name | New_Name |  QOR_Sysid |  Action |  *filler* |      *
*   | Char 8     | Char 8   |  Char 4    |  Bin 1  |  Char 3   |      *
*    ----------------------------------------------------------       *
*    Last Entry is indicated by special TS_Queue Name                 *
*                                                                     *
*  Registers:                                                         *
*    R1 = Work register                                               *
*    R7 = Set to the TS Queue Name                                    *
*    R8 = Command Parameter List (CLPS)                               *
*    R9 = Points to the next entry in the TS_Routing_Table            *
*    R15= Work register                                               *
*                                                                     *
*  Logic:                                                             *
*    TS_Request:                                                      *
*       If called recursively then                                    *
*         call Error(Recursive_Call1)                                 *
*       Else                                                          *
*         If the Command GROUP code is not a TS request then          *
*           call Error(Invalid_Group_Code1)                           *
*         Else                                                        *
*           Clear the UEPTQTOK                                        *
*           Address the Command Plist UEPCLPS                         *
*           Fetch tsq_name                                            *
*           Fetch start of TS_Routing_Table                           *
*    Check_Next_Entry:                                                *
*           Get the next table entry                                  *
*           Select (entry_name)                                       *
*             When (last_entry) call Entry_Not_Found                  *
*             When (tsq_name)                                         *
*               Select (entry_action)                                 *
*                 When (Route) call Route_Request                     *
*                 When (Local) call Local_Request                     *
*                 Otherwise call Error(Invalid_Table_Action)          *
*               End Select                                            *
*             Otherwise                                               *
*               Goto Check_Next_Entry                                 *
*           End Select                                                *
*         End If                                                      *
*       End If                                                        *
*    Return                                                           *
```

Figure 73 (Part 5 of 16). Example exit program for the XTSEREQ exit

```
*=================================================================*
TS_REQUEST DS  0H
*        Check for possible recursion
         L     R1,UEPRECUR         Address of recursive count
         LH    R1,0(R1)            Fetch count
         LTR   R1,R1               Has exit been invoked recursively?
         BNZ   ERROR2              ..Yes Branch to error routine
*
*        Extract pointer to the EID and TS queue name from CLPS
         L     R8,UEPCLPS          Fetch address of Command Plist
         USING TS_ADDR_LIST,R8     Use R8 to address CLPS
         L     R1,TS_ADDR0         Address the EID..
         L     R7,TS_ADDR1         Fetch address of TS QUEUE
         DROP  R8                  Drop addressability to CLPS
*
*        Check that the Command GROUP code corresponds to a TS request
         USING TS_EID,R1           ..with Register 1
         CLI   TS_GROUP,TS_TEMPSTOR_GROUP Is this a TS request?
         BNE   ERROR3              ..No  Branch to error routine
         DROP  R1                  Drop addressability to EID
*
*        Clear the TS Request token
         L     R1,UEPTQTOK         Fetch address of token
         XC    0(4,R1),0(R1)       Clear Token for XTSEREQC
*
*
*-----------------------------------------------------------------*
* Start scan of TS_Routing Table                                  *
*-----------------------------------------------------------------*
         LA    R9,TS_ROUTING_TABLE Fetch address of routing table
         USING TABLE_ENTRY,R9      Address entries from R9
*
CHECK_NEXT_ENTRY DS 0H
         CLC   ENTRY_NAME,ENTRY_NAME_LAST Is this the last entry
         BE    ENTRY_NOT_FOUND     ..Yes Take default routing action
         CLC   ENTRY_NAME,0(R7)    Is this the wanted TS queue name?
         BE    ENTRY_FOUND         ..Yes Check for the action required
         LA    R9,24(R9)           Point to next entry
         B     CHECK_NEXT_ENTRY    Start search again
*
ENTRY_FOUND DS 0H
         CLI   ENTRY_ACTION,ROUTE  Is the action to route request?
         BE    ROUTE_REQUEST       ..Yes Branch to Route routine
         CLI   ENTRY_ACTION,LOCAL  Is the action to rename queue?
         BE    LOCAL_REQUEST       ..Yes Branch to Local routine
         B     ERROR4              Otherwise Branch to error routine
         DROP  R9                  Drop addressability to Entry
         EJECT ,
*
```

Figure 73 (Part 6 of 16). Example exit program for the XTSEREQ exit

