

CICS Family



Communicating from CICS on System/390

CICS Family



Communicating from CICS on System/390

Note!

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 157.

Ninth Edition (September 2006)

This edition applies to the following IBM Customer Information Control System (CICS) licensed programs, and to all subsequent releases and modifications of these programs, until otherwise indicated in new editions:

CICS Transaction Server for z/OS Version 3
CICS Transaction Server for z/OS Version 2, program number 5697-E93
CICS Transaction Server for OS/390 Version 1, program number 5655-147
CICS Transaction Server for VSE/ESA, program number 5648-054
CICS/VSE Version 2, program number 5686-026

Consult the latest edition of the applicable IBM system bibliography for current information on these products.

This book is based on the eighth edition of the *CICS Family: Communicating from CICS on System/390* manual, SC34-6474-02. Changes from that edition are marked by vertical lines to the left of the changes.

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Contents

Preface	ix
What this book is about	ix
Who this book is for	ix
What is not covered by this book	ix
What you need to know to understand this book	x
Terminology	x
Macro syntax notation	xi
Book structure	xii
Summary of changes	xv
Changes for the seventh edition.	xv
Changes for the sixth edition	xv
Changes for the fifth edition	xvi
Changes for the fourth edition	xvi

Part 1. Communicating with non-System/390 CICS systems 1

Chapter 1. Overview of CICS System/390–non-System/390 intercommunication	3
Function shipping	3
Restrictions on function shipping	4
Data conversion	4
Transaction routing	4
CICS on System/390→CICS non-System/390	5
CICS non-System/390→CICS on System/390	5
Dynamic transaction routing	5
Data conversion	6
Transaction routing restrictions	6
Distributed program link (DPL).	6
Restrictions on programs linked by DPL	6
Note for DB2	7
Abends when using DPL.	7
Performance optimization for DPL	7
Asynchronous processing	8
Distributed transaction processing (DTP)	8
Summary of CICS System/390–non-System/390 intercommunication	9
Chapter 2. Planning for CICS System/390–non-System/390 intercommunication	11
Path length and resource definition tradeoffs	11
Assumptions	11
Possible approaches	12
Summary	14
Syncpointing (LU 6.2)	14
Function shipping from CICS on System/390 to CICS Transaction Server for Windows	14
DPL or function shipping from CICS Transaction Server for Windows to CICS on System/390	16
Chapter 3. Resource definition for communication with non-System/390 systems	17
System generation and initialization	18
Setting up LU 6.2 links	19

All communication with CICS non-System/390 systems	19
Function shipping and DPL from CICS non-System/390 systems	19
Function shipping and DPL to CICS non-System/390 systems	19
Transaction routing from CICS non-System/390 systems	20
Transaction routing to CICS non-System/390 systems	20
Defining remote resources.	20
CICS on System/390 mirror transaction definition	20
CICS on System/390 mirror program definition	21
Data conversion program definition	22
Data conversion table definition	22
User-replaceable conversion program definition	22
Remote system TERMINAL definition (single session)	23
Remote system TYPETERM definition	25
CONNECTION definition for parallel sessions	26
SESSIONS definition for parallel sessions	27
Remote terminal TERMINAL definition	28
Remote terminal TYPETERM definition	30
Chapter 4. CICS internal security	31
Introduction to CICS/VSE internal security	31
Security profile	31
Link profile	31
SNT entry for link	32
Required specifications in remote systems.	32
CICS/VSE specifications	33
Specifying LU 6.2 security requirements	34
Mirror transaction	34
Mirror program and data conversion modules.	34
Connection	35
Session	35
File control table (FCT)	36
Signon table (SNT)	36
Chapter 5. VTAM/NCP definitions	39
VTAM application definition	39
Single sessions.	39
Parallel sessions	40
Chapter 6. Data conversion for communication with non-System/390 systems	43
Where data conversion takes place	43
Function shipping and DPL	43
Distributed transaction processing	44
Transaction routing	44
Avoiding data conversion	44
Types of conversion	44
Character data	45
CICS-supported conversions	45
Arabic	47
Baltic Rim.	48
Cyrillic	48
Devanagari	49
Farsi.	49
Greek	49
Hebrew.	50
Japanese	51

Korean	52
Lao	52
Latin-1 and Latin-9	53
Latin-2	54
Latin-5	55
Simplified Chinese	55
Thai	56
Traditional Chinese	56
Urdu	57
Vietnamese	57
Unicode data	57
Binary data	58
The conversion process	58
Components	58
Process	59
Standard and nonstandard conversion	60
Sequence of conversion processing	61
Resource definition to enable data conversion	63
Defining the conversion table.	63
DFHCNV macro types	63
DFHCNV TYPE=INITIAL	66
DFHCNV TYPE=ENTRY	68
DFHCNV TYPE=KEY	71
DFHCNV TYPE=SELECT	71
DFHCNV TYPE=FIELD	72
DFHCNV TYPE=FINAL	74
Hints on coding the macros	74
User-defined conversion tables	75
SRVERCP=USR	75
SRVERCP=USRD.	75
Invalid and undefined DBCS characters	77
Example macros	78
Assembling and link-editing the conversion programs	81
The user-replaceable conversion program	82
User-named conversion programs	82
DFHUCNV	82

Part 2. Server Support for CICS Clients 103

Chapter 7. Introduction to CICS Clients	105
What is a CICS Client?	105
What functions do CICS Clients provide?	106
The External Call Interface	106
The External Presentation Interface	106
The External Security interface	107
Terminal emulation	107
What protocols are supported?	107
APPC	107
TCP/IP support	108
Benefits of Client support	109
Further information about Clients	109
Chapter 8. Installing server support for Clients	111
Installing the DFHCLNT and DFHIPECI resource groups	111
Defining the CSCC and CIEO transient data queues.	111
Installing connections to Clients	112

#

Static APPC definitions	112
Autoinstalled APPC connections	112
Using TCP/IP	112
Installing Client virtual terminals	116
Using static definitions	116
Using autoinstall	118
How CICS installs Client terminals	120
Defining a Client-attached printer	121
Example static definition of a Client-attached printer	121
Setting up security	124
Bind security (APPC only)	124
Link security (APPC only)	124
User security	124
CICS-supplied transactions	125
System initialization parameters	125
Chapter 9. Data conversion for Clients	127
The client code page	127
The ECI	127
The EPI and terminal emulator	128
The server code page and character set	131
The ECI	131
The EPI and terminal emulator	131
Binary data conversion	133
Defining code pages to CICS on System/390	133
Chapter 10. Application programming for Clients	135
Writing ECI server programs	135
Writing EPI server programs	135
Client-attached printers	136
Chapter 11. Problem determination for Clients	139
Trace points	139
Messages	139
Abend codes	139
Chapter 12. Recovery after a restart of CICS	141
Recovering the Client terminal emulator	141
Client EPI and ECI programs	141
Chapter 13. Restrictions on Client support	143
Chapter 14. Migration considerations	145
Moving to a client/server environment	145
Using existing applications as servers	145
Data conversion	145
The External Call Interface	145
The External Presentation Interface	145

#

Part 3. Appendixes 147

Bibliography	149
CICS Family intercommunication books	149
CICS on System/390 intercommunication books	149
CICS Transaction Server for z/OS Version 3 Release 1	149
CICS Transaction Server for z/OS Version 2 Release 3	149

CICS Transaction Server for z/OS Version 2 Release 2	149
CICS Transaction Server for OS/390 Release 3	149
CICS Transaction Server for VSE/ESA Release 1.1.1	149
CICS/VSE Version 2	150
CICS non-System/390 intercommunication books.	150
CICS Transaction Gateway and CICS Universal Client	150
Accessibility	151
Index	153
Notices	157
Programming interface information	158
Trademarks and service marks	159
Sending your comments to IBM	161

Preface

What this book is about

This book is about setting up a CICS® System/390® product—CICS Transaction Server for z/OS®, CICS Transaction Server for OS/390®, CICS Transaction Server for VSE/ESA™, or CICS/VSE®—to communicate with a non-System/390 CICS product—CICS on Open Systems, CICS Transaction Server for Windows®, CICS/400®, or one of the CICS Clients workstation products. This type of communication is called CICS interproduct communication.

For an overview of CICS interproduct communication, see the *CICS Family: Interproduct Communication* manual, which explains the documentation scheme of which this book is a part. Note that chapters 6-11 of the *CICS Family: Interproduct Communication* manual duplicate material in the *Intercommunication Guide* for your CICS System/390 product. These chapters are primarily intended for users of CICS non-System/390 products.

In general, the present book does not duplicate information in a CICS System/390 product library. It may, however, duplicate material in the CICS non-System/390 product libraries, if the information is relevant to users of CICS System/390 products.

Who this book is for

This book is intended for those responsible for planning and implementing the **System/390 side** of intercommunication between a System/390 CICS system and any of the following non-System/390 CICS products—CICS Transaction Server for Windows, CICS on Open Systems, CICS/400, or CICS Clients.

What is not covered by this book

This book describes communication between System/390 and non-System/390 CICS products. It does not describe:

- CICS on System/390-CICS on System/390 communication. See the *Intercommunication Guides* for the relevant CICS on System/390 products.
- Distributed transaction processing. See the *Distributed Transaction Programming* manual for your CICS on System/390 product.
- The Front End Programming Interface feature of some CICS on System/390 products. See the *Front End Programming Interface User's Guide* for your CICS on System/390 product.
- CICS/VSE Version 2.3's support for the CICS Clients workstation products. This is described in a separate manual—the *CICS/VSE 2.3 Server Support for CICS Clients* manual, SC33-1712.
- Access to CICS programs and transactions from non-CICS environments. Some of the CICS on System/390 products offer more support for this than others. The books that describe this support are:
 - The *CICS External CICS Interface* manual
 - The *CICS External Interfaces Guide*
 - The *CICS Internet and External Interfaces Guide*
 - The *CICS Internet Guide*
 - The *CICS ONC RPC Guide*
 - The *CICS Web Interface Guide*.

To discover which of these books apply to your CICS on System/390 product, and their order numbers, see “CICS on System/390 intercommunication books” on page 149.

What you need to know to understand this book

This book assumes a conceptual understanding of CICS intercommunication, recovery and restart, resource definition, customization, and security.

Terminology

The following CICS products run on computers of the System/370™, System/390, or zSeries® family, and support communication with CICS products that run on other hardware platforms. (Not all of these products run on all of these computers—for example, CICS Transaction Server for z/OS Version 2 does not run on System/370.)

- CICS Transaction Server for z/OS Version 3
- CICS Transaction Server for z/OS Version 2, program number 5697–E93
- CICS Transaction Server for OS/390 Version 1, program number 5655-147
- CICS Transaction Server for VSE/ESA, program number 5648-054
- CICS/VSE Version 2, program number 5686-026

In this book, the term **System/390** is used to refer to any System/370, System/390, or zSeries computer on which one of the above products can run. The term **non-System/390** refers to the hardware platforms used by other CICS products—for example, iSeries® (used by CICS/400), IBM-compatible personal computers (used by CICS Transaction Server for Windows), and RISC System/6000® (used by CICS on Open Systems).

In statements that apply to each of the CICS products that runs on a System/390 hardware platform, the generic term **CICS on System/390** is used to represent all of them. One of these CICS products is referred to by name only if there is a difference in its interface to non-System/390 products as compared with the interface from other System/390 products. Subject to explicitly-stated exceptions, interpret all references to CICS as applying to your CICS on System/390 product.

The term *CICS Transaction Server for z/OS*, without a qualifying Version number, is used as a generic term for:

- CICS Transaction Server for z/OS Version 3 Release 1
- CICS Transaction Server for z/OS Version 2 Release 3
- CICS Transaction Server for z/OS Version 2 Release 2

The term *CICS Transaction Server for OS/390*, without a qualifying Version number, refers to CICS Transaction Server for OS/390 Release 3.

The term *CICS Transaction Server for Windows*, without a qualifier, means CICS Transaction Server for Windows, Version 5.0.

The term *CICS on Open Systems* is used as a generic name for:

- TXSeries® for Multiplatforms Version 5.1, which contains:
 - CICS for AIX®
 - CICS for HP-UX
 - CICS for Sun Solaris
 - CICS for Windows NT®
- TXSeries Version 4.3 for AIX (which contains CICS for AIX)
- TXSeries Version 4.3 for Sun Solaris (which contains CICS for Sun Solaris)

- TXSeries Version 4.3 for Windows NT (which contains CICS for Windows NT)
- TXSeries Version 4.2 for HP-UX (which contains CICS for HP-UX)

Where it is necessary to distinguish between these products, the full product names are quoted.

The term *CICS Transaction Server for VSE/ESA* means CICS Transaction Server for VSE/ESA Release 1.1.1.

The term *CICS/VSE* means CICS for VSE/ESA Version 2 Release 3.

The term *CICS/400* is used as a generic name for:

- CICS/400 Version 4 Release 5
- CICS Transaction Server for iSeries

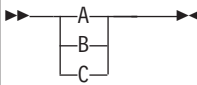
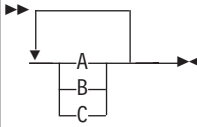
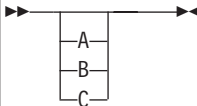
The term *CICS Clients* is used as a generic term for:

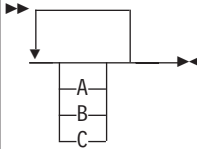
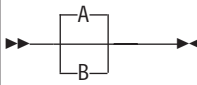


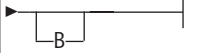
- The CICS Universal Client (for Windows NT, Windows 2000, and Windows XP)
- The CICS Client elements of the CICS Transaction Gateway products
- The client daemons of the CICS Transaction Gateway products

The notation **CICS–CICS TS for Windows** is used to refer to communication in either direction. To specify communication in only one direction, an arrow is added. For example, CICS–CICS on Open Systems function shipping refers to function shipping from CICS to CICS on Open Systems or from CICS on Open Systems to CICS. CICS/400→CICS function shipping refers only to function shipping from CICS/400 to CICS.

Macro syntax notation

This section explains the syntax of the DFHCNV resource definition macros described in “Defining the conversion table” on page 63.

Symbol	Action
	A set of alternatives—one of which you must code.
	A set of alternatives—one of which you must code. You may code more than one of them, in any sequence.
	A set of alternatives—one of which you may code.

Symbol	Action
	A set of alternatives — any number (including none) of which you may code once, in any sequence.
	Alternatives where A is the default.
 <p>Name:</p>  	Use with the named section in place of its name.
Punctuation and uppercase characters	Code exactly as shown.
Lowercase characters	Code your own text, as appropriate (for example, name).

Book structure

Part 1, “Communicating with non-System/390 CICS systems,” on page 1 describes how to set up a CICS on System/390 system to communicate with non-System/390 CICS systems.

It contains the following chapters:

Chapter 1, “Overview of CICS System/390–non-System/390 intercommunication”

summarizes intercommunication between System/390 and non-System/390 CICS products, listing the supported facilities, with a brief description of each.

Chapter 2, “Planning for CICS System/390–non-System/390 intercommunication”

describes the areas where you have a choice to make when designing your System/390–non-System/390 communication links and applications.

Chapter 3, “Resource definition for communication with non-System/390 systems”

describes the CICS on System/390 resource definitions needed to support communication with a non-System/390 CICS system.

Chapter 4, “CICS internal security”

describes the security available on CICS on System/390—non-System/390 links, and the resource definitions needed to specify the level of security you want.

Chapter 5, “VTAM/NCP definitions”

describes the VTAM/NCP definitions necessary to support intercommunication between System/390 and non-System/390 CICS products.

Chapter 6, “Data conversion for communication with non-System/390 systems”

describes the CICS on System/390 resource definitions needed to enable data conversion for communication with CICS Transaction Server for Windows or CICS on Open Systems. This chapter also lists the supplied user-replaceable data conversion program, which you can replace or modify if the supplied standard conversion program does not meet your needs.

Part 2, “Server Support for CICS Clients,” on page 103

describes how to set up a CICS on System/390 system to act as a server to the CICS Clients workstation products.

It contains the following chapters:

Chapter 7, “Introduction to CICS Clients”

Chapter 8, “Installing server support for Clients”

Chapter 9, “Data conversion for Clients”

Chapter 10, “Application programming for Clients”

Chapter 11, “Problem determination for Clients”

Chapter 12, “Recovery after a restart of CICS”

Chapter 13, “Restrictions on Client support”

Chapter 14, “Migration considerations”

Summary of changes

This book is based on the eighth edition of the *Communicating from CICS on System/390* manual, SC34-6474-02. Changes from that edition are marked by vertical bars in the left margin.

This part lists briefly the changes that have been made for the following editions:

- “Changes for the seventh edition”
- “Changes for the sixth edition”
- “Changes for the fifth edition” on page xvi
- “Changes for the fourth edition” on page xvi

Changes for the seventh edition

The major changes for this edition are:

- The book has been revised to take account of the following new products:
 - CICS Transaction Server for z/OS Version 3
- The DFHCNV macro, used to define data conversion templates, has been updated to allow you to specify client and server code page defaults in the system initialization table. This can simplify CICSplex management by reducing the number of conversion tables needed. See “Defaults for client and server code pages” on page 64.