```
*=====================================================================*
*  TS_REQUEST_COMPLETE - Invoked at XTSEREQC exit point               *
*    Free any shared storage that was acquired during previous        *
*    invocation at XTSEREQ                                            *
*                                                                     *
*  Registers:                                                         *
*    R1 = Work register                                               *
*    R6 = Linkage register                                            *
*    R8 = Command Parameter List (CLPS)                               *
*                                                                     *
*  Logic:                                                             *
*    TS_Request_Complete:                                             *
*      If called recursively then                                     *
*        call Error(Recursive_Call2)                                  *
*      Else                                                           *
*        If the Command GROUP code is not a TS request then           *
*          call Error(Invalid_Group_Code2)                            *
*        Else                                                         *
*          If UEPTQTOK->token ¬= 0 then Call Freemain_Shared_Plist    *
*        End If                                                       *
*      End If                                                         *
*    Return                                                           *
*=====================================================================*
TS_REQUEST_COMPLETE DS  0H
*        Check for possible recursion
         L     R1,UEPRECUR         Address of recursive count
         LH    R1,0(R1)            Fetch count
         LTR   R1,R1               Has exit been invoked recursively?
         BNZ   ERROR5              ..Yes Branch to error routine
*
*        Check that the Command GROUP code corresponds to a TS request
         L     R8,UEPCLPS          Fetch address of Command Plist
         USING TS_ADDR_LIST,R8     Use R8 to address CLPS
         L     R1,TS_ADDR0         Address the EID..
         USING TS_EID,R1           ..with Register 1
         CLI   TS_GROUP,TS_TEMPSTOR_GROUP Is this a TS request?
         BNE   ERROR6              ..No  Branch to error routine
         DROP  R1                  Drop addressability to EID
         DROP  R8                  Drop addressability to CLPS
*
         L     R1,UEPTQTOK         Fetch address of Token
         L     R1,0(R1)            Fetch actual token
         LTR   R1,R1               Did XTSEREQ GETMAIN any storage?
         BZ    RETURN              ..No  Return to caller
         BAL   R6,FREEMAIN_SHARED  ..Yes Issue FREEMAIN
         B     RETURN              Return to caller
         EJECT ,
*
```

Figure 73 (Part 7 of 16). Example exit program for the XTSEREQ exit

```
*=====================================================================*
* LOCAL_REQUEST: Process Local TS Queues                              *
*   An entry has been found in the TS_Routing Table for this TS       *
*   Queue Name. If required, rename the TS Queue Name, but do not     *
*   modify the SYSID.                                                 *
*                                                                     *
*  Registers:                                                         *
*    R1 = Work register                                               *
*    R6 = Link Register                                               *
*    R7 = Address of current Queue name       (Set on entry)          *
*    R8 = Command Parameter List (CLPS)                               *
*    R9 = Address of table entry              (Set on entry)          *
*    R12= Work register (Shared_storage)                              *
*                                                                     *
*  Logic:                                                             *
*    Local_Request:                                                   *
*      If entry_name ¬= new_name then                                 *
*        Call Getmain_Shared                                          *
*        Copy new_name into shared storage                            *
*        Address the command plist                                    *
*        Update ADDR1 to point to address of the new TS QUEUE name    *
*        Set the Hi-order bit if last address in CLPS                 *
*      End If                                                         *
*    Return                                                           *
*=====================================================================*
LOCAL_REQUEST DS 0H
         USING TABLE_ENTRY,R9      R9 points to the table entry
         CLC   NEW_NAME,0(R7)      Is the new_name=current_queue name?
         BE    RETURN              ..Yes Return
*
*        Obtain Shared storage to hold the new queue name
         BAL   R6,GETMAIN_SHARED   GETMAIN SHARED storage
         L     R12,UEPTQTOK        Fetch address of token
         L     R12,0(R12)          Fetch shared storage pointer
         USING SHARED_STORAGE,R12  Address using R12
         MVC   SHARED_NAME,NEW_NAME Copy QNAME into shared storage
*
*        Update the Queue Name in CLPS
         L     R8,UEPCLPS          Address the CLPS.
         USING TS_ADDR_LIST,R8     ..with Register 8
         LA    R1,SHARED_NAME      Fetch address of the new QNAME
         TM    TS_ADDR1,X'80'      Is the hi-order bit on?
         BZ    LOCAL1              ..No continue
         O     R1,=X'80000000'     Indicate ADDR1 is last parameter
LOCAL1   DS    0H
         ST    R1,TS_ADDR1         Store address in TS_ADDR1
         B     RETURN              Return
         DROP  R8                  Drop TS_ADDR_LIST
         DROP  R12                 Drop SHARED_STORAGE
         DROP  R9                  Drop addressability to Entry
         EJECT ,
*
```

Figure 73 (Part 8 of 16). Example exit program for the XTSEREQ exit

```
*=====================================================================*
* ROUTE_REQUEST: Ship request to remote system                        *
*   An entry has been found in the TS_Routing Table for this TS       *
*   Queue Name. The request is modified by adding a SYSID to the      *
*   command and renaming the queue if required.                       *
*                                                                     *
*  Registers:                                                         *
*    R1 = Work register                                               *
*    R6 = Link Register                                               *
*    R7 = Address of current Queue name       (Set on entry)          *
*    R8 = Command Parameter List (CLPS)                               *
*    R9 = Address of table entry              (Set on entry)          *
*    R12= Work register (Shared_storage)                              *
*                                                                     *
*  Logic:                                                             *
*    Route_Request:                                                   *
*      Call Getmain_Shared                                            *
*      If entry_name ¬= new_name then                                 *
*        Copy new_name into shared storage                            *
*        Address the command plist                                    *
*        Update ADDR1 to point to address of the new TS QUEUE name    *
*      End If                                                         *
*      Copy new_sysid into shared storage                             *
*      Address the command plist                                      *
*      Update ADDR7 to point to the address of the new SYSID          *
*      Set the SYSID existence bit in the EID                         *
*      Set the Hi-order bit in last address in CLPS                   *
*    Return                                                           *
*=====================================================================*
ROUTE_REQUEST DS 0H
         BAL   R6,GETMAIN_SHARED   GETMAIN SHARED storage
         L     R12,UEPTQTOK        Fetch address of token
         L     R12,0(R12)          Fetch Shared storage address
         USING SHARED_STORAGE,R12  Address using R12
*
*        Update the Queue Name in CLPS
         USING TABLE_ENTRY,R9      R9 points to the table entry
         CLC   NEW_NAME,0(R7)      Is the new_name=current_queue name?
         BE    ROUTE1              ..Yes No need to update Queue Name
         MVC   SHARED_NAME,NEW_NAME Copy QNAME into shared storage
         L     R8,UEPCLPS          Address the CLPS..
         USING TS_ADDR_LIST,R8     ..with Register 8
         LA    R1,SHARED_NAME      Fetch address of the new QNAME
         ST    R1,TS_ADDR1         Store address in TS_ADDR1
         DROP  R8                  Drop TS_ADDR_LIST
*
```

Figure 73 (Part 9 of 16). Example exit program for the XTSEREQ exit

```
*        Update the Sysid in CLPS
ROUTE1   DS    0H
         MVC   SHARED_SYSID,NEW_SYSID Copy SYSID into shared storage
         L     R8,UEPCLPS          Address the CLPS..
         USING TS_ADDR_LIST,R8     ..with Register 8
         L     R1,TS_ADDR0         Address the EID..
         USING TS_EID,R1           ..with Register 1
         OI    TS_BITS1,TS_SYSID_V Indicate SYSID now present in CLPS
         DROP  R1                  Drop addressability to EID
         LA    R1,SHARED_SYSID     Fetch address of the new SYSID
         ST    R1,TS_ADDR7         Store address in TS_ADDR7
         OI    TS_ADDR7,X'80'      Indicate SYSID is end of plist
*
*        Clear hi-order bits in ARGs 1 to 5
         NI    TS_ADDR1,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR2,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR3,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR4,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR5,X'7F'      Indicate not last parameter in CLPS
         B     RETURN              Return
         DROP  R8                  Drop TS_ADDR_LIST
         DROP  R12                 Drop SHARED_STORAGE
         DROP  R9                  Drop addressability to Entry
         EJECT ,
*
*===================================================================*
* ENTRY_NOT_FOUND - No entry was found in the TS_Routing_Table       *
*   No entry found in Routing Table for this TS Queue Name. In the    *
*   sample program, all such requests are routed.                     *
*                                                                     *
*  Registers:                                                         *
*    R1 = Work register                                               *
*    R6 = Link Register                                               *
*    R8 = Command Parameter List (CLPS)                               *
*    R12= Work register (Shared_storage)                              *
*                                                                     *
```

Figure 73 (Part 10 of 16). Example exit program for the XTSEREQ exit