Changes for the sixth edition

The major changes for this edition were:

- The book was revised to take account of the following new products:
 - CICS Transaction Server for z/OS Version 2 Release 3
 - CICS Transaction Server for Windows, Version 5.0
- References to the following CICS products, which are no longer supported, were removed:
 - CICS Transaction Server for z/OS Version 2 Release 1
 - CICS Transaction Server for OS/390 Release 2
 - CICS Transaction Server for OS/390 Release 1
 - CICS Transaction Server for VSE/ESA Release 1.0
 - CICS/ESA[®] Version 4.1
 - CICS Transaction Server for OS/2[®] Warp Version 4.1
 - CICS for OS/2 Version 3.1
- The tables of client and server code pages in Chapter 6, “Data conversion for communication with non-System/390 systems,” on page 43 were updated.
- The tables of client and server code pages in Chapter 9, “Data conversion for Clients,” on page 127 were updated.
- In CICS TS for z/OS Version 2.3 and later, the DFHCNV macro, used to define data conversion templates, is extended. Whereas previously you had to define a separate template for each resource to which data conversion was to be applied, it is now possible to define generic templates that apply to multiple resources. The new support for generic templates was described in “Defining the conversion table” on page 63.

Changes for the fifth edition

The major changes for this edition were:

- The book was revised to take account of the following new product:
 - CICS Transaction Server for z/OS Version 2 Release 2
- CICS TS for z/OS Version 2.2's support for user-named data conversion programs was described in "User-named conversion programs" on page 82.
- The new ECI over TCP/IP function was described in "Using ECI over TCP/IP" on page 108 and "Using ECI over TCP/IP" on page 114.

Changes for the fourth edition

The more significant changes for this edition were:

- The book was revised to take account of the following new product:
 - CICS Transaction Server for z/OS Version 2 Release 1
- The tables of client and server code pages in Chapter 6, "Data conversion for communication with non-System/390 systems," on page 43 were updated.
- The tables of client and server code pages in Chapter 9, "Data conversion for Clients," on page 127 were updated.
- References to CICS/ESA Version 3 were removed, because this product is no longer supported.

Part 1. Communicating with non-System/390 CICS systems

This part of the book describes how to set up a CICS on System/390 system to communicate with non-System/390 CICS systems. It contains the following topics:

- Chapter 1, “Overview of CICS System/390–non-System/390 intercommunication,” on page 3
- Chapter 2, “Planning for CICS System/390–non-System/390 intercommunication,” on page 11
- Chapter 3, “Resource definition for communication with non-System/390 systems,” on page 17
- Chapter 4, “CICS internal security,” on page 31
- Chapter 5, “VTAM/NCP definitions,” on page 39
- Chapter 6, “Data conversion for communication with non-System/390 systems,” on page 43

Note: CICS on System/390’s support for the CICS Clients products is described in Part 2, “Server Support for CICS Clients,” on page 103.

Chapter 1. Overview of CICS System/390–non-System/390 intercommunication

Note

In this chapter and throughout this book, the generic term **CICS on System/390** represents all CICS System/390 products.

Interproduct communication between System/390 and non-System/390 CICS systems uses the Systems Network Architecture (SNA) LU 6.2 protocol. The descriptions in this chapter assume LU 6.2 links.

Below is a list of the supported facilities. Every CICS on System/390 product supports all these facilities.

Function shipping (see “Function shipping”)

File control, temporary storage, transient data, syncpoint, and interval control requests can be shipped in either direction between System/390 and non-System/390 CICS systems.

Transaction routing (see “Transaction routing” on page 4)

Transactions can be routed over an LU 6.2 link in either direction between System/390 and non-System/390 CICS systems.

Distributed program link (DPL) (see “Distributed program link (DPL)” on page 6)

DPL enables CICS application programs to issue EXEC CICS LINK commands in either direction between System/390 and non-System/390 CICS systems.

Asynchronous processing (see “Asynchronous processing” on page 8)

Asynchronous processing is supported between System/390 and non-System/390 CICS systems. The initiating request can flow in either direction.

Distributed transaction processing (DTP) (see “Distributed transaction processing (DTP)” on page 8)

Distributed transaction processing, using mapped conversations, is supported between System/390 and non-System/390 CICS systems. The initiating request can flow in either direction.

Function shipping

Non-System/390 CICS application programs can access resources (data or transactions) owned by a CICS on System/390 system, and a CICS on System/390 application can access resources owned by a non-System/390 CICS system, in each case provided that the resources are defined as remote in the function shipping system.

A function shipping request takes the form of a normal EXEC CICS command. If either of the following conditions applies, the application-owning system recognizes that function shipping is required and ships the request to the remote resource-owning system.

1. The EXEC command specifies a remote system in the SYSID option.
2. The resource is defined as remote.

The mirror program in each CICS product (DFHMIRS in CICS on System/390) handles inbound function shipping.

function shipping

As already noted, the LU 6.2 protocol is used for all communication between System/390 and non-System/390 CICS systems. Synchronization level 2 on LU 6.2 links is supported by CICS on Open Systems and CICS/400. It is *not* supported by CICS Transaction Server for Windows. Synchronization level 1 is supported for function shipping between all non-System/390 and System/390 CICS systems. See “Syncpointing (LU 6.2)” on page 14.

Restrictions on function shipping

There are some restrictions on function shipping between System/390 and non-System/390 CICS systems.

CICS non-System/390→CICS on System/390

Function shipping the following sequence of commands from a non-System/390 CICS to a CICS on System/390 system causes the System/390 mirror transaction to abend:

```
DELETEQ TS Q(RFRED)
WRITEQ TS Q(RFRED) FROM()
SYNCPOINT
```

This is because, on CICS on System/390, you cannot delete a recoverable temporary storage queue and then write to it, without issuing a syncpoint between the two commands.

DL/I database access

Non-System/390 CICS systems cannot function-ship requests to DL/I databases accessed through CICS on System/390 systems. To access DL/I databases from CICS Transaction Server for Windows, CICS on Open Systems, or CICS/400, use distributed transaction processing or the distributed program link function.

Data conversion

CICS Transaction Server for Windows and CICS on Open Systems use ASCII¹ data representation and CICS/400 and CICS on System/390 systems use EBCDIC². When conversion is necessary, the ASCII-based system always converts system data such as resource names. Conversion of user data is performed as necessary in the resource-owning system. For example, for CICS TS for Windows→CICS function shipping, CICS converts the user data (see Table 2 on page 43). For CICS→CICS TS for Windows function shipping, CICS TS for Windows converts the user data.

Transaction routing

Transaction routing enables a terminal in one CICS system to run with a transaction in another CICS system. The typical way to initiate transaction routing is by entering a remote transaction ID at a local terminal. For other ways, see the *CICS Family: Interproduct Communication* manual.

Transactions can be routed in either direction over an LU 6.2 link between any CICS non-System/390 system and any CICS on System/390 system.

1. American National Standard Code for Information Interchange

2. Extended Binary-Coded Decimal Interchange Code

CICS on System/390→CICS non-System/390

For transaction routing from a CICS on System/390 system, CICS on System/390 requires a remote definition of the non-System/390 transaction. The REMOTESYSTEM name must be the name of the connection to the non-System/390 system.

CICS on System/390 requires a local definition of the terminal from which the transaction is routed. The definition could be statically-defined or autoinstalled.

The non-System/390 CICS requires a remote definition of the terminal. This remote terminal definition could be statically-defined to the non-System/390 CICS or shipped from CICS on System/390.

CICS non-System/390→CICS on System/390

For transaction routing from CICS Transaction Server for Windows, CICS on Open Systems, or CICS/400, the non-System/390 CICS requires a remote definition of the CICS on System/390 transaction (see the *Intercommunication Guide* or equivalent for the non-System/390 system).

The non-System/390 CICS requires a local definition of the terminal from which the transaction is routed.

CICS on System/390 requires a remote definition of the terminal. This remote terminal definition could be statically-defined to CICS on System/390 or shipped from the non-System/390 CICS.

The remote definition of a non-System/390 terminal has the following characteristics:

- REMOTESYSTEM is the System/390 name of the connection to the non-System/390 system.
- A subset of the 3270 extended data stream architecture (ASCII-7) is supported.
- The color, highlight, programmable symbols (PS), and outline extended attributes are supported but only to the extent that they are generated by BMS. (A field may have these attributes but an individual character within a field cannot have separate attributes.)
- TCTUALENG must be the same as TCTUAL in the non-System/390 system TCT definition for the terminal.
- REMOTENAME is the terminal ID in the non-System/390 TCT definition for the terminal.³

Dynamic transaction routing

Dynamic transaction routing allows a user-written program (the “dynamic transaction routing program”) to select the system to which a transaction routing request is to be directed. Dynamic transaction routing is supported by CICS on System/390, CICS on Open Systems, and CICS Transaction Server for Windows, but not by CICS/400.

The terminal-owning region (TOR) that receives the transaction request and the application-owning region (AOR) to which the request is routed do not have to be

3. In a network of CICS Transaction Server for Windows systems, they can all use the same terminal names. A transaction routing exit allows the changing of shipped terminal names to unique values, called terminal shipping aliases. If a terminal shipping alias is used, it must be the name in the CICS remote definition of the terminal.

transaction routing

the same CICS product-type. For example, it is possible for a dynamic transaction routing program running on a CICS on System/390 TOR to route a transaction request to a CICS/400 AOR.

Data conversion

CICS on System/390 systems do no data conversion for transaction routing. Screen data always flows as 3270 data streams. COMMAREAs and TCTUAs (which are relevant to pseudoconversational transactions) are converted by the ASCII system.

Transaction routing restrictions

There are some restrictions on transaction routing support, as follows:

- BMS paging is not supported.
- The fully qualified network name of CICS Transaction Server for Windows is not available in the CICS monitoring record for LU 6.2 links.
- CICS Transaction Server for Windows should not invoke CICS on System/390 transactions defined with message protection options that cannot be honored on synclevel 1 links—that is, MSGINTEG(YES) or PROTECT(YES).

Distributed program link (DPL)

Distributed program link (DPL) enables an application program in a local CICS system to issue an EXEC CICS LINK command to link to a program in a remote CICS system, which returns control to the calling program.

CICS on System/390 supports both inbound and outbound DPL with all current non-System/390 CICS systems.

Distributed program link:

- Provides a way for non-System/390 CICS systems to access DL/I and SQL databases and BDAM files owned by a System/390 CICS system, and allows existing System/390 programs to be used on the data. (Another way of accessing this data is to use distributed transaction processing—see “Distributed transaction processing (DTP)” on page 8.)
- Provides improved performance for a distributed system consisting of multiple CICS systems. For example, a single link can achieve a data set browse that would require multiple flows if function shipping were used.
- Allows a CICS programmer to use an LU 6.2 link without needing to know the protocol.

Restrictions on programs linked by DPL

In CICS on System/390, the linked program runs under the mirror transaction, using that transaction’s attributes, for example, task priority, security attributes, and keys.

A CICS program linked by a program in a remote CICS system cannot issue:

- Terminal control commands to the initiating CICS system
- Commands that inquire on terminal attributes
- BMS commands
- SIGNON and SIGNOFF (CICS Transaction Server for z/OS and CICS Transaction Server for OS/390 only)

A DPL server program on CICS on System/390 terminates with transaction abend code ADPL if it issues one of the restricted commands listed above.

A CICS program linked by a program in a remote CICS system can issue commands that address the TWA or the TCTUA. However, if the linked-to program addresses the TWA it is given access to the TWA of the *local* transaction. If it addresses the TCTUA a null pointer is returned.

Note for DB2

When DB2® data is accessed from CICS Transaction Server for Windows, CICS 400®, or CICS on Open Systems, security access is based on the TRANSID passed to the System/390 mirror transaction.

The System/390 EIBTRNID field is set to the transaction ID passed by the remote CICS system, and this is used for the duration of the link. This mechanism allows greater selectivity for DB2 plans.

Abends when using DPL

If the linked CICS program terminates abnormally and doesn't handle the abend itself, the mirror program returns an abend code. The code returned is that which would have been returned by an ASSIGN ABCODE command. Note that the abend code returned to the linking CICS system is the last abend to occur in the mirror program, which may have handled other abends before terminating.

Performance optimization for DPL

The performance of DPL may be affected by the amount of data transmitted, which includes the optional COMMAREA specified on an EXEC CICS LINK command. For communication between all CICS servers, the recommended maximum length of a communications area is 32500 bytes.

CICS on System/390 and the other CICS products contain algorithms designed to reduce the number of bytes to be transmitted. The algorithms remove some trailing binary zeros from the COMMAREA before transmission and restore them after transmission. The operation of these algorithms is transparent to the application programs, which always see the full-size COMMAREA.

When transmission time accounts for a significant part of the response time at a user terminal or workstation, application programs may be able to improve performance by using the DATALENGTH parameter in the LINK command. This parameter specifies a contiguous area of storage, at the start of the COMMAREA, to be passed to the invoked program. For example, if all the data to be transmitted is grouped in the first 100 bytes of a 30 000-byte COMMAREA, and DATALENGTH(100) is specified, only the first 100 bytes are transmitted.

Dynamic routing of DPL requests

CICS Transaction Server for OS/390 Release 3 and CICS Transaction Server for z/OS allow you to route DPL requests dynamically. In these products, if a program defined as DYNAMIC is the subject of an EXEC CICS LINK command, the CICS dynamic routing program is invoked, and can select a remote region on which the program is to execute.

CICS TS for OS/390 Release 3 and later can dynamically route:

- EXEC CICS LINK commands issued locally.
- DPL calls received from other CICS regions. The other CICS regions do not have to be CICS TS for OS/390 Release 3 or later systems. This means that other CICS products can benefit from the enhanced workload balancing capabilities of CICS TS for OS/390 Release 3 and later.

distributed program link

- Any type of program-link request received from outside CICS. For example, CICS Transaction Server for OS/390 Release 3 and later can dynamically route any of the following:
 - Calls received from:
 - CICS Web support
 - The CICS Transaction Gateway
 - Calls from external CICS interface (EXCI) client programs
 - External call interface (ECI) calls from any of the CICS Client workstation products
 - Distributed Computing Environment (DCE) remote procedure calls (RPCs)
 - ONC RPC calls.

#

For definitive information about how to route program-link requests dynamically, see your *Intercommunication Guide*.

Asynchronous processing

Asynchronous processing is a form of intercommunication in which one transaction initiates another, and the two transactions then run independently of each other (that is, asynchronously).

Asynchronous processing is initiated when a transaction issues a START command for a remote transaction. The issue of the START command can be regarded as a special case of function shipping, in which the shipped request is a START command. Data passed by the starting transaction can be accessed by the started transaction using the RETRIEVE command.

A transaction can initiate and communicate synchronously with a remote transaction and then terminate, leaving the initiated transaction to continue asynchronously. The original initiating request can flow in either direction between System/390 and non-System/390 CICS systems.

Distributed transaction processing (DTP)

Distributed transaction processing (DTP) enables transactions running in one CICS system to initiate and communicate synchronously with transactions in another CICS system. DTP is supported between CICS on System/390 products and each of the non-System/390 CICS products. The initiating transaction can be in either the System/390 or non-System/390 CICS system. Sync level 1 is the maximum synclevel for CICS Transaction Server for Windows links.

DTP is an alternative to DPL as a way for other CICS systems to access DL/I and DB2 databases owned by a CICS on System/390 system that has a database-handling transaction.

Application programs can issue CICS commands for APPC conversations and so control the allocation and use of an APPC session. To do this, a program must be aware of the state of the conversation over the intersystem link at any given time.

The EXEC CICS commands used to control an APPC conversation are: ALLOCATE, CONNECT PROCESS, EXTRACT PROCESS, SEND, RECEIVE, CONVERSE, WAIT, ISSUE CONFIRMATION, ISSUE ERROR, ISSUE ABEND, FREE.

Summary of CICS System/390–non-System/390 intercommunication

Table 1 shows the communication functions that a CICS System/390 product can support on links between itself and each non-System/390 CICS system-level product.

Note: CICS on System/390's support for the CICS Clients workstation products is described in Part 2, "Server Support for CICS Clients," on page 103.

If a function is shown as supported in the table, it means that:

1. The function is supported on all current System/390 products (CICS Transaction Server for z/OS, CICS Transaction Server for OS/390, CICS Transaction Server for VSE/ESA, and CICS/VSE).
2. Both inbound and outbound requests are supported.

All functions are supported on LU 6.2 connections only. Data conversion, where necessary, is supported at each end of the link.