```
*  Logic:                                                             *
*    Entry_Not_Found:                                                 *
*      Call Getmain_Shared                                            *
*      Copy default_sysid into shared storage                         *
*      Address the command plist                                      *
*      Update ADDR7 to point to the address of the default SYSID      *
*      Set the SYSID existence bit in the EID                         *
*      Set the Hi-order bit in last address in CLPS                   *
*    Return                                                           *
*=====================================================================*
ENTRY_NOT_FOUND DS 0H
         BAL   R6,GETMAIN_SHARED   GETMAIN SHARED storage
         L     R12,UEPTQTOK        Fetch address of token
         L     R12,0(R12)          Fetch shared storage address
         USING SHARED_STORAGE,R12  Address using R12
*
*        Update the Sysid in CLPS
         MVC   SHARED_SYSID,DEFAULT_SYSID Copy SYSID to shared storage
         L     R8,UEPCLPS          Address the CLPS..
         USING TS_ADDR_LIST,R8     ..with Register 8
         L     R1,TS_ADDR0         Address the EID..
         USING TS_EID,R1           ..with Register 1
         OI    TS_BITS1,TS_SYSID_V Indicate SYSID now present in CLPS
         DROP  R1                  Drop addressability to EID
         LA    R1,SHARED_SYSID     Fetch address of the new SYSID
         ST    R1,TS_ADDR7         Store address in TS_ADDR7
         OI    TS_ADDR7,X'80'      Indicate SYSID is end of plist
*
*        Clear hi-order bits in ARGs 1 to 5
         NI    TS_ADDR1,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR2,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR3,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR4,X'7F'      Indicate not last parameter in CLPS
         NI    TS_ADDR5,X'7F'      Indicate not last parameter in CLPS
         B     RETURN              Return
         DROP  R8                  Drop TS_ADDR_LIST
         DROP  R12                 Drop SHARED_STORAGE
         EJECT ,
*
```

Figure 73 (Part 11 of 16). Example exit program for the XTSEREQ exit

```
*=====================================================================*
*  GETMAIN_SHARED - Obtain Shared storage                             *
*    We cannot use transaction storage to pass information in the     *
*    Command Parameter List since this is volatile and will be        *
*    released when the exit program returns to CICS.                  *
*    We must obtain SHARED storage here, and free it at the           *
*    TS request complete exit XTSEREQC                                *
*                                                                     *
*  Registers:                                                         *
*    R0 = Used by EXEC CICS call                                      *
*    R1 = Used by EXEC CICS call                                      *
*         Work Register                                               *
*    R6 = Link Register - Return Address                              *
*    R11= EIB register   (set on entry)                               *
*    R12= Work register                                               *
*    R14= Used by EXEC CICS call                                      *
*    R15= Used by EXEC CICS call                                      *
*                                                                     *
*  Logic:                                                             *
*    Getmain_Shared:                                                  *
*      EXEC CICS GETMAIN LENGTH(32) SET(UEPTQTOK) SHARED RESP(resp)   *
*      If resp ¬= OK then                                             *
*        Call Error(Getmain_Failed)                                   *
*      Else                                                           *
*        Address shared storage                                       *
*        Set eyecatcher 'XTSEREQ Storage'                             *
*      End If                                                         *
*    Return                                                           *
*=====================================================================*
GETMAIN_SHARED DS 0H
         L     R12,UEPTQTOK            Fetch address of token
         L     R12,0(R12)              Fetch shared storage anchor
         LTR   R12,R12                 Is the storage already present?
         BNZR  R6                      ..Yes Return
         EXEC CICS GETMAIN LENGTH(32) SET(R12) SHARED                  X
                   INITIMG(X'00') RESP(RESP)
         CLC   RESP,DFHRESP(NORMAL)    GETMAIN worked OK?
         BNE   ERROR7                  ..No Goto Error routine
         L     R1,UEPTQTOK             Fetch address of token
         ST    R12,0(R1)               Save address of storage
         USING SHARED_STORAGE,R12
         MVC   SHARED_EYECATCHER,EYE_CATCHER Set Eyecatcher
         DROP  R12                     Drop R12
         BR    R6                      Return to caller
         EJECT ,
*
```

Figure 73 (Part 12 of 16). Example exit program for the XTSEREQ exit