Table 1. CICS interproduct communication

CICS TS for z/OS, CICS TS for OS/390, CICS TS VSE/ESA, CICS/VSE	CICS Transaction Server for Windows	CICS on Open Systems	CICS/400
Function shipping	Yes	Yes	Yes
Transaction routing	Yes	Yes	Yes
Distributed program link	Yes	Yes	Yes
Distributed transaction processing	Yes	Yes	Yes
Asynchronous processing	Yes	Yes	Yes

summary

Chapter 2. Planning for CICS System/390–non-System/390 intercommunication

CICS interproduct communication requires planning and setup at both ends. CICS on System/390 planners should consult the planners of all the systems with which CICS on System/390 is to communicate.

This chapter discusses the areas where decisions must be made.

Path length and resource definition tradeoffs

If more than one System/390 CICS system is communicating with an ASCII system—that is, with CICS Transaction Server for Windows or CICS on Open Systems—direct and indirect links are possible. The links used affect resource definition effort and processing workload. The processing workload includes data transfer and data conversion.

Where user data conversion is performed by the System/390, it occurs at the first System/390 system for data inbound from the ASCII system, and at the last System/390 system for data outbound to the ASCII system. In Figure 1, an ASCII system running CICS Transaction Server for Windows is linked to two CICS on System/390 systems, directly to CICS1 and indirectly, through CICS1, to CICS2. CICS1 and CICS2 can be connected in any way supported for the particular products. Whatever the connection between CICS1 and CICS2, CICS1 does the conversion for data transferred in either direction.

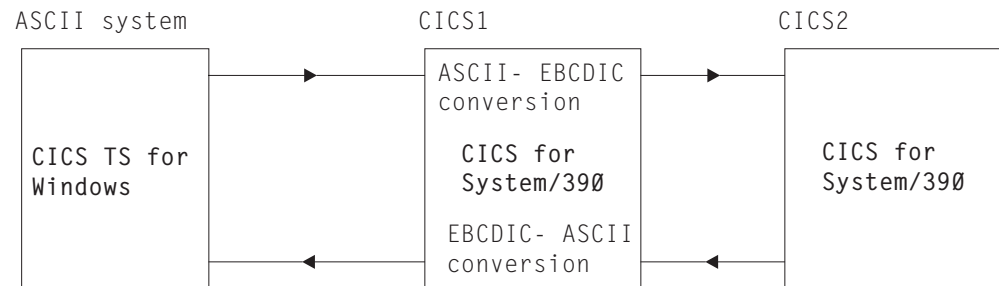


Figure 1. Where data conversion takes place

Figure 2 on page 12 shows an ASCII system, CICS Transaction Server for Windows or CICS on Open Systems, and four CICS System/390 systems. This figure is the basis of the discussion in the rest of this chapter.

The CICS on System/390 systems comprise:

- One terminal-owning region (TOR)
- Two application-owning regions (AOR1 and AOR2)
- One data-owning region (DOR).

The ASCII system can have a separate LU 6.2 link to each System/390 system. Figure 2 shows three such links: link X to TOR, link Y to AOR1, and link Z to DOR.

Assumptions

Under “Possible approaches” on page 12, the following assumptions are made about Figure 2 on page 12.

planning

1. A user of the ASCII system can enter a transaction (TRN1) owned by system AOR1 that requires access to:
 - Temporary storage (TS) queues in DOR
 - Transient data (TD) queues in systems AOR1, AOR2, and DOR
 - File control (FC) files in DOR.
2. Function shipping can take place from the ASCII system directly to TOR, AOR1, and DOR, and indirectly to AOR2.

Note: Some or all of these requests may require data conversion.

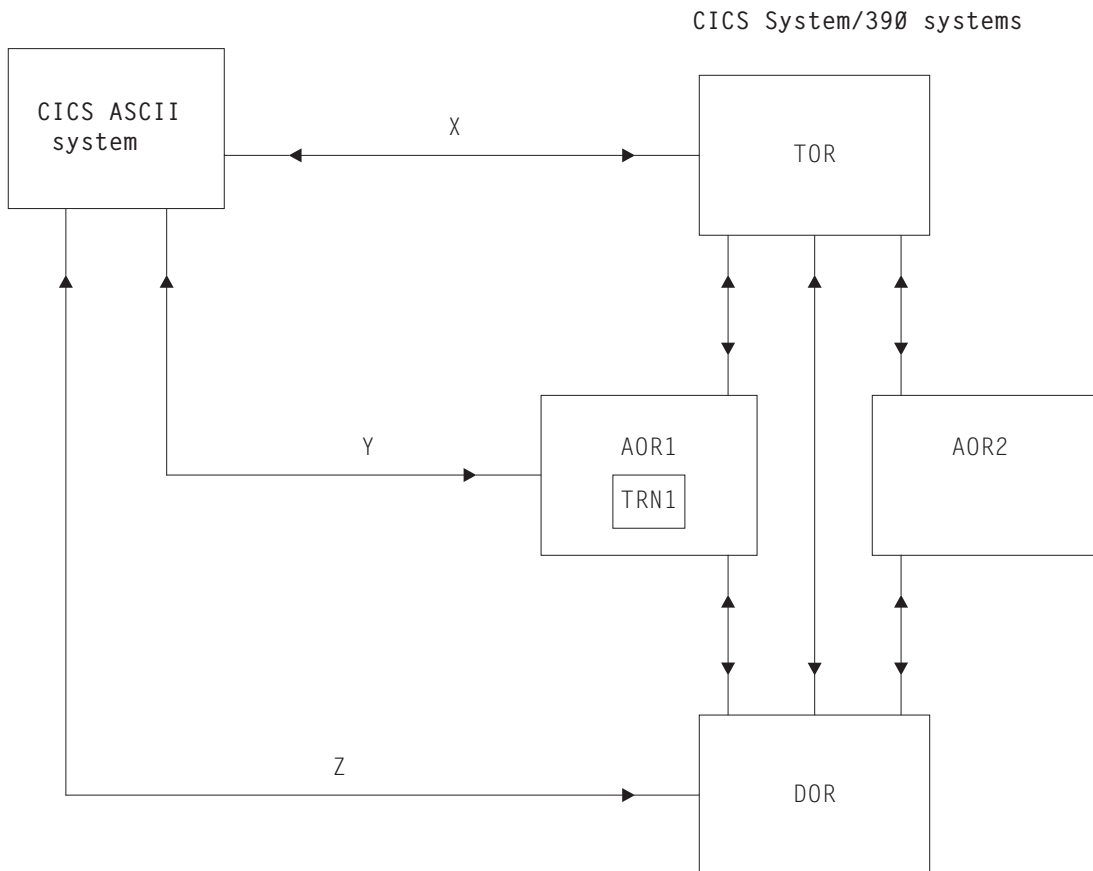


Figure 2. Sample configuration of System/390 and non-System/390 CICS systems

Possible approaches

With the setup in Figure 2, and the stated assumptions, various scenarios are possible, as discussed below.

Note: In the discussion, the term “data conversion modules” refers to:

1. The standard data conversion program
2. The data conversion table
3. The user-replaceable data conversion program.

All three of these items are required for function shipping and DPL, but only the first two for transaction routing.

Transaction routing: ASCII—TOR—AOR1

The following definitions are necessary:

- In the ASCII system, a remote definition of the transaction (the remote system is specified as TOR).
- In TOR:
 - A remote terminal definition (or a shipped terminal definition)
 - A remote definition of the transaction (the remote system is specified as AOR1).
- In AOR1:
 - A remote terminal definition (or a shipped terminal definition).
 - Remote definitions of the files owned by DOR that are to be accessed by the transaction.
 - Remote definitions of the temporary storage queues in DOR.
 - Remote definitions of the transient data destinations in DOR.
 - Local transient data definitions.
 - Local transaction and program definitions.
 - If AOR1 is a CICS/VSE Version 2 system, an indirect connection to the ASCII system, via TOR. Indirect connections are required only for transaction routing across intermediate systems. For information about defining indirect connections, see the *Intercommunication Guide* for your CICS System/390 product.
- In DOR:
 - Local transient data definitions
 - Local temporary storage definitions
 - Local file definitions.

The ASCII system uses its system services to perform the data conversion from ASCII to EBCDIC.

Transaction routing: ASCII—AOR1

The same resource definitions are required as for transaction routing through TOR (see above), except that:

- In the ASCII system, on the remote transaction definition, the remote system is specified as AOR1
- In TOR, the remote terminal and transaction definitions are no longer necessary
- In AOR1, the indirect connection to the ASCII system is no longer necessary.

Function shipping: ASCII—TOR—AOR1—DOR

The following definitions are necessary:

- In the ASCII system, remote definitions of the resources to be accessed
- In TOR:
 - Remote definitions of the resources to be accessed
 - Definitions of the data conversion modules.
- In AOR1:
 - Local definitions of its own resources
 - Remote definitions of resources owned by DOR, that are to be accessed by the ASCII system.
- In DOR, local definitions of its own resources.

The data conversion modules need to be defined in only one system, TOR, which does the ASCII↔EBCDIC conversion on the transmitted user data.

Function shipping: ASCII—AOR1—DOR

The same resource definitions are required as for the previous example, except that:

- The definitions in TOR are not required
- The data conversion module definitions are in AOR1, which does the ASCII↔EBCDIC conversion on the transmitted user data.

Function shipping: ASCII—AOR1 and ASCII—DOR

The same resource definitions are required as for the previous example, except that:

- The remote resource definitions are not required in AOR1
- AOR1 and DOR each do ASCII↔EBCDIC conversion on transmitted user data, depending on which system is the target of each function-shipped request. You must therefore define the data conversion modules in both AOR1 and DOR.

Summary

A direct link from the workstation to the target CICS system gives the shortest path length. If you have several target CICS on System/390 systems, you can ship all requests through a single system in which you have defined the data conversion modules. This enables you to define the data conversion modules in only one place, at the expense of a longer path length and the need to create more remote resource definitions.

Syncpointing (LU 6.2)

Synchronization level 2 is supported on LU 6.2 links by CICS on Open Systems and CICS/400. It is *not* supported by CICS Transaction Server for Windows. LU 6.2 sessions between CICS Transaction Server for Windows and CICS on System/390 are bound at synchronization level 1 (synclevel 1), which allows the exchange of private synchronization requests and responses, but not the use of CICS syncpointing commands. However, for function shipping, CICS has defined session-local protocols that allow limited use of syncpoint commands. The effects of this are:

- Session-local protocols are needed to coordinate changes made in both systems.
- CICS cannot guarantee resource integrity after a session or system failure.

CICS has defined session-local protocols for use when function shipping occurs at synclevel 1. The following examples describe the use of these protocols.

Function shipping from CICS on System/390 to CICS Transaction Server for Windows

A and B are two CICS on System/390 systems communicating with each other at synclevel 2 (SL 2 in the figure). B communicates at synclevel 1 (SL 1 in the figure) with three CICS Transaction Server for Windows systems, X, Y, and Z.

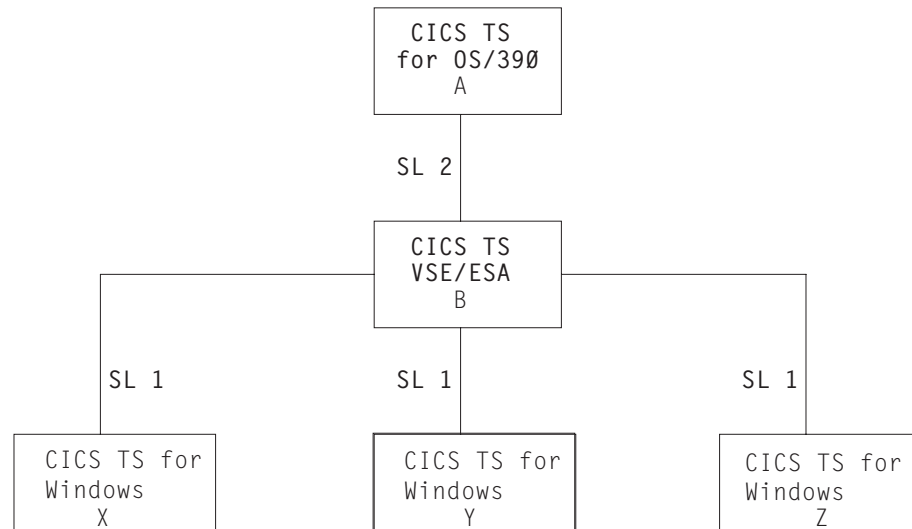


Figure 3. Synchronization between CICS on System/390 and CICS Transaction Server for Windows. CICS Transaction Server for Windows systems do not support synclevel 2 over LU 6.2 links.

Provided there are no failures (transaction, session, or LU (either end of each link)) during the commit stage (while recoverable resource changes are being committed by each partner), data integrity is assured at either end of each link.

If there is a failure during the A-B commit stage, all resource updates can be backed out. However, if there is a failure during the commit stage on the B-X, B-Y, or B-Z sessions, the system requesting synchronization has no way of knowing if its partner has committed the changes to its resources.

The implications of this are best explained by an example.

Example

A transaction in B (defined with the INDOUBT(BACKOUT) attribute) is function shipping file update requests to A, X, Y, and Z. The function-shipping transaction requests synchronization by issuing an EXEC CICS RETURN command. CICS commits the changes on the synclevel 2 session (B-A) first, and then the changes on each synclevel 1 session in turn.

If a failure occurs during the B-A commit stage, the changes on all systems are rolled back. If a failure occurs during the commit stage on any of the synclevel 1 links (B-X, B-Y, or B-Z), a message is issued, and synclevel 1 processing continues on the remaining links, with the aim of committing as many synclevel 1 resources as possible. *User-defined procedures are needed to resynchronize function-shipped updates.*

Suggestion

If you use function shipping between CICS on System/390 and CICS Transaction Server for Windows, you incur the risk described here. If this risk is unacceptable, you should use distributed transaction processing. You can then build your own integrity into the programs at either end of the link.

syncpointing

DPL or function shipping from CICS Transaction Server for Windows to CICS on System/390

DPL and function shipping incorporate synclevel 1 logic. The CICS Transaction Server for Windows system initiates the commit procedure by requesting CICS on System/390 to commit data changes. The CICS Transaction Server for Windows system then commits the changes itself when it receives confirmation of CICS on System/390 commitment.

Figure 4 illustrates synclevel 1 support in a simple example. You can, of course, have a number of connected CICS systems. In the case of multiple connected systems, the commit request is propagated through all the system connections.

When using DPL, you should take syncpoints from the CICS Transaction Server for Windows system. If you take a syncpoint in the linked-to System/390 program, the syncpoint request is not propagated back to the CICS Transaction Server for Windows system.

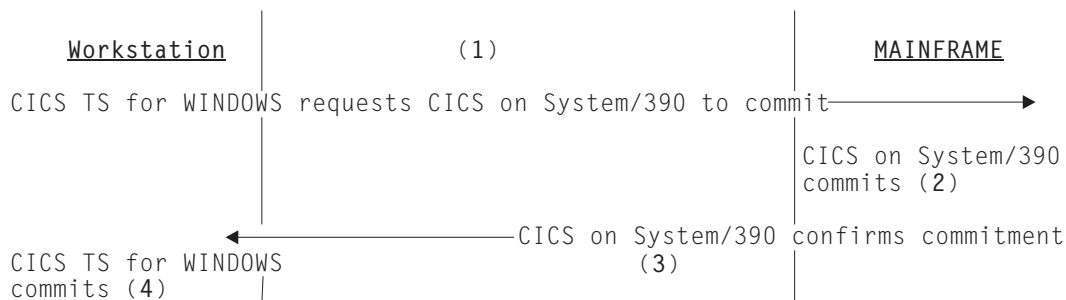


Figure 4. Sync level 1 logic in a CICS Transaction Server for Windows—CICS on System/390 link

Chapter 3. Resource definition for communication with non-System/390 systems

This chapter describes the resource definitions needed in a CICS on System/390 system for communication with non-System/390 CICS products. SNA LU 6.2 (APPC) links are used.

Examples in this chapter

This chapter consists mainly of example resource definitions using the CEDA transaction. Note that:

- The examples do not show complete CEDA screens, but only options that are relevant to intercommunication.
- Some options are not available or relevant to all CICS System/390 products. Where this applies, it is noted in the text following the example screen.

For further information about the intercommunication options available on your System/390 system, see the *Intercommunication Guide* for your CICS on System/390 product.

- The examples are intended as generic definitions that will work on all CICS on System/390 systems. As such, options that are unavailable on some products, or that are retained solely for CSD-compatibility with earlier CICS releases, are given default values, or are not specified.

For definitive information about coding the intercommunication options, see the *Resource Definition Guide*⁴ for your CICS on System/390 product.

- If possible, you should use the same group name for all definitions associated with a particular remote system. The examples use the name CICSWIN.

4. *Resource Definition (Online)* in earlier releases

System generation and initialization

Set the following fields in the CICS system initialization table (SIT):

- ISC=YES, to include the intercommunication programs
- For CICS/VSE Version 2 only, EXEC=YES, to support command-level programs (CICS Transaction Server for Windows, CICS/400, and CICS on Open Systems, like CICS TS for z/OS, CICS TS for OS/390, and CICS Transaction Server for VSE/ESA, do not support macro-level programs).

For CICS/VSE Version 2 systems only, code the following operands of the DFHSG PROGRAM=TCP macro instruction (used during system generation and customization to create the terminal control program) with the values shown:

- ACCMETH=VTAM, to support VTAM®
- CHNASSY=YES, to support SNA chain assembly
- VTAMDEV=(..,LUTYPE6,..) to identify the type of link you are using.

Setting up LU 6.2 links

You must use an LU 6.2 link for all the facilities described in Chapter 1, “Overview of CICS System/390–non-System/390 intercommunication,” on page 3. Depending on the intercommunication functions being used, create resource definitions similar to those required on a link between two System/390 CICS systems.

All communication with CICS non-System/390 systems

Define the following:

- A communications profile. (You can use the supplied profile, DFHCICSA, which is defined in the supplied group DFHSTAND.)
- For single-session links, the remote CICS system, using TERMINAL and TYPETERM definitions; see “Remote system TERMINAL definition (single session)” on page 23 and “Remote system TYPETERM definition” on page 25.
- For parallel sessions, CONNECTION and SESSIONS definitions, see “CONNECTION definition for parallel sessions” on page 26 and “SESSIONS definition for parallel sessions” on page 27.

No CONNECTION or SESSIONS definitions are necessary for single-session links, which can be completely defined by TERMINAL and TYPETERM definitions. The terminal name (for example, PSO2 on page 23) serves as the connection name.

If you require parallel-session links, omit the TERMINAL and TYPETERM definitions. The CONNECTION and SESSIONS definitions support both types of link.

If you are using CICS internal security (CICS/VSE Version 2 only), and you want IDENTIFY or VERIFY attach-time security, use the DFHSNT resource definition macro to create an SNT entry for each non-System/390 user who accesses CICS/VSE resources. If you are using an external security manager (ESM), such as RACF®, define user profiles to your ESM instead. See Chapter 4, “CICS internal security,” on page 31.

Function shipping and DPL from CICS non-System/390 systems

Define the following:

- The mirror transaction (the name varies with product and release); see “CICS on System/390 mirror transaction definition” on page 20.
- The mirror program (the name varies with product and release); see “CICS on System/390 mirror program definition” on page 21.
- If the remote system is CICS on Open Systems or CICS Transaction Server for Windows, the data conversion program DFHCCNV, the data conversion table DFHCNV, and, if you need nonstandard conversion, the user-replaceable conversion program DFHUCNV; see page 22.

(The above three items are defined in the supplied group DFHISC.)

An incoming START command can use the TERMID option to specify a terminal that is to be associated with the started transaction. Unless you can rely on a definition of this terminal being shipped from the non-System/390 system, you should create a remote definition of it to CICS on System/390.

Function shipping and DPL to CICS non-System/390 systems

For function shipping, define the remote resource (file, temporary storage queue, or transient data queue).

LU 6.2 definitions

For function shipping of a START command, define the remote transaction, unless the LINK or START command includes the SYSID option.

Transaction routing from CICS non-System/390 systems

Create remote terminal definitions for those terminals whose definitions cannot be shipped from the non-System/390 system. Examples of such terminals are 3270 terminals or printers defined with the attribute SHIPPABLE(NO).

Transaction routing to CICS non-System/390 systems

Define the remote transaction. Unless you are using dynamic transaction routing, specify the REMOTESYSTEM value as the name of the connection to the transaction-owning system.

Defining remote resources

The following pages give examples of the definitions required to support intercommunication connections and functions at the system level. When defining a remote resource for a specific application (program, transaction, file, queue, or terminal), the REMOTESYSTEM value is the name of the connection to the resource-owning system. For an example of a remote resource definition, see "Remote terminal TERMINAL definition" on page 28.

CICS on System/390 mirror transaction definition

Most of the values below must be entered as shown.

The profile name shown is that of an IBM-supplied profile. If you create your own profile, change this name. In your own profile, specify INBFMH (All), which is required for function shipping and distributed transaction processing.

```
DEFINE TRANSACTION(CPMI) GROUP(CICSWIN)
OVERTYPE TO MODIFY
CEDA DEFine
Transaction      : CPMI
Group           : CICSWIN
PROGram         ==> DFHMIRS
TWAsize         ==> 00000          0-32767
PROFile         ==> DFHCICSA
PARTitionset    ==>
STATUS         ==> Enabled        Enabled|Disabled
PRIMEdsize     ==> 00000          0-65520
SCHEDULING
PRIOrity       ==> 001           0-255
TCLass         ==> No            No|1-10
ALIASES
```

If you use the TRANSID option of the EXEC CICS LINK command to specify a different mirror transaction, you need to copy this definition, change the TRANSACTION name and, possibly, change the values of TWASIZE, PRIMEDSIZE, PRIORITY, and TCLASS.

CICS on System/390 mirror program definition

Enter all values as shown.

For CICS/VSE Version 2 systems that use CICS internal security, the RSL value of PUBLIC means that no CICS security restrictions are placed on the use of this program. If you wish to restrict its use, enter a number in the range 1 through 24. A value of 0 denies use of this program to any transaction defined with RSLC(YES). For details of the RSL and RSLC attributes, refer to the *CICS/VSE Version 2 Release 3 Resource Definition Guide*.

```

DEFINE PROGRAM(DFHMIRS) GROUP(CICSWIN)
OVERTYPE TO MODIFY
CEDA DEFine
PROGRAM      ==> DFHMIRS
Group       ==> CICSWIN
Language    ==> Assembler      Cobol|Assembler|Le370|C|P1i|Rpg
RELoad     ==> No                No|Yes
RESident   ==> No                No|Yes
RSL        ==> Public            0-24|Public
Status     ==> Enabled          Enabled|Disabled

```

The following notes apply to all program definition screens.

Notes:

1. The RSL option relates to CICS internal security, and does not apply to CICS TS for z/OS, CICS TS for OS/390, or CICS Transaction Server for VSE/ESA. For compatibility with earlier releases, it appears on a CEDA display, but is set to 00 and cannot be changed.
2. The RPG language is supported by CICS/VSE Version 2 only.

LU 6.2 definitions

Data conversion program definition

Enter all values as shown.

```
DEFINE PROGRAM(DFHCCNV)
OVERTYPE TO MODIFY
CEDA DEFine
PROGram      ==> DFHCCNV
Group        ==> CICSWIN
Language     ==> Assembler      Cobol|Assembler|Le370|C|Pl1|Rpg
RELoad      ==> No              No|Yes
RESident    ==> No              No|Yes
RS1         ==> 00              0-24|Public
Status      ==> Enabled         Enabled|Disabled
```

Data conversion table definition

Enter all values as shown.

```
DEFINE PROGRAM (DFHCNV)
OVERTYPE TO MODIFY
CEDA DEFine
PROGram      ==> DFHCNV
Group        ==> CICSWIN
Language     ==> Assembler      Cobol|Assembler|Le370|C|Pl1|Rpg
RELoad      ==> No              No|Yes
RESident    ==> No              No|Yes
RS1         ==> 00              0-24|Public
Status      ==> Enabled         Enabled|Disabled
```

User-replaceable conversion program definition

Enter all values as shown.

```
DEFINE PROGRAM (DFHUCNV)
OVERTYPE TO MODIFY
CEDA DEFine
PROGram      ==> DFHUCNV
Group        ==> CICSWIN
Language     ==> Assembler      Cobol|Assembler|Le370|C|Pl1|Rpg
RELoad      ==> No              No|Yes
RESident    ==> No              No|Yes
RS1         ==> 00              0-24|Public
Status      ==> Enabled         Enabled|Disabled
```

For all program definition screens, see “the notes on program definition screens” on page 21.

Remote system TERMINAL definition (single session)

For a single-session link, a terminal definition can serve as the CICS on System/390 definition of the LU 6.2 connection to CICS Transaction Server for Windows, CICS/400, or CICS on Open Systems. This example is a definition of an LU 6.2 connection to CICS Transaction Server for Windows.

No remote attributes are necessary because the non-System/390 system appears to CICS on System/390 as a locally-attached terminal. (In other words, CICS on System/390 owns the connection.)

NETNAME must be the name by which the remote system is known to VTAM.

Most of the values should be entered as shown. There are no constraints on the terminal name or operator defaults. For an example accompanying TYPETERM definition, see "Remote system TYPETERM definition" on page 25.

```

DEFINE TERMINAL(PS02) GROUP(CICSWIN)
OVERTYPE TO MODIFY
CEDA DEFine
TErmina1 ==> PS02
GrOup ==> CICSWIN
AUTOINSTModE1 ==> No No|Yes|On1y
AUTOINSTName ==>
TERMINAL IDENTIFIERS
TYpeterm ==> APPC
Netname ==> T1112821
CONSOLE ==> No No|0-99
REMOTESystem ==>
REMOTESYsnet ==>
REMOTEName ==>
Modename ==> SIGMA
ASSOCIATED PRINTERS
PRINTER ==>
PRINTERCopy ==> No No|Yes
ALTPRINTER ==>
ALTPRINTERCopy==> No No|Yes
PIPELINE PROPERTIES
POol ==>
TAsklimit ==> No No|Yes
OPERATOR DEFAULTS
OPERID ==>
OPERPriority ==> 000 0-255
OPERRs1 ==> 0 0-24,...
OPERSecurity ==> 1 1-64,...
PRESET SECURITY
Userid ==>
TERMINAL USAGES
TRansaction ==>
TEmpriority ==> 000 0-255
Inservice ==> Yes Yes|No
SESSION SECURITY
Securityname ==>
ATTachsec ==> Local Local|Identify|Verify|
Persistent|Mixidpe
BINDPassword ==> PASSWORD NOT SPECIFIED
BINDSecurity ==> No No|Yes

```

The following notes apply to all terminal definition screens.

LU 6.2 definitions

Notes:

1. The OPERID, OPERPRIORITY, OPERRSL, and OPERSECURITY options are obsolete in CICS TS for z/OS, CICS TS for OS/390, and CICS Transaction Server for VSE/ESA, but are retained for compatibility with earlier releases.
2. The REMOTESYSNET option does not apply to CICS/VSE Version 2.
3. The ATTACHSEC, BINDPASSWORD, and BINDSECURITY options apply only to APPC (LUTYPE6.2) links. BINDSECURITY is not applicable to CICS/VSE Version 2. BINDPASSWORD is not applicable to CICS Transaction Server for z/OS, CICS Transaction Server for OS/390 or CICS Transaction Server for VSE/ESA.

Remote system TYPETERM definition

This definition relates to the “Remote system TERMINAL definition (single session)” on page 23.

Most of the values below must be entered as shown.

```

DEFINE TYPETERM(APPC) GROUP(CICSWIN)
OVERTYPE TO MODIFY
CEDA DEFine
  TYPeterm      : APPC
  Group         : CICSWIN
RESOURCE TYPE
  DEvice        ==> APPC
  TERmodel      ==>
  SESSiontype   ==>
  LDclst        ==>
  SHippable     ==> No                No|Yes
MAPPING PROPERTIES
  PAGesize      ==> 000 , 000        0-999
  ALTPage       ==> 000 , 000        0-999
  ALTSuffix     ==>
  FMhparm       ==> No                No|Yes
  OBOperid      ==> No                No|Yes
PAGING PROPERTIES
  AUTOPage      ==> No                No|Yes
DEVICE PROPERTIES
  SOsi          ==> No                No|Yes
  BACKtrans     ==> No                No|Yes
  CGosgid       ==> 00000 , 00000    0-65535
SESSION PROPERTIES
  AScii         ==> No                No|7|8
  SENDsize      ==> 00256            0-30720
  RECEivesize   ==> 00256            0-30720
  BRacket       ==> Yes              Yes|No
  LOGMode       ==>
DIAGNOSTIC DISPLAY
  ERRLastline   ==> No                No|Yes
  ERRIntensity  ==> No                No|Yes
  ERRColor      ==> No                No|Blue|Red|Green
  |Turquoise|Yellow|NEutral
  ERRHilight    ==> No                No|Blink|Reverse|Underline
OPERATIONAL PROPERTIES
  AUTOConnect   ==> Yes              No|Yes|All
RECOVERY
  RECOVOption   ==> Sysdefault        Sysdefault|Clearconv|
  |Releasesess|Uncondrel|None
  RECOVNotify   ==> None              None|Message|Transaction

```

Note: In CICS TS for OS/390, CICS TS for z/OS, and CICS Transaction Server for VSE/ESA, it is possible to:

- Autoinstall single-session LU 6.2 links initiated by BIND requests
- Use VTAM persistent sessions on LU 6.2 links.

For details, see the relevant *Intercommunication Guide*.

CONNECTION definition for parallel sessions

This sample CONNECTION definition for parallel sessions accompanies the SESSIONS definition that follows. NETNAME (IYA79270 in this example) must be the name by which the remote system is known to VTAM.

The connection name (ISCA in this example) is the REMOTESYSTEM value in remote definitions of resources (files, terminals, and transactions) owned by the non-System/390 CICS system linked by this connection.

```

DEFINE CONNECTION(ISCA) GROUP(ISCAA)
OVERTYPE TO MODIFY
CEDA DEFine
  Connection ==> ISCA
  Group      ==> ISCAA
CONNECTION IDENTIFIERS
  Netname    ==> IYA79270
  INdsys     ==>
CONNECTION PROPERTIES
  AAccessmethod ==> VTAM          Vtam|Irc|INdirect|Xm
  PProtocol     ==> APPC          Appc|Lu61
  SInglesess    ==> No           No|Yes
  DAtastream    ==> User         User|3270|SCs|STrfield|Lms
  RECORDformat ==> U            U|Vb
  QueueLimit    ==> No          No|0-9999
  Maxqtime      ==> No          No|0-9999
OPERATIONAL PROPERTIES
  Autoconnect   ==> Yes         Yes|No
  INService     ==> Yes         Yes|No
SECURITY
  SEcurityname  ==>
  ATTachsec     ==> Local       Local|Identify|Verify|
                                     Persistent|Mixidpe
  BINDPassword  ==>
  BINDSecurity  ==> No          PASSWORD NOT SPECIFIED
                                     No|Yes
RECOVERY
  PSrecovery    ==> Sysdefault  Sysdefault|None
  
```

Notes:

1. QUEUELIMIT and MAXQTIME do not apply to CICS/VSE Version 2. These options enable you to control the queuing of requests for free sessions on the connection. See your *Intercommunication Guide* for more details.
2. PSRECOVERY does not apply to CICS/VSE Version 2. With the RECOVPTION attribute of DEFINE SESSIONS, it enables you to use VTAM persistent sessions on LU 6.2 links. See your *Intercommunication Guide* for more details.
3. BINDSECURITY is not applicable to CICS/VSE Version 2. BINDPASSWORD is not applicable to CICS Transaction Server for z/OS, CICS Transaction Server for OS/390, or CICS Transaction Server for VSE/ESA.

SESSIONS definition for parallel sessions

This sample SESSIONS definition for parallel sessions accompanies the preceding CONNECTION definition.

```

DEFINE SESSIONS(ISCA) GROUP(ISCAA)
OVERTYPE TO MODIFY
CEDA DEFine
SESSION IDENTIFIERS
Sessions ==> ISCA
Group ==> ISCAA
Connection ==> ISCA
M0dename ==> CICSISCO
SESSION PROPERTIES
Protocol ==> APPC Appc|Lu61
MAximum ==> 5,2
SENDSize ==> 4096 1-30720
RECEIVESize ==> 1024 1-30720
SESSPriority ==> 000 0-255
OPERATIONAL PROPERTIES
Autoconnect ==> YES Yes|No
INservice ==> Yes Yes|No
Buildchain ==> Yes Yes|No
IOarealen ==> 0,0 0-32767
RELreq ==> Yes Yes|No
DIScreq ==> Yes Yes|No
NEPclass ==> 000 0-255
RECOVERY
RECOVoption ==> Sysdefault Sysdefault|Clearconv|
Releasesess|Uncondrel|No
RECOVNotify ==> None None|Message|Transaction

```

Note: In CICS TS for OS/390, CICS TS for z/OS, and CICS Transaction Server for VSE/ESA, you can autoinstall parallel-session LU 6.2 links that are initiated by BIND requests. For details, see the relevant *Intercommunication Guide*.

Remote terminal **TERMINAL** definition

CICS systems cannot ship definitions of:

- Non-VTAM terminals
- Terminals that have been defined as SHIPPABLE(NO).

If an incoming transaction routing request (or an automatic transaction initiation (ATI) request) is associated with a non-shippable terminal, CICS on System/390 must have a remote terminal definition that meets the following requirements:

- REMOTESYSTEM must be the System/390 name of the connection to the non-System/390 (terminal-owning) system.

For CICS/VSE Version 2, if there is no direct connection to the terminal-owning system, REMOTESYSTEM must specify the name of an **indirect** connection. For details of indirect connections, when they are required and how to define them, see the *Intercommunication Guide* for your CICS on System/390 product.