```
*=====================================================================*
*  FREEMAIN_SHARED - Free shared storage                              *
*    Free the shared storage associated with this command.            *
*                                                                     *
*  Registers:                                                         *
*    R0 = Used by EXEC CICS call                                      *
*    R1 = Used by EXEC CICS call                                      *
*    R6 = Link Register - Return Address                              *
*    R11= EIB register   (set on entry)                               *
*    R12= Work register                                               *
*    R14= Used by EXEC CICS call                                      *
*    R15= Used by EXEC CICS call                                      *
*                                                                     *
*  Logic:                                                             *
*    Freemain_Shared:                                                 *
*      Address shared storage                                         *
*      If eyecatcher ¬= 'XTSEREQ Storage' then                        *
*        Call Error(Freemain_Logic_Error)                             *
*      Else                                                           *
*        EXEC CICS FREEMAIN DATAPOINTER(UEPTQTOK) RESP(resp)          *
*        If resp ¬= OK then                                           *
*          Call Error(Freemain_Failed)                                *
*        End If                                                       *
*      End If                                                         *
*    Return                                                           *
*=====================================================================*
FREEMAIN_SHARED DS 0H
         L     R12,UEPTQTOK            Fetch token address
         L     R12,0(R12)              Address shared storage address
         USING SHARED_STORAGE,R12      ..Using R12
         CLC   SHARED_EYECATCHER,EYE_CATCHER Is this our storage?
         BNE   ERROR8                  ..No Goto Error routine
         DROP  R12                     Drop R12
         EXEC CICS FREEMAIN DATAPOINTER(R12) RESP(RESP)
         CLC   RESP,DFHRESP(NORMAL)    FREEMAIN worked OK?
         BNE   ERROR9                  ..No Goto Error routine
         L     R12,UEPTQTOK            Fetch token address
         XC    0(4,R12),0(R12)         Clear token address
         BR    R6                      Return to caller
         EJECT ,
*
*=====================================================================*
*  Trace Routines                                                     *
*    Issue a Trace XPI call                                           *
*                                                                     *
*  Registers:                                                         *
*    R0 = Used by XPI call                                            *
*    R1 = DFHTRPT plist                                               *
*    R6 = Link Register - Return Address                              *
*    R12= Work register                                               *
*    R13= EISTG register (set by DFHEIENT)                            *
*         Kernel Stack entry                                          *
*    R14= Used by XPI call                                            *
*    R15= Used by XPI call                                            *
*=====================================================================*
```

Figure 73 (Part 13 of 16). Example exit program for the XTSEREQ exit

```
         USING DFHTRPT_ARG,R1
TRACE_ENTRY DS 0H
         L     R1,UEPXSTOR         Prepare for XPI call
         DFHTRPTX CLEAR,                                               X
               POINT_ID(TR_ENTRY)
         B     ISSUE_TRACE
TRACE_EXIT DS  0H
         L     R1,UEPXSTOR         Prepare for XPI call
         DFHTRPTX CLEAR,                                               X
               POINT_ID(TR_EXIT)
         B     ISSUE_TRACE
TRACE_ERROR DS 0H
         L     R1,UEPXSTOR         Prepare for XPI call
         DFHTRPTX CLEAR,                                               X
               POINT_ID(TR_ERROR),                                     X
               DATA1(TR_ERROR_N,1)
         BAL   R6,ISSUE_TRACE
         B     RETURN
*
*-------------------------------------------------------------------*
* Issue the Trace XPI call                                          *
*-------------------------------------------------------------------*
ISSUE_TRACE DS 0H
         L     R8,UEPTRACE         Address of trace flag
         TM    0(R8),UEPTRON       Is trace on?
         BZ    NO_TRACE            No - do not issue trace then
         LR    R12,R13             Save R13 round XPI call
         L     R13,UEPSTACK
         DFHTRPTX CALL,                                                X
               IN,                                                     X
               FUNCTION(TRACE_PUT),                                    X
               POINT_ID(*),                                            X
               OUT,                                                    X
               RESPONSE(*),                                            X
               REASON(*)
         LR    R13,R12             Restore R13 (DFHEISTG)
NO_TRACE DS    0H
         BR    R6                  Return to caller
         DROP  R1
*
*===================================================================*
*  ERRORn                                                           *
*    Error has occurred during processing                           *
*    Issue a trace point and return to the CICS                     *
*===================================================================*
ERROR1   DS    0H
         MVI   TR_ERROR_N,1
         B     TRACE_ERROR
ERROR2   DS    0H
         MVI   TR_ERROR_N,2
         B     TRACE_ERROR
ERROR3   DS    0H
         MVI   TR_ERROR_N,3
         B     TRACE_ERROR
```

Figure 73 (Part 14 of 16). Example exit program for the XTSEREQ exit