For CICS TS for OS/390, CICS TS for z/OS, and CICS Transaction Server for VSE/ESA, if there is no direct connection to the terminal-owning system, REMOTESYSTEM must specify the name of the first connection in the path to it. REMOTESYSNET must specify the network name by which the terminal-owning system is known to VTAM. See the *Intercommunication Guide*.

- A subset of the 3270 extended data stream is supported.
- The color, highlight, PS, and outline extended attributes are supported but only to the extent that they are generated by BMS. A field can have these attributes but an individual character within a field cannot have separate attributes.
- TCTUALENG must be the same as TCTUAL in the non-System/390 TCT definition for the terminal.
- REMOTENAME must be the same as the terminal id in the non-System/390 system's definition for the terminal.

An example definition follows.

```

DEFINE TERMINAL(R123) GROUP(CICSWIN)
OVERTYPE TO MODIFY
CEDA DEFine
  TErmina1 ==> R123
  GrOp ==> CICSWIN
  AUTINSTModel ==> No No|Yes|Only
TERMINAL IDENTIFIERS
  TYpeterm ==> LU62TR
  NEtname ==>
  CONSOLE ==> No No|0-99
  REMOTESystem ==> ISCA
  REMOTESYsnet ==>
  REMOTEName ==> V123
ASSOCIATED PRINTERS
  PRINTERCopy ==> No No|Yes
  ALTPRINTCopy ==> No No|Yes
PIPELINE PROPERTIES
  TAsklimit ==> No No|1-32767
OPERATOR DEFAULTS
  OPERPID ==>
  OPERPriority ==> 000 0-255
  OPERRs1 ==> 0 0-24,...
  OPERSecurity ==> 1 1-64,...
PRESET SECURITY
  Userid ==>
TERMINAL USAGES
  TEmpriority ==> 000 0-255
  Inservice ==> Yes Yes|No
SESSION SECURITY
  ATTachsec ==> Local Local|Identify|Verify|
  Persistent|Mixidpe
  BINDPassword ==> PASSWORD NOT SPECIFIED
  BINDSecurity ==> No No|Yes

```

For all terminal definitions, see the “Notes on terminal definition screens” on page 23.

Remote terminal TYPETERM definition

Here is an example of a TYPETERM definition to accompany the preceding TERMINAL definition.

```

DEFINE TYPETERM(LU62TR) GROUP(CICSWIN)
OVERTYPE TO MODIFY
CEDA DEFINE
  TYpeterm      ==> LU62TR
  Group         ==> CICSWIN
RESOURCE TYPE
  DEvice        ==> 3270
  TERmmodel     ==> 2
  SESsiontype   ==>
  LDclist       ==>
  SHippable     ==> No           No|Yes
MAPPING PROPERTIES
  PAGesize      ==> 024 , 080    0-999
  ALTPage       ==> 024 , 080    0-999
  ALTSuffix     ==>
  FMhparm       ==> No           No|Yes
  OBOperid      ==> No           No|Yes
PAGING PROPERTIES
  AUTOPage      ==> No           No|Yes
DEVICE PROPERTIES
  SOsi          ==> No           No|Yes
  BAcKtrans     ==> No           No|Yes
  CGcsgid       ==> 00000 , 00000 0-65535
SESSION PROPERTIES
  AScii         ==> No           No|7|8
  SENdsize      ==> 00000        0-30720
  RECEivesize   ==> 01920        0-30720
  BRacket       ==> Yes          Yes|No
  LOGMode       ==>
DIAGNOSTIC DISPLAY
  ERRLastline   ==> Yes          No|Yes
  ERRIntensify  ==> Yes          No|Yes
  ERRColor      ==> No           NO|Blue|Red|Pink|Green|
  Turquoise|Yellow|NEutral
  ERRHilight    ==> No           No|Blink|Reverse|Underline
OPERATIONAL PROPERTIES
  AUTOConnect   ==> Yes          No|Yes|All
  ATi           ==> Yes          No|Yes
RECOVERY
  RECOVoption   ==> Sysdefault   Sysdefault|Clearconv|
  Releasesess  |Uncondre1|None
  RECOVNotify   ==> None         None|Message|Transaction

```

Chapter 4. CICS internal security

Important

- This chapter applies only to CICS/VSE Version 2 users of CICS internal security.
- It includes sample resource definition fragments, using the CEDA transaction and the DFHFCT and DFHSNT macros. For full information on the CEDA transaction and the DFHFCT and DFHSNT macros, see the *CICS/VSE Version 2 Release 3 Resource Definition Guide*.

You can protect the System/390's resources against unauthorized access by remote users. Depending on your CICS on System/390 product, you may be able to use either CICS internal security or an external security manager (ESM), such as the Resource Access Control Facility (RACF). CICS TS for z/OS, CICS TS for OS/390, and CICS Transaction Server for VSE/ESA do not support CICS internal security. CICS/VSE Version 2 supports either method.⁵

This chapter describes only CICS/VSE Version 2.3 internal security. CICS TS for OS/390 and CICS TS for z/OS users of RACF should refer to the *CICS-RACF Security Guide* for their System/390 product. CICS TS for OS/390 and CICS TS for z/OS users of other external security managers should refer to the documentation for their ESM. CICS Transaction Server for VSE/ESA users should refer to the *CICS Transaction Server for VSE/ESA Security Guide*. CICS/VSE Version 2 users of external security should refer to the documentation for their ESM.

Introduction to CICS/VSE internal security

CICS/VSE internal security, apart from resource security, is defined at two levels:

User security

You define a security profile for each workstation user.

Link security

You define a security profile for the link. This gives the link access to all the resources that the users can access collectively. No user has access to a resource that the link itself cannot access.

Security profile

Security profiles consist of one or more numeric keys, chosen from the digits 1 through 24. When a protected resource is defined, it is associated with one of these values. A user who has a matching key is allowed to access that resource, provided that the link also has a matching key (user security is a subset of link security).

Link profile

If you do not need to specify security for individual users, you can let all user security profiles default to the link profile. For this, you specify ATTACHSEC(Local) on the CEDA DEFINE CONNECTION⁶ command. You define the link security profile by specifying OPERRSL on the same command. Let this option default if you want the link to access only unprotected resources.

5. CICS/VSE Version 2 and CICS Transaction Server for VSE/ESA support external security but not RACF.

6. If the link is single-session LU 6.2, specify ATTACHSEC and SECURITYNAME in the CEDA DEFINE TERMINAL command.

SNT entry for link

An alternative way to specify link security is to define an SNT entry for the link. Specify RSLKEY to define the link security profile. The user ID you give to the link has to be matched to SECURITYNAME on the CEDA DEFINE CONNECTION⁶ command.

Required specifications in remote systems

To enable protected access to CICS/VSE resources, specifications are needed in each remote system.

CICS Transaction Server for Windows specifications

To enable security checking of CICS Transaction Server for Windows users by CICS/VSE, **Attach security** must be specified as V in the CICS Transaction Server for Windows TCS definition of the CICS/VSE system. All user IDs must be defined in the CICS Transaction Server for Windows signon table (SNT).

CICS for AIX specifications

In the communications definition (CD) stanza, the entry for the CICS/VSE system should specify **RemoteSystemSecurity=IDENTIFY**, which is consistent with either IDENTIFY or VERIFY in the SNA Services connection profile. All user IDs, whether or not they use intercommunication, must be in the user definition (UD) stanza.

AIX SNA Services: In the connection profile for the CICS/VSE system, the conversation security access list must contain the user IDs and passwords of all users that are to access the CICS/VSE system. The connection profile should specify **SecurityLevel=IDENTIFY** or **VERIFY**, depending on the security required.

CICS/400 specifications

An AS/400[®] user profile, containing a user ID and password, is required for each CICS/400 user who accesses protected CICS/VSE resources. In the AS/400 configuration list, the entry for the CICS/VSE system should specify **Secure Loc(*YES)**, which is the equivalent of ATTACHSEC=Verify in the CICS/VSE CONNECTION definition.

CICS/VSE specifications

For CICS/VSE resource security, entries are needed in the SNT for all remote users. Each entry must match a corresponding entry in a remote system's SNT or equivalent.⁷The level of security on a link depends on the ATTACHSEC option of the CEDA DEFINE CONNECTION⁸ command.

If you are using an external security manager, you probably need only the *default* entry in the CICS SNT. This covers both link and users.

Because the mirror transaction accesses all resources for the users, CICS/VSE does not apply resource security checking unless you specify RSLC(YES) or RSLC(EXTERNAL) on the CEDA DEFINE TRANSACTION for the mirror transaction.

For further guidance, see the *CICS/VSE Version 2 Release 3 Intercommunication Guide*. Note that bind-time security is not supported.

Implementation

Implementation of security for CICS Transaction Server for Windows, CICS on Open Systems, or CICS/400 access to CICS/VSE resources is similar to that for CICS/VSE—CICS/VSE intercommunication.

Sign-on security

If ATTACHSEC=IDENTIFY is specified in the CICS/VSE and CICS non-System/390 connection definitions, the remote user ID must match an entry in the CICS/VSE SNT. For ATTACHSEC=VERIFY, the user ID and password transmitted with the request must match the user ID and password in a CICS/VSE SNT entry. For ATTACHSEC=LOCAL, there is no user security.

Attach-time and resource access security

For ATTACHSEC=LOCAL, the resources accessed must have security keys that are a subset of the range of the OPERRSL keys specified for the connection.

For ATTACHSEC=VERIFY|IDENTIFY, in addition to the requirements for ATTACHSEC=LOCAL, the user's SNT operator class must match the RSL key for the resource. Additional checks may be needed, depending on the definitions of mirror and routed transactions.

7. For example, for CICS for AIX this is the UD stanza; for CICS/400, the AS/400 user profiles.

8. If the link is single-session LU 6.2, specify ATTACHSEC and SECURITYNAME in the CEDA DEFINE TERMINAL command.

Specifying LU 6.2 security requirements

Specifying your security requirements involves entries in several CEDA and macro resource definitions:

- Mirror transaction
- Data conversion modules
- Connection
- Session
- Routed transaction
- File control table
- Sign-on table.

Note: If a definition is included in the supplied group DFHISC, you should copy it to another group before making any changes.

Mirror transaction

If you want security protection of CICS/VSE resources such as files, transient data destinations, and temporary storage queues, you must specify RSLC(YES) for the mirror transaction. You can protect the mirror transaction itself by specifying a TRANSEC value other than 1 or an RSL value other than PUBLIC, or both. TRANSEC (2–64) causes a check of the operator class and link security keys when the mirror is invoked from a CICS non-System/390 terminal. RSL(00) prevents access to the mirror transaction by any other transaction that is itself specified with RSLC(YES).

The simplest way to protect your resources is suggested below. With these definitions, the mirror transaction itself is unprotected. You control CICS/VSE resource security by the resource RSL key and the connection, terminal, and user keys.

```

ALTER TRANSACTION (CPMI) GROUP(CICSWIN)
OVERTYPE TO MODIFY
CEDA ALTER
.....
SECURITY
Extsec           No           No|Yes
TRANsec          01           1-64
RSL              00           0-24|Public
RSLC             YES          No|Yes|External
.....
    
```

Mirror program and data conversion modules

If you specify RSLC=YES for the mirror transaction, CICS checks the RSL keys for all resources it accesses. These resources include the mirror program, and the data conversion modules, DFHCNV, DFHCCNV, and DFHUCNV. Each resource can be associated with only one key, and the RSL key for each resource is likely to be different. It is therefore easiest to specify the key for all these modules as PUBLIC, which allows unprotected access. This creates no security exposure if you protect your data resources.

It is recommended that you specify the RSL key for the mirror program as shown, and repeat for DFHCNV, DFHCCNV, and DFHUCNV.

```

ALTER PROGRAM(DFHMIRS) GR(CICSWIN)
OVERTYPE TO MODIFY
CEDA ALTer
.....
RSL          Public          0-24|Public
.....
    
```

Connection

The ATTACHSEC value in the connection definition determines the level of user security. If you want CICS/VSE to verify each user and password, alter the connection definition as shown below. **For CICS Transaction Server for Windows—CICS/VSE links do not specify BINDPASSWORD.**

```

ALTER CONNECTION (APPC) GR(CICSWIN)
OVERTYPE TO MODIFY
CEDA ALTer
.....
ATTachsec    Verify          Local|Identify|Verify
.....
    
```

Session

The OPERRSL values in the session definition must include the RSL key of any protected resource accessed. The OPERSECURITY values must include the TRANSEC key of any protected transaction accessed. Only resources with an RSL key of **4** and transactions with a TRANSEC key of **10** can be accessed by links set up with the session definition below.

```

ALTER SESSION (ONE) GR(CICSWIN)
OVERTYPE TO MODIFY
CEDA ALTer
.....
OPERRs1      4              0-24
OPERSECurity 10              1-64
.....
    
```

Transaction

Security of transaction routing from a CICS non-System/390 system is affected by the definition of the routed transaction. The example shows the security fields in the definition of a transaction. The meanings of the entries shown are:

EXTSEC(NO)

specifies the use of CICS resource security level (RSL) checking rather than an external security manager.

TRANSEC(10)

specifies that routing of this transaction is permitted only if the link and terminal OPERSECURITY keys include the value **10**. If the terminal has no OPERSECURITY key, the user's SNT operator keys must include the value **10**. For example, TRANSEC(1) means that the transaction can be attached by any user or terminal.

specifying LU 6.2 security

RSL(0)

prevents invocation of this transaction by other transactions defined with RSLC(YES). This protects the transaction without affecting transaction routing.

RSLC(YES)

specifies that security checking is required for resources accessed by this transaction.

```
ALTER TRANSACTION (RTED) GR(CICSWIN)
OVERTYPE TO MODIFY
CEDA ALTer
.....
SECURITY
Extsec          No          No|Yes
TRANsec         10          1-64
RSL             00          0-24|Public
RSLC            YES         No|Yes|External
.....
```

File control table (FCT)

If FILEA is to have a resource security value of 4, generate your file control table (FCT) to include the following definition:

To protect transient data destinations and temporary storage queues, use a similar

```
DFHFCT TYPE=FILE,          X
      DATASET=FILEA,      X
      RSL=4,               X
```

Figure 5. File control table

entry in any DFHDCT TYPE=EXTRA, DFHDCT TYPE=INTRA, and DFHTST TYPE=SECURITY macros.

Signon table (SNT)

Specify each CICS non-System/390 user in the SNT on CICS/VSE, as shown in Figure 6 on page 37. For a CICS non-System/390 user to use a CICS/VSE link with ATTACHSEC=VERIFY security, an entry in the non-System/390 signon table (or equivalent) must have a password and user ID that exactly match an entry in the CICS/VSE signon table.

For ATTACHSEC=IDENTIFY, only the user IDs must match.

For ATTACHSEC=LOCAL, all users can use the link.

Assuming the connection is defined with ATTACHSEC=VERIFY, the example CICS/VSE SNT entry below makes the link available to a CICS Transaction Server for Windows user with a CICS Transaction Server for Windows SNT entry that specifies user ID **USR1** and password **PAS1**.

```
DFHSNT TYPE=ENTRY,           X
      OPIDENT=USR1,          X
      PASSWORD=PAS1,         X
      USERID=USR1
```

Figure 6. Example signon table

The user's authority to access resources is determined by the RSLKEY, SCTKEY, and OPCLASS options in this entry.

Chapter 5. VTAM/NCP definitions

CICS on System/390 requires VTAM/NCP definitions for all links to CICS Transaction Server for Windows, CICS/400, or CICS on Open Systems, except DFT 3270 links. This chapter gives examples of a VTAM application definition, and of NCP and MODETABLE definitions for both single sessions and parallel sessions. To understand the details of the examples, see the *VTAM Resource Definition Reference* manual, SC33-6412.

VTAM application definition

```
          VBUILD  TYPE=APPL
DBDCCICS  APPL    ...,PARSESS=YES,MODETAB=MODELU62,SONSCIP=YES,...
```

Figure 7. Host VTAM application definition

Single sessions

```
G115D128  GROUP  MAXDATA=265,
:
          MODETAB=MTSIGMA
:
L115D128  LINE  ADDRESS=(128,HALF)
          SERVICE ORDER=(P111283,P111284)
P111283  PU   ADDR=C3,PUTYPE=2,ISTATUS=INACTIVE
T1112830 LU   LOCADDR=2
T1112831 LU   LOCADDR=3
T1112832 LU   LOCADDR=4
T1112833 LU   LOCADDR=5
T1112834 LU   LOCADDR=6
T1112835 LU   LOCADDR=7
T1112836 LU   LOCADDR=8
T1112837 LU   LOCADDR=9
P111284  PU   ADDR=C4,PUTYPE=2,ISTATUS=INACTIVE
T1112840 LU   LOCADDR=2
T1112841 LU   LOCADDR=3
T1112842 LU   LOCADDR=4,DLOGMOD=SIGMA
T1112843 LU   LOCADDR=5
T1112844 LU   LOCADDR=6
T1112845 LU   LOCADDR=7
T1112846 LU   LOCADDR=8
T1112847 LU   LOCADDR=9
```

Figure 8. Host VTAM NCP definitions for single sessions

VTAM/NCP definitions for parallel sessions

```
MTSIGMA  MODEENT  LOGMODE=MTSIGMA

SIGMA    MODEENT  LOGMODE=SIGMA,
          TYPE=0,      NEGOTIABLE BIND
          FMPROF=X'13', FM PROFILE
          TSPROF=X'07', TS PROFILE
          PRIPROT=X'B0', PRIM PROTOCOL
          SECPROT=X'B0', SEC PROTOCOL
          COMPROT=X'50B1', COMMON PROTOCOL
          PSNDPAC=X'00', PRIM SEND PACING
          SRCVPAC=X'00', SEC RECEIVE PACING
          SSNSPAC=X'00', SEC SEND PACING
          RUSIZES=X'8585', RU IN=256. RU OUT=256.
          PSERVICE=X'0602000000000000000002C00'
```

Figure 9. Host VTAM MODETABLE definitions for single sessions

Parallel sessions

The example in Figure 10 on page 41 is for a System/390–PS/2 SDLC LU 6.2 link with six PUs. The LU definitions with LOCADDR=0 are for PU2.1 independent parallel sessions. All the other definitions are for PU2.0 dependent single-session LUs.

VTAM/NCP definitions for parallel sessions

```
* Line 027 set up for parallel sessions
* XID=YES & RESSCB are required for parallel sessions
*
IYA7L027 LINE ADDRESS=(027,FULL),OWNER=HP
SERVICE ORDER=(IYA7C027,IYA7C327,IYA7C627)
SERVICE ORDER=(IYA7C927,IYA7CC27,IYA7CF27)
IYA7C027 PU ADDR=C1,PUTYPE=2,ISTATUS=ACTIVE,XID=YES
IYA70270 LU LOCADDR=0,MODETAB=MODEL62,DLOGMOD=LU62PS,RESSCB=30
IYA70271 LU LOCADDR=1
IYA70272 LU LOCADDR=2
IYA70273 LU LOCADDR=3
IYA70274 LU LOCADDR=4
IYA70275 LU LOCADDR=5
IYA70276 LU LOCADDR=6
IYA70277 LU LOCADDR=7
IYA7C327 PU ADDR=C2,PUTYPE=2,ISTATUS=ACTIVE,XID=YES
IYA73270 LU LOCADDR=0,MODETAB=MODEL62,DLOGMOD=LU62PS,RESSCB=30
IYA73271 LU LOCADDR=1
IYA73272 LU LOCADDR=2
IYA73273 LU LOCADDR=3
IYA73274 LU LOCADDR=4
IYA73275 LU LOCADDR=5
IYA73276 LU LOCADDR=6
IYA73277 LU LOCADDR=7
IYA7C627 PU ADDR=C3,PUTYPE=2,ISTATUS=ACTIVE,XID=YES
IYA76270 LU LOCADDR=0,MODETAB=MODEL62,DLOGMOD=LU62PS,RESSCB=30
IYA76271 LU LOCADDR=1
IYA76272 LU LOCADDR=2
IYA76273 LU LOCADDR=3
IYA76274 LU LOCADDR=4
IYA76275 LU LOCADDR=5
IYA76276 LU LOCADDR=6
IYA76277 LU LOCADDR=7
IYA7C927 PU ADDR=C4,PUTYPE=2,ISTATUS=ACTIVE,XID=YES
IYA79270 LU LOCADDR=0,MODETAB=MODEL62,DLOGMOD=LU62PS,RESSCB=30
IYA79271 LU LOCADDR=1
IYA79272 LU LOCADDR=2
IYA79273 LU LOCADDR=3
IYA79274 LU LOCADDR=4
IYA79275 LU LOCADDR=5
IYA79276 LU LOCADDR=6
IYA79277 LU LOCADDR=7
IYA7CC27 PU ADDR=C5,PUTYPE=2,ISTATUS=ACTIVE,XID=YES
IYA7C270 LU LOCADDR=0,MODETAB=MODEL62,DLOGMOD=LU62PS,RESSCB=30
IYA7C271 LU LOCADDR=1
IYA7C272 LU LOCADDR=2
IYA7C273 LU LOCADDR=3
IYA7C274 LU LOCADDR=4
IYA7C275 LU LOCADDR=5
IYA7C276 LU LOCADDR=6
IYA7C277 LU LOCADDR=7
IYA7CF27 PU ADDR=C6,PUTYPE=2,ISTATUS=ACTIVE,XID=YES
IYA7F270 LU LOCADDR=0,MODETAB=MODEL62,DLOGMOD=LU62PS,RESSCB=30
IYA7F271 LU LOCADDR=1
IYA7F272 LU LOCADDR=2
IYA7F273 LU LOCADDR=3
IYA7F274 LU LOCADDR=4
IYA7F275 LU LOCADDR=5
IYA7F276 LU LOCADDR=6
IYA7F277 LU LOCADDR=7
```

Figure 10. Host VTAM NCP definitions for parallel sessions

VTAM/NCP definitions for parallel sessions

```
MODELU62 MODETAB
*
* * * * *
* Log mode table for use with lu62 -
*
* PARALLEL SESSIONS=YES
*
*
* * * * *
LU62PS  MODEENT LOGMODE=LU62PS,
        TYPE=0,          ONLY TYPE RECOGNIZED
        FMPROF=X'13',    SNA
        TSPROF=X'07',    SNA
        PRIPROT=X'B0',   PRIMARY PROTOCOL
        SECPROT=X'B0',   SECONDARY PROTOCOL
        COMPROT=X'78A5', COMMON PROTOCOL
        SSNDPAC=X'00',
        SRCVPAC=X'00',
        RUSIZES=X'8989',  RUSIZES IN-4096 OUT-4096
        PSNDPAC=X'00',
        PSERVIC=X'0602000000000000122F00'
* * * * *
* LU62 REQUIRES SNASVCMG TO RUN PROPERLY for //11. session support
        MODEENT LOGMODE=SNASVCMG,COS=CICS2,
        TYPE=0,          ONLY TYPE RECOGNIZED
        FMPROF=X'13',    SNA
        TSPROF=X'07',    SNA
        PRIPROT=X'B0',   PRIMARY PROTOCOL
        SECPROT=X'B0',   SECONDARY PROTOCOL
        COMPROT=X'78A5', COMMON PROTOCOL
        SSNDPAC=X'00',
        SRCVPAC=X'00',
        RUSIZES=X'8989',  RUSIZES IN-4096 OUT-4096
        PSNDPAC=X'00',
        PSERVIC=X'0602000000000000122F00'
        MODEEND
        END
```

Figure 11. Host VTAM MODETABLE definitions for parallel sessions

Figure 11 shows the VTAM MODETABLE definitions required for a parallel-session LU 6.2 link.

Chapter 6. Data conversion for communication with non-System/390 systems

Whenever data is passed from one CICS system to another, some or all of the data may have to be converted from ASCII to EBCDIC format, or vice versa.

Important

If you are using a **channel** to perform data conversion, read “Data conversion using channels” in the *CICS Application Programming Guide* instead of this topic. Channels are available in CICS Transaction Server for z/OS Version 3 Release 1 onwards.

Where data conversion takes place

CICS intercommunication takes place on SNA links, which assume that all system data is in EBCDIC format. To ensure that transmitted data is in EBCDIC format, CICS ASCII-based systems convert all fields except application data areas, which are converted by the receiving system. Table 2 shows where data conversion is done for function shipping and DPL between CICS systems. The table includes *all* the conversion done automatically by CICS systems.

Table 2. Data conversion for function shipping and DPL

Request type	Data	Conversion type	Where converted
TS	Queue name	Character	ASCII system
TS	FROM area	As specified in DFHCNV table	Receiving system
TD	Queue name	Character	ASCII system
TD	INTO area	As specified in DFHCNV table	Receiving system
FC	File name	Character	ASCII system
FC	SET area	As specified in DFHCNV table	Receiving system
FC	Key	As specified in DFHCNV table	Receiving system
IC	Transaction ID	Character	ASCII system
IC	FROM area	As specified in DFHCNV table	Receiving system
IC	RTERMID, RTRANSID, REQID	Character	ASCII system
PC	Program name	Character	ASCII system
PC	COMMAREA	As specified in DFHCNV table	Receiving system

Function shipping and DPL

For function shipping and DPL *from* an ASCII system to CICS on System/390, the ASCII system converts the resource names, and CICS on System/390 converts the user data (see Table 2).

where conversion takes place

- # For function shipping and DPL to an ASCII system from CICS on System/390, the ASCII system does all the necessary conversion.
- # Conversion of application data is done field-by-field. Thus, ensure that the size of each field in the application data is sufficient to hold the result of the conversion applied to it. (This is particularly relevant where a field in the application data may contain both SBCS and DBCS characters).
- #

Distributed transaction processing

DTP uses application-specific data areas and cannot have a general procedure for data conversion. It is the application's responsibility to perform data conversion. Application design determines whether conversion is at the System/390 or the workstation.

Transaction routing

CICS on System/390 systems do no data conversion for transaction routing. Screen data always flows as 3270 data streams. COMMAREAs and TCTUAs (which are relevant to pseudoconversational transactions) are converted by the ASCII system.

Avoiding data conversion

Application design can reduce the amount of data conversion.

For example, if a System/390 CICS system acts as a file manager for CICS Transaction Server for Windows systems, the data in the file can be coded in ASCII, eliminating the need for data conversion.

If data is held at the workstation purely for the purpose of communicating with a System/390 CICS system, it can be coded in EBCDIC.

Types of conversion

The possible types of conversion are:

Standard conversion

This applies to:

- Single-byte character sets (SBCS)
- Graphic or double-byte character sets (DBCS)
- Mixed character sets (containing SBCS and DBCS data)
- Multi-byte character sets (MBCS)
- By default, to binary data in INTEL format.

No conversion

This applies to:

- Character data encoded as UCS-2 or UTF-8
- By default, to binary data in System/390 format
- Packed decimal data.

User-defined nonstandard conversion

You can apply nonstandard data conversion by writing your own version of the user-replaceable conversion program. If specified, a user-defined conversion is applied instead of the standard conversion.

You can apply user-defined conversion to selected fields, and leave others to be converted by the CICS standard conversion program.

For all CICS on System/390 products *other than* CICS TS for z/OS, Version 2.2 and later, to take advantage of nonstandard conversion you must provide a single data conversion program named DFHUCNV. This will probably be a customized version of the DFHUCNV program supplied with CICS.

For CICS TS for z/OS, Version 2.2 and later, you can provide *either*:

1. Your own, customized, version of DFHUCNV, *or*
2. One or more differently-named conversion programs

If the nonstandard conversion applies only to character data, you may not need to write your own data conversion program. Instead, you could create your own conversion tables for use with the standard conversion program, DFHCCNV. See “User-defined conversion tables” on page 75.

Important

Your user-supplied conversion program must not convert any data that the standard conversion program attempts to convert. Double conversion gives unpredictable results. To ensure that double conversion does not occur, your conversion program must convert only fields defined as DATATYP=USERDATA (see “the DATATYP option of the DFHCNV TYPE=FIELD macro” on page 73).

Character data

Character data is described by a character set identifier and a code page identifier. The latter defines how each character is to be encoded; for example “A” is encoded as X'41' in ASCII and as X'C1' in EBCDIC.

The SRVERCP keyword on the DFHCNV TYPE=ENTRY macro determines the “server” code page in which character data associated with the specified resource is encoded in the System/390 server. Such data is assumed to be encoded in EBCDIC.

The CLINTCP keyword on the DFHCNV TYPE=ENTRY macro determines the default “client” code page in which the character data associated with the specified resource is encoded when it is received by or sent from the System/390 server. In general, such data is assumed to be encoded in ASCII. However, the data may be encoded in EBCDIC. (In this case, the client and server code pages are likely to be different, even though both are EBCDIC.)

The default client code page can be overridden. This allows several workstations, each using a different ASCII-coded graphic character representation, to share data with the System/390.

If the resource can be accessed from both CICS Transaction Server for Windows and CICS on Open Systems, the default client code page must be set to the code page used by CICS Transaction Server for Windows. For example, specifying CLINTCP=932 allows CICS Transaction Server for Windows using code page 932 and CICS on Open Systems using code page 954 to access the same resource.

CICS-supported conversions

This section provides a complete list of the Coded Character Set Identifiers (CCSIDs) supported by CICS on System/390. Additional CCSIDs will be supported

character data

as necessary. However, there is no guarantee that such CCSIDs will be supported by all of the products/releases to which this edition applies.

For unsupported CCSIDs, you can create your own conversion tables, for use with the standard conversion program, DFHCCNV. See “User-defined conversion tables” on page 75.

For nonstandard conversions, you must supply your own conversion program—see “User/CICS conversion” on page 60.

CICS on System/390 is able to convert character data between ASCII and EBCDIC provided that the client and server CCSIDs belong to the same group; the groups being:

CICS on System/390 is usually able to convert character data between ASCII and
EBCDIC if the client and server CCSIDs belong to the same group. However, there
are some limitations on conversions, even within the same group: for example,
when new CCSIDs are defined to extend the character set, conversions between
new equivalent ASCII and EBCDIC CCSIDs will be supported, but conversions
mixing old and new ASCII and EBCDIC CCSIDs may not.

Arabic

Baltic Rim

Latvia, Lithuania, Estonia

Cyrillic

Eastern Europe; Bulgaria, Russia, Yugoslavia

Devanagari (Hindi)

India

Farsi (Persian)

Iran

Greek

Greece

Hebrew

Israel

Japanese

Japan

Korean

Korea

Lao

Laos

Latin-1 and Latin-9

USA, Western Europe, and many other countries

Latin-2

Eastern Europe; Albania, Czech Republic, Hungary, Poland, Romania, Slovakia, Yugoslavia, Former Yugoslavia

Latin-5

Turkey

Simplified Chinese

Peoples' Republic of China

Thai

Thailand

Traditional Chinese

Taiwan

Urdu

Pakistan

Vietnamese

Vietnam

The following tables list the CCSIDs supported for each group. For each CCSID, they show:

- The value to be specified for the CLINTCP or SRVERCP keyword.
- The codepage identifier or identifiers (CPGIDs).
- The current CICS on System/390 products that support the CCSID. Four levels of support are defined—“Base”, “T01”, “T02”, and “T03”.

Base

- CICS Transaction Server for z/OS (all releases)
- CICS Transaction Server for OS/390 Release 3
- CICS Transaction Server for VSE/ESA
- CICS/VSE Version 2 Release 3

T01

- CICS Transaction Server for z/OS (all releases)
- CICS Transaction Server for OS/390 Release 3
- CICS Transaction Server for VSE/ESA
- CICS/VSE Version 2 Release 3 plus APAR PQ19019

T02

- CICS Transaction Server for z/OS (all releases)

T03

- CICS Transaction Server for z/OS Version 3
- CICS Transaction Server for z/OS Version 2 Release 3

Arabic

Table 3. Arabic, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
864	Base	00864	00864	PC data: Arabic
1089 8859-6	Base	01089	01089	ISO 8859-6: Arabic
1256	T01	01256	01256	MS Windows: Arabic
5352	T02	05352	01256	MS Windows: Arabic, version 2 with euro
# 9448	T03	09448	09448	MS Windows: Arabic, 2001
17248	T02	17248	00864	PC Data: Arabic with euro

Table 4. Arabic, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
420	Base	00420	00420	Host: Arabic
16804	T02	16804	00420	Host: Arabic with euro

character data

Note: Data conversion does not change the direction of Arabic data.

Baltic Rim

Table 5. Baltic Rim, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
901	T02	00901	00901	PC data: Latvia, Lithuania; with euro
# 902	T02	00902	00902	PC data: Estonia with euro
921	T01	00921	00921	PC data: Latvia, Lithuania
# 922	T01	00922	00922	PC data: Estonia
1257	T01	01257	01257	MS Windows: Baltic Rim
5353	T02	05353	01257	MS Windows: Baltic Rim, version 2 with euro

Table 6. Baltic Rim, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1112	T01	01112	01112	Host: Latvia, Lithuania
# 1122	T01	01122	01122	Host: Estonia
1156	T02	01156	01156	Host: Latvia, Lithuania; with euro
# 1157	T01	01157	01157	Host: Estonia;, with euro

Cyrillic

Table 7. Cyrillic, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
808	T02	00808	00808	PC data: Cyrillic, Russia; with euro
848	T02	00848	00848	PC data: Cyrillic, Ukraine; with euro
849	T02	00849	00849	PC data: Cyrillic, Belarus; with euro
# 855	Base	00855	00855	PC data: Cyrillic
866	Base	00866	00866	PC data: Cyrillic, Russia
872	T02	00872	00872	PC data: Cyrillic with euro
915 8859-5	Base	00915	00915	ISO 8859-5: Cyrillic
1124	T02	01124	01124	8-bit: Cyrillic, Belarus
1125	T02	01125	01125	PC Data: Cyrillic, Ukraine
1131	T02	01131	01131	PC Data: Cyrillic, Belarus
1251	T01	01251	01251	MS Windows: Cyrillic
5347	T02	05347	01251	MS Windows: Cyrillic, version 2 with euro

Table 8. Cyrillic, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1025	Base	01025	01025	Host: Cyrillic multilingual
1123	T02	01123	01123	Host: Cyrillic Ukraine
1154	T02	01154	01154	Host: Cyrillic multilingual; with euro
1158	T02	01158	01158	Host: Cyrillic Ukraine; with euro

Devanagari

Table 9. Devanagari, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
806	T03	00806	00806	PC data: ISCII-91, Devanagari script code

Table 10. Devanagari, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1137	T03	01137	01137	Host: Devanagari

Note: These Devanagari CCSIDs may also be used to encode the identical Devanagari character repertoire used by Marathi.