```
ERROR4   DS    0H
         MVI   TR_ERROR_N,4
         B     TRACE_ERROR
ERROR5   DS    0H
         MVI   TR_ERROR_N,5
         B     TRACE_ERROR
ERROR6   DS    0H
         MVI   TR_ERROR_N,6
         B     TRACE_ERROR
ERROR7   DS    0H
         MVI   TR_ERROR_N,7
         B     TRACE_ERROR
ERROR8   DS    0H
         MVI   TR_ERROR_N,7
         B     TRACE_ERROR
ERROR9   DS    0H
         MVI   TR_ERROR_N,7
         B     TRACE_ERROR
         EJECT ,
         DROP  R2                       Drop DFHUEPAR
         DROP  R11                      Drop EIB
         LTORG ,
***********************************************************************
* CONSTANTS                                                           *
***********************************************************************
                 DS 0D
EYE_CATCHER      DC CL16'XTSEREQ Storage '
DEFAULT_SYSID    DC CL4'MQ1 '
LOCAL            EQU X'01'
ROUTE            EQU X'02'
*
* Trace point ids
TR_ENTRY         DC XL2'120'
TR_EXIT          DC XL2'121'
TR_ERROR         DC XL2'122'
*
*---------------------------------------------------------------------*
*   TABLE_ENTRY:                                                      *
*    -----------------------------------------------------------      *
*   | Entry_Name | New_Name |  QOR_Sysid |  Action |  *filler* |      *
*   | Char 8     | Char 8   |  Char 4    |  Bin 1  |  Char 3   |      *
*    -----------------------------------------------------------      *
*    Last Entry is indicated by special TS_Queue Name                 *
*---------------------------------------------------------------------*
```

Figure 73 (Part 15 of 16). Example exit program for the XTSEREQ exit

```
TS_ROUTING_TABLE DS 0D
ENTRY_NAME_1     DC CL8'AAAAAAAA'         Rename Queue AAAAAAAA as
NEW_NAME_1       DC CL8'BBBBBBBB'         BBBBBBBB
QOR_SYSID_1      DC CL4' '
ACTION_1         DC XL1'01'               Local request
FILLER_1         DC CL3' '
ENTRY_NAME_2     DC CL8'A1      '         Rename Queue A1 as
NEW_NAME_2       DC CL8'B1      '         B1
QOR_SYSID_2      DC CL4' '
ACTION_2         DC XL1'01'               Local request
FILLER_2         DC CL3' '
ENTRY_NAME_3     DC CL8'A2      '         Rename Queue A2 as
NEW_NAME_3       DC CL8'B2      '         B2
QOR_SYSID_3      DC CL4' '
ACTION_3         DC XL1'01'               Local request
FILLER_3         DC CL3' '
ENTRY_NAME_4     DC CL8'RRRRRRRR'         Rename Queue RRRRRRRR as
NEW_NAME_4       DC CL8'REMOTE  '         REMOTE and ship request
QOR_SYSID_4      DC CL4'MQ1 '             to System MQ1
ACTION_4         DC XL1'02'
FILLER_4         DC CL3' '
ENTRY_NAME_5     DC CL8'R1      '         Don't rename Queue R1, but
NEW_NAME_5       DC CL8'R1      '         ship request to System MQ1
QOR_SYSID_5      DC CL4'MQ1 '
ACTION_5         DC XL1'02'
FILLER_5         DC CL3' '
ENTRY_NAME_LAST  DC XL8'FFFFFFFFFFFFFFFF'
NEW_NAME_LAST    DC CL8' '
QOR_SYSID_LAST   DC CL4' '
ACTION_LAST      DC XL1'00'
FILLER_LAST      DC CL3' '
         END   DFH$XTSE
```

Figure 73 (Part 16 of 16). Example exit program for the XTSEREQ exit

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