Farsi

Table 11. Farsi, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
1098	T03	01098	01098	PC data: Farsi

Table 12. Farsi, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1097	T03	01097	01097	Host: Farsi

Note: Data conversion does not change the direction of Farsi data.

Greek

Table 13. Greek, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
813 8859-7	Base	00813	00813	ISO 8859-7: Greece
869	Base	00869	00869	PC data: Greece
1253	T01	01253	01253	MS Windows: Greece
4909	T02	04909	00813	ISO 8859-7: Greece with euro
5349	T02	05349	01253	MS Windows: Greece, version 2 with euro
9061	T02	09061	00869	PC Data: Greece with euro

Table 14. Greek, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
875	Base	00875	00875	Host: Greece
4971	T02	04971	00875	Host: Greece with euro

character data

Hebrew

Table 15. Hebrew, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
856	Base	00856	00856	PC data: Hebrew
862	T02	00862	00862	PC data: Hebrew (migration)
867	T02	00867	00867	PC Data: Hebrew with euro
916 8859-8	Base	00916	00916	ISO 8859-8: Hebrew
1255	T01	01255	01255	MS Windows: Hebrew
5351	T02	05351	01255	MS Windows: Hebrew, version 2 with euro
9447	T03	09447	01255	MS Windows: Hebrew, version 2 with euro and new sheqel

Table 16. Hebrew, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
424	Base	00424	00424	Host: Hebrew
803	T02	00803	00803	Host: Hebrew (Character Set A)
4899	T02	04899	00803	Host: Hebrew (Character Set A) with euro
12712	T02	12712	00424	Host: Hebrew with euro and new sheqel

Note: Data conversion does not change the direction of Hebrew data.

Japanese

Table 17. Japanese, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
932	Base	00932	1. 00897 2. 00301	1. PC data: SBCS 2. PC data: DBCS including 1880 user-defined characters
942	Base	00942	1. 01041 2. 00301	1. PC data: Extended SBCS 2. PC data: DBCS including 1880 user-defined characters
943	T01	00943	1. 00897 2. 00941	1. PC data: SBCS 2. PC data: DBCS for Open environment including 1880 IBM® user-defined characters
954 EUCJP	Base	00954	1. 00895 2. 00952 3. 00896 4. 00953	1. G0: JIS X201 Roman 2. G1: JIS X208-1990 3. G1: JIS X201 Katakana 4. G1: JIS X212
5050	T02	05050	1. 00895 2. 00952 3. 00896 4. 00953	1. G0: JIS X201 Roman 2. G1: JIS X208-1990 3. G1: JIS X201 Katakana 4. G1: JIS X212

Table 18. Japanese, Server CCSIDs

SRVERCP		CCSID	CPGID	Comments
930	Base	00930	1. 00290 2. 00300 3. 00290 4. 00300	1. Katakana Host: extended SBCS 2. Kanji Host: DBCS including 4370 user-defined characters 3. Katakana Host: extended SBCS 4. Kanji Host: DBCS including 1880 user-defined characters
931	Base	00931	1. 00037 2. 00300	1. Latin Host: SBCS 2. Kanji Host: DBCS including 4370 user-defined characters
939	Base	00939	1. 01027 2. 00300 3. 01027 4. 00300	1. Latin Host: extended SBCS 2. Kanji Host: DBCS including 4370 user-defined characters 3. Latin Host: extended SBCS 4. Kanji Host: DBCS including 1880 user-defined characters
1390	T02	01390	1. 00290 2. 00300	1. Katakana Host: extended SBCS; with euro 2. Kanji Host: DBCS including 6205 user-defined characters
1399	T02	01399	1. 01027 2. 00300	1. Latin Host: extended SBCS; with euro 2. Kanji Host: DBCS including 4370 user-defined characters; with euro

character data

Korean

Table 19. Korean, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
934	Base	00934	1. 00891 2. 00926	1. PC data: SBCS 2. PC data: DBCS including 1880 user-defined characters
944	Base	00944	1. 01040 2. 00926	1. PC data: Extended SBCS 2. PC data: DBCS including 1880 user-defined characters
949	Base	00949	1. 01088 2. 00951	1. IBM KS Code - PC data: SBCS 2. IBM KS code - PC data: DBCS including 1880 user-defined characters
970 EUCKR	Base	00970	1. 00367 2. 00971	1. G0: ASCII 2. G1: KSC X5601-1989 including 1880 user-defined characters
1363	T01	01363	1. 01126 2. 01362	1. PC data: MS Windows Korean SBCS 2. PC data: MS Windows Koran DBCS including 11172 full Hangul

Table 20. Korean, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
933	Base	00933	1. 00833 2. 00834	1. Host: Extended SBCS 2. Host: DBCS including 1880 user-defined characters and 11172 full Hangul characters
1364	T02	01364	1. 00833 2. 00834	1. Host: Extended SBCS 2. Host: DBCS including 1880 user-defined characters and 11172 full Hangul characters

Lao

Table 21. Lao, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
1133	T03	01133	01133	ISO-8: Lao

Table 22. Lao, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1132	T03	01132	01132	Host: Lao

Latin-1 and Latin-9

Table 23. Latin-1, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
437	Base	00437	00437	PC data: PC Base; USA, many other countries
819 8859-1	Base	00819	00819	ISO 8859-1: Latin-1 countries
850	Base	00850	00850	PC data: Latin-1 countries
858	T01	00858	00858	PC data: Latin-1 countries; with euro
923	T01	00923	00923	ISO 8859-15: Latin-9
924	T02	00924	00924	ISO 8859-15: Latin-9
1047	T02	01047	01047	Host: Latin-1
1252	T01	01252	01252	MS Windows: Latin-1 countries
5348	T01	05348	01252	MS Windows: Latin-1 countries, version 2 with euro

Table 24. Latin-1 and Latin-9, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
037	Base	00037	00037	Host: USA, Canada (ESA), Netherlands, Portugal, Brazil, Australia, New Zealand
273	Base	00273	00273	Host: Austria, Germany
277	Base	00277	00277	Host: Denmark, Norway
278	Base	00278	00278	Host: Finland, Sweden
280	Base	00280	00280	Host: Italy
284	Base	00284	00284	Host: Spain, Latin America (Spanish)
285	Base	00285	00285	Host: United Kingdom
297	Base	00297	00297	Host: France
500	Base	00500	00500	Host: Belgium, Canada (AS/400), Switzerland, International Latin-1
871	Base	00871	00871	Host: Iceland
924	T01	00924	00924	Host: Latin-9
1047	T01	01047	01047	Host: Latin-1
1140	T01	01140	01140	Host: USA, Canada (ESA), Netherlands, Portugal, Brazil, Australia, New Zealand; with euro
1141	T01	01141	01141	Host: Austria, Germany; with euro
1142	T01	01142	01142	Host: Denmark, Norway; with euro
1143	T01	01143	01143	Host: Finland, Sweden; with euro
1144	T01	01144	01144	Host: Italy; with euro
1145	T01	01145	01145	Host: Spain, Latin America (Spanish); with euro
1146	T01	01146	01146	Host: United Kingdom; with euro
1147	T01	01147	01147	Host: France; with euro
1148	T01	01148	01148	Host: Belgium, Canada (AS/400), Switzerland, International Latin-1; with euro
1149	T01	01149	01149	Host: Iceland; with euro

character data

Note: Conversions are supported between non euro-supported CCSIDs and euro-supported CCSIDs. These should be used with care because:

- The international currency symbol in each non euro-supported EBCDIC CCSID (for example, 00500) has been replaced by the euro symbol in the equivalent euro-supported EBCDIC CCSID (for example, 01148).
- The dotless *i* in non euro-supported ASCII CCSID 00850 has been replaced by the euro symbol in the equivalent euro-supported ASCII CCSID 00858.

Latin-2

Table 25. Latin-2, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
852	Base	00852	00852	PC data: Latin-2 multilingual
912 8859-2	Base	00912	00912	ISO 8859-2: Latin-2 multilingual
1250	T01	01250	01250	MS Windows: Latin-2
5346	T02	05346	01250	MS Windows: Latin-2, version 2 with euro
9044	T02	09044	00852	PC data: Latin-2 multilingual with euro

Table 26. Latin-2, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
500	T02	00500	00500	Host: International Latin-1
870	Base	00870	00870	Host: Latin-2 multilingual
# 924	T01	00924	00924	Host: Latin-9
# 1140	T01	01140	01140	Host: USA, Canada (ESA), Netherlands, Portugal, Brazil, Australia, New Zealand; with euro
# 1141	T01	01141	01141	Host: Austria, Germany; with euro
# 1142	T01	01142	01142	Host: Denmark, Norway; with euro
# 1143	T01	01143	01143	Host: Finland, Sweden; with euro
# 1144	T01	01144	01144	Host: Italy; with euro
# 1145	T01	01145	01145	Host: Spain, Latin America (Spanish); with euro
# 1146	T01	01146	01146	Host: United Kingdom; with euro
# 1147	T01	01147	01147	Host: France; with euro
1148	T02	01148	01148	Host: International Latin-1 with euro
# 1149	T01	01149	01149	Host: Iceland; with euro
1153	T02	01153	01153	Host: Latin-2 multilingual with euro

Note: Conversions are supported for some combinations of Latin-2 ASCII CCSIDs and Latin-1 EBCDIC CCSIDs.

Latin-5

Table 27. Latin-5, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
857	Base	00857	00857	PC data: Latin-5 (Turkey)
920 8859-9	Base	00920	00920	ISO 8859-9: Latin-5 (ECMA-128, Turkey TS-5881)
1254	T01	01254	01254	MS Windows: Turkey
5350	T02	05350	01254	MS Windows: Turkey, version 2 with euro
9049	T02	09049	00857	PC data: Latin-5 (Turkey) with euro

Table 28. Latin-5, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1026	Base	01026	01026	Host: Latin-5 (Turkey)
1155	T02	01155	01155	Host: Latin-5 (Turkey) with euro

Simplified Chinese

Table 29. Simplified Chinese, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
946	Base	00946	1. 01042 2. 00928	1. PC data: Extended SBCS 2. PC data: DBCS including 1880 user-defined characters
1381	Base	01381	1. 01115 2. 01380	1. PC data: Extended SBCS (IBM GB) 2. PC data: DBCS (IBM GB) including 31 IBM-selected, 1880 user-defined characters
1383 EUCCN	T01	01383	1. 00367 2. 01382	1. G0: ASCII 2. G1: GB 2312-80 set
1386	T01	01386	1. 01114 2. 01385	1. PC data: S-Chinese GBK and T-Chinese IBM BIG-5 2. PC data: S-Chinese GBK
5488	T03	05488	1. 01252 2. 01385 3. 01391	1. GB18030, 1-byte data 2. GB18030, 2-byte data 3. GB18030, 4-byte data

Table 30. Simplified Chinese, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
935	Base	00935	1. 00836 2. 00837	1. Host: Extended SBCS 2. Host: DBCS including 1880 user-defined characters
1388	T02	01388	1. 00836 2. 00837	1. Host: Extended SBCS 2. Host: DBCS including 1880 user-defined characters
9127	T02	09127	1. 00836 2. 00837	1. Host: Extended SBCS 2. Host: DBCS including 1880 user-defined characters

character data

Thai

Table 31. Thai, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
1161	T03	01161	01161	PC data: Thai with euro
1162	T03	01162	01162	MS Windows: Thai with euro
9066	T03	09066	00874	PC data: Thai extended SBCS

Table 32. Thai, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1160	T03	01160	01160	Host: Thai with euro
9030	T03	09030	00838	Host: Thai extended SBCS

Traditional Chinese

Table 33. Traditional Chinese, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
938	Base	00938	1. 00904 2. 00927	1. PC data: SBCS 2. PC data: DBCS including 6204 user-defined characters
948	Base	00948	1. 01043 2. 00927	1. PC data: Extended SBCS 2. PC data: DBCS including 6204 user-defined characters
950 BIG5	Base	00950	1. 01114 2. 00947	1. PC data: SBCS (IBM BIG5) 2. PC data: DBCS including 13493 CNS, 566 IBM selected, 6204 user-defined characters
964 EUCTW	Base	00964	1. 00367 2. 00960 3. 00961	1. G0: ASCII 2. G1: CNS 11643 plane 1 3. G1: CNS 11643 plane 2
1370	T02	01370	1. 01114 2. 00947	1. PC data: Extended SBCS; with euro 2. PC data: DBCS including 6204 user-defined characters; with euro

Table 34. Traditional Chinese, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
937	Base	00937	1. 00037 2. 00835	1. Host: Extended SBCS 2. Host: DBCS including 6204 user-defined characters
1371	T02	01371	1. 01159 2. 00835	1. Host: Extended SBCS; with euro 2. Host: DBCS including 6204 user-defined characters; with euro

Urdu

Table 35. Urdu, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
868	T03	00868	00868	PC data: Urdu
1006	T03	01006	01006	ISO-8: Urdu

Table 36. Urdu, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
918	T03	00918	00918	Host: Urdu

Note: Data conversion does not change the direction of Urdu data.

Vietnamese

Table 37. Vietnamese, Client CCSIDs

CLINTCP	in	CCSID	CPGID	Comments
1129	T02	01129	01129	ISO-8: Vietnamese
1163	T02	01163	01163	ISO-8: Vietnamese with euro
1258	T02	01258	01258	MS Windows: Vietnamese
5354	T02	05354	01258	MS Windows: Vietnamese, version 2 with euro

Table 38. Vietnamese, Server CCSIDs

SRVERCP	in	CCSID	CPGID	Comments
1130	T02	01130	01130	Host: Vietnamese
1164	T02	01164	01164	Host: Vietnamese with euro

Unicode data

CICS on System/390 provides limited support for Unicode-encoded character data. The support allows workstations to share UCS-2 or UTF-8 encoded data with the System/390 provided, that no conversion is required.

Note: More extensive support for conversion to and from Unicode data is available in CICS if you use channels to communicate your data. See the *CICS Application Programming Guide*. Channels are available in CICS Transaction Server for z/OS Version 3 Release 1 onwards.

Table 39. Unicode

#	CLINTCP SRVERCP	in	CCSID	CPGID	Comments
#	1200	T01	01200	01400	Unicode with character set 65535 (the “growing” character set, see Note beneath table). In the absence of a byte-order mark (BOM), assumed to be UTF-16 BE (big-endian).
#	UTF-8	T01	01208	01400	Unicode with character set 65535 (the “growing” character set, see Note beneath table). UTF-8.

character data

Table 39. Unicode (continued)

#	CLINTCP SRVERCP	in	CCSID	CPGID	Comments
#	13488	T01	13488	01400	Unicode with character set 3001 (fixed at Unicode 2.0 character repertoire). In the absence of a byte-order mark, assumed to be UTF16-BE (big-endian).
#	17584		17584	01400	Unicode with character set 3004 (fixed at Unicode 3.0 character repertoire). in the absence of a byte-order mark, assumed to be UTF16-BE (big-endian).

Note: Character set 65535 is known as the “growing character set” because it
allows more characters to be added to the set from time to time. This allows
a product that supports Unicode to avoid having to change the CCSID value
every time more characters are added to Unicode.

Binary data

For binary data you can specify, on the DFHCNV TYPE=FIELD macro, either:

DATATYP=BINARY

The default format for binary data received by CICS on System/390 is
big-endian; that is, multibyte numerical values have the most significant
byte values first (in the lower machine address).

DATATYP=NUMERIC

The default format for binary data received by CICS on System/390 is
little-endian; that is, multibyte numerical values have the least significant
byte values first.

The default binary format can be overridden. It is therefore important that you code a DFHCNV TYPE=FIELD macro for every binary field. If the resource can be accessed from CICS Transaction Server for Windows, you must set the default binary format to that used by CICS Transaction Server for Windows.

You should ensure that the format of each individual binary data field—BINARY or NUMERIC—is consistent across all INTEL platforms.

The conversion process

This section describes in more detail how data conversion works in a CICS on System/390 system.

Components

The CICS or user-supplied mirror transactions do the System/390 conversions, using the following CICS components:

DFHCNV

The conversion table. For each resource for which conversion is required, DFHCNV contains a **conversion template**. A conversion template is a table entry defining fields in a data area that are to be converted, and the conversion method to be applied to each field.

You define the DFHCNV table with the DFHCNV resource definition macros described in “Defining the conversion table” on page 63.

DFHCCNV

The CICS program that drives the conversion process. DFHCCNV uses the DFHCNV table to determine the required conversions. It applies standard conversion to those fields in the conversion templates for which nonstandard, user-handled conversion is not specified.

The user-replaceable conversion program, DFHUCNV

A user-replaceable program that allows you to override the standard conversions applied by CICS. You can use it to apply your own conversion logic to specific data fields. (How to do this is described in “User/CICS conversion” on page 60.)

You can use the supplied program as a model on which to base your own version.

For all CICS on System/390 products *other than* CICS TS for z/OS, Version 2.2 and later, to take advantage of nonstandard conversion you must provide a single data conversion program named DFHUCNV. This will probably be a customized version of the DFHUCNV program supplied with CICS.

For CICS TS for z/OS, Version 2.2 and later, you can provide *either*:

1. Your own, customized, version of DFHUCNV, *or*
2. One or more differently-named conversion programs

In the following sections, the generic term “DFHUCNV” represents both the (possibly customized) IBM-supplied conversion program and user-named conversion programs.

Process

This section describes the standard conversions that can be applied by DFHCCNV to specific fields in a conversion template. Other types of conversion are possible, if you write a DFHUCNV program.

Character data

Character data can be converted:

- From ASCII to EBCDIC, on receipt of a request from CICS Transaction Server for Windows or CICS on Open Systems, before invoking the EXEC interface
- From EBCDIC to ASCII, on return from the EXEC interface, before transmitting the response to CICS Transaction Server for Windows or CICS on Open Systems.

The translation tables shipped with CICS conform to the standards described in the *IBM Character Data Representation Architecture Level 2 - Registry*, SC09-1391.

Binary data

Binary data can be converted:

#

- From little-endian to big-endian format, on receipt of a request from CICS Transaction Server for Windows.
- From big-endian to little-endian format, before transmitting the response to CICS Transaction Server for Windows.

In CICS Transaction Server for Windows, COBOL/2™ programs can be compiled so that binary and packed decimal fields are in System/390-compatible format and require no conversion at the System/390 (see “the DATATYP option of the DFHCNV TYPE=FIELD macro” on page 73).

Standard and nonstandard conversion

Consider a single resource, a file for example, that requires data conversion. There are three possibilities; you can use:

- CICS-only conversion—all data fields are handled by the standard CICS conversion program, DFHCCNV
- User/CICS conversion—a combination of nonstandard and standard conversion, in which some data fields are handled by user code in DFHUCNV and some by DFHCCNV
- User-only conversion—all data fields are handled by DFHUCNV.

CICS-only conversion

The resource contains no data fields that require nonstandard conversion; all can be converted by standard means. You must:

1. Create a conversion template, using the DFHCNV macros described in “Defining the conversion table” on page 63. This enables DFHCCNV to handle the resource.
2. Specify USREXIT=NO on the DFHCNV TYPE=ENTRY macro that defines the resource. This prevents DFHUCNV from being called unnecessarily.
3. Do not specify DATATYP=USERDATA on any of the DFHCNV TYPE=FIELD macros that define the data fields.

User/CICS conversion

The resource contains some fields that can be converted by standard means, and some that require nonstandard conversion. You must:

1. Create a conversion template.
2. Specify USREXIT=YES or (for CICS TS for z/OS Version 2.2 and later) USREXIT=*program* on the DFHCNV TYPE=ENTRY macro that defines the resource. If USREXIT=YES is specified, DFHUCNV is called. If USREXIT=*program* is specified, your conversion program named *program* is called.
3. Specify DATATYP=USERDATA on the DFHCNV TYPE=FIELD macros that define the nonstandard data fields. Optionally, also define nonstandard fields with a USRTYPE value in the range X'50' through X'80' (see “the USRTYPE option of the DFHCNV TYPE=FIELD macro” on page 73). These values are passed to your user program, and can be used to distinguish between different types of nonstandard field.

Define standard fields as DATATYP=CHARACTER, PD, BINARY, GRAPHIC, or NUMERIC, as appropriate.

4. Supply a user-written version of DFHUCNV or (for CICS TS for z/OS Version 2.2 and later) a differently-named conversion program to handle the nonstandard fields.

“The user-replaceable conversion program” on page 82 gives a description and listing of DFHUCNV, with guidance on how to use it as a basis for your own conversion program. (The default version supplied with CICS handles only temporary storage requests for which templates have been defined.)

User-only conversion

The resource contains no fields that can be converted by standard means; all require nonstandard conversion. There are two methods of enabling user-only conversion.

Method 1: This is the **recommended method**:

1. Create a conversion template.
2. Specify USREXIT=YES or (for CICS TS for z/OS Version 2.2 and later) USREXIT=*program* on the DFHCNV TYPE=ENTRY macro that defines the resource. If USREXIT=YES is specified, DFHUCNV is called. If USREXIT=*program* is specified, your conversion program named *program* is called.
3. Specify DATATYP=USERDATA on *all* the DFHCNV TYPE=FIELD macros that define the data fields. Optionally, define all fields with a USRTYPE value in the range X'50' through X'80'.
4. Supply a user-written version of DFHUCNV or (for CICS TS for z/OS Version 2.2 and later) a differently-named conversion program to handle all fields.

Method 2:

1. Do not create a conversion template. If there is no template for a resource, CICS invokes DFHUCNV (but not DFHCCNV), on the assumption that it is to handle all conversion.
2. Supply a user-written version of DFHUCNV to handle all fields.

This method is **not recommended**, because:

- The parameter list passed to your DFHUCNV program does not contain as much information as it does if you define a conversion template. The fields that contain data are listed in “Parameter list (DFHUVNDS)” on page 83.
- It relies on the following:
 - That all workstations connected to the CICS on System/390 server share a common encoding (for example, 437) for character data, and a common format (for example, little-endian) for binary data
 - That your version of DFHUCNV knows the ASCII encoding and binary format, and knows the corresponding EBCDIC encoding
 - That DFHUCNV provides the appropriate ASCII/EBCDIC translation tables.

#

Sequence of conversion processing

The sequence of conversion processing is as follows:

1. Unless USREXIT=NO is specified in the DFHCNV TYPE=ENTRY macro that defines the conversion template for the resource, DFHCCNV links to DFHUCNV, passing the parameter list described in “Parameter list (DFHUVNDS)” on page 83.

Notes:

- a. If you have not defined a template, DFHUCNV is invoked, on the assumption that the user program is to handle all conversions for the resource.
 - b. DFHUCNV *must* be present in your system unless *all* DFHCNV TYPE=ENTRY macros specify USREXIT=NO.
2. If a conversion template is defined for the resource, DFHUCNV is responsible for converting any fields with a type in the user-data range.
If no conversion template is defined for the resource, DFHUCNV is responsible for determining the format of the data, and for converting all appropriate fields.
 3. On return from DFHUCNV, DFHCCNV carries out any standard conversions specified in the conversion template for fields that are not subject to user-defined conversion.
 4. The shipped request is executed.

the conversion process

If data conversion is required, a DPL request from CICS Transaction Server for Windows should not use the TRANSID option to specify a transaction other than the default CPML, which is required to trigger conversion.

Figure 12 summarizes System/390 conversion procedures.

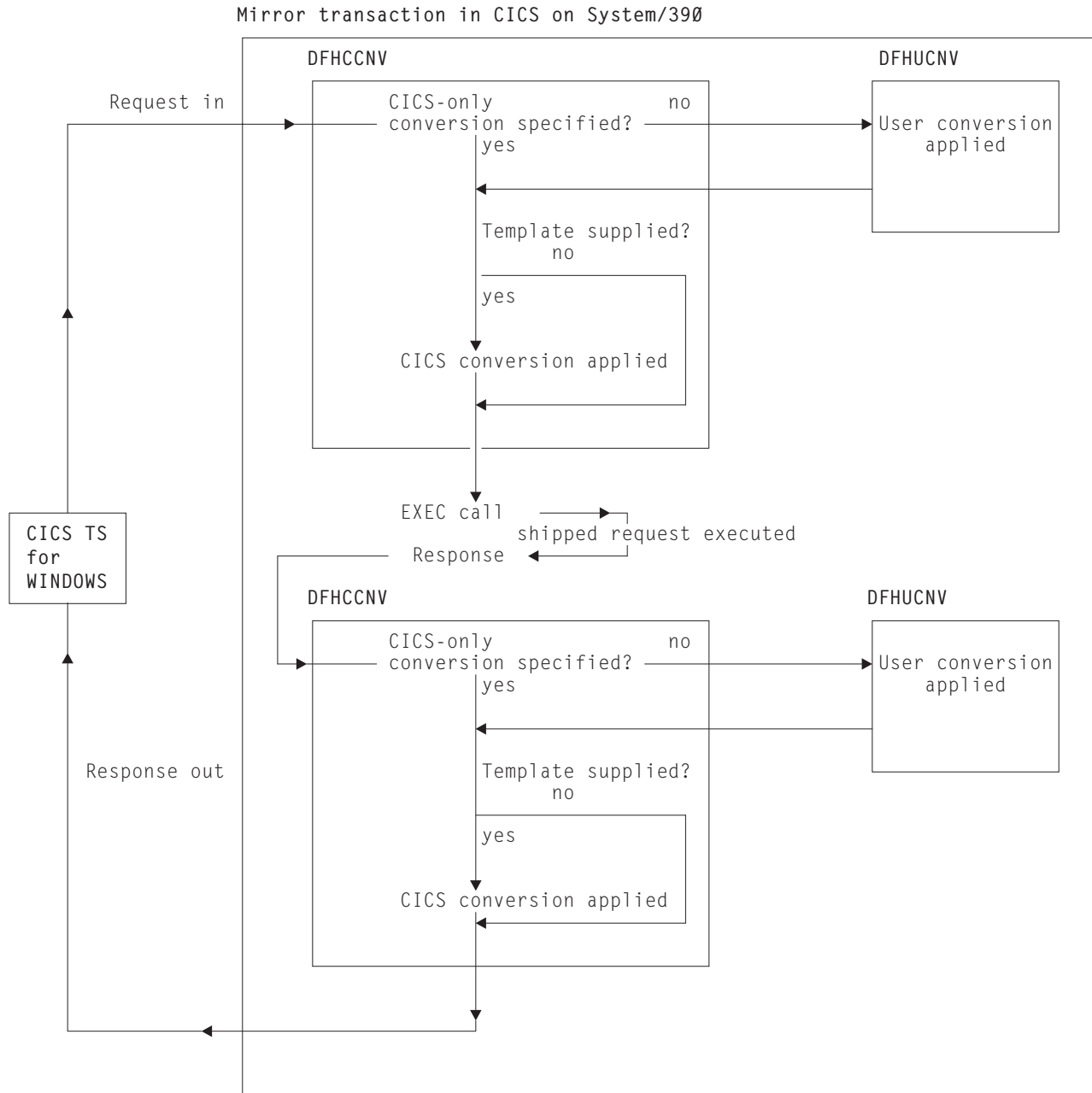


Figure 12. Data conversion in CICS on System/390

Resource definition to enable data conversion

To allow data conversion at the System/390, the following resources must be defined to the CICS on System/390 system:

- DFHCNV, conversion table
- DFHCCNV, standard conversion program
- DFHUCNV, user-defined conversion program.

For details of how to create the conversion table, see the next section “Defining the conversion table.”

Defining the conversion table

You define the conversion table with DFHCNV resource definition macros, which are described below.

The output of the DFHCNV macro assembly contains templates specifying resource conversion requirements and conversion tables to enable the required conversions. User-generated conversion tables must be placed in the DFHCNV macro source.

If you are running CICS on System/390 in a z/OS environment, see “Assembling and link-editing the conversion programs” on page 81.

DFHCNV macro types

The following macros define the conversion table:

- # DFHCNV TYPE=INITIAL defines the beginning of the conversion table. It defines the default client and server CCSIDs.
- # DFHCNV TYPE=ENTRY specifies a name and type to uniquely identify a data resource. There must be one for each resource for which conversion is required (no conversion is applied to a resource that is not defined in a DFHCNV TYPE=ENTRY macro). The entry for one resource is concluded by the next TYPE=ENTRY statement, or by the end of the table. The CCSID to be used is specified.

CICS TS for z/OS Version 2.3 and later

You can create generic templates that apply to multiple resources of the same resource type. You do this by using the RPFX or XRPFX parameters of the DFHCNV TYPE=ENTRY macro to specify a prefix that can be matched against multiple resource names, rather than using the full name of a specific resource.

Defining resources in this way means that order becomes important in the conversion table. For example, when specifying file resources, if prefix AB precedes prefix ABCD, the former entry is used to convert data for a file resource named ABCDEFGH. This example would give you an error when assembling the conversion table. To avoid errors, you should put the most specific resource names at the top of the conversion table, with the least specific prefix at the bottom.

When no resource name or prefix is specified, the default conversion template is used for that particular resource type. For an example of the DFHCNV TYPE=ENTRY macro, see “DFHCNV TYPE=ENTRY” on page 68.

defining the conversion table

- DFHCNV TYPE=KEY applies only to an FC entry. Use this macro only if a record might need to be accessed by key (if records are always accessed by relative record number or relative byte address, do not code a TYPE=KEY macro). When used, this macro must immediately follow a TYPE=ENTRY macro, and must be followed by one or more TYPE=FIELD macros, which define the data conversion to be applied to the key.
- DFHCNV TYPE=SELECT defines selection of a record⁹ for data conversion based on the value of a field in the record. Each TYPE=SELECT macro is followed by one or more TYPE=FIELD macros, which define the data conversion to be applied if the record satisfies the test defined in the TYPE=SELECT macro. The last TYPE=SELECT macro for each entry is an OPTION=DEFAULT macro, which defines the conversion to be applied to a record that satisfies no preceding TYPE=SELECT macro.
- DFHCNV TYPE=FIELD specifies the position and length of a field, and the conversion to be applied to it. There must be a TYPE=FIELD macro for each field for which conversion is required.
- DFHCNV TYPE=FINAL concludes the conversion table definition.

Conversion and key templates

Templates are table entries defining fields in a data area or key that are to be converted and the conversion method to be applied to each field. A conversion template is defined by one or more DFHCNV TYPE=FIELD macros following a DFHCNV TYPE=SELECT macro. A key template consists of one or more DFHCNV TYPE=FIELD macros following a DFHCNV TYPE=KEY macro. Each type of template is terminated by the next non-FIELD macro in the table definition. Figure 14 on page 66 shows templates within a complete conversion table definition.

Defaults for client and server code pages

This section applies only to CICS Transaction Server for z/OS Version 3 Release 1 and later.

Certain distributed components of a CICSplex such as CICS Transaction Gateway for z/OS and CICS Transaction Server for Windows do not provide an override for the default client code page specified in the conversion table. As conversion tables do not have a suffix, a consequence of this is that two tables can be required, each residing on a different library and differing only in the default code page.

In order to reduce the number of conversion tables required, you can specify that the default client or server code page is defined in the system initialization table. For the client code page:

1. In the DFHCNV TYPE=ENTRY and TYPE=SELECT macros, specify the value SYSDEF for the CLINTCP parameter.
2. In the system initialization table, set a default client code page by specifying a value for the CLINTCP parameter. You can use any value supported for the CLINTCP parameter on the DFHCNV macro. The default is CLINTCP=437.

For the server code page:

1. In the DFHCNV TYPE=ENTRY and TYPE=SELECT macros, specify the value SYSDEF for the SRVERCP parameter.

9. FC record, TS data, TD data, IC start "from" data, or COMMAREA transmitted with DPL

2. In the system initialization table, set a server code page by specifying a value for the SRVERCP parameter. You can use any value supported for SRVERCP parameter on the DFHCNV macro. The default is SRVERCP=037.

Example sequence—DFHCNV macros

Figure 14 on page 66 shows a typical sequence of DFHCNV macros. The figure is annotated to show the sets of entries that correspond to resource entries, conversion templates, and key templates. (The indentation is to illustrate nesting. When coding the macros, as with all CICS resource definition macros, observe assembler rules.)

Conversion table for initial program verification (IVP)

When running the IVP jobs for your CICS on System/390 system, you need the conversion table whose source is given in Figure 13. You don't need to code all these macros. You can generate exactly the same conversion table by assembling the special macro, DFHCNV TYPE=IVP.

Figure 13 is a simple example of a conversion table definition.

All the fields are character, so only a single TYPE=SELECT macro is needed. It specifies OPTION=DEFAULT, and has a single TYPE=FIELD macro to define the whole data record.

The TYPE=KEY macro is followed by a single TYPE=FIELD macro, which redefines the first six bytes of the data record.

```
DFHCNV TYPE=INITIAL
DFHCNV TYPE=ENTRY,RTYPE=FC,RNAME=FILEA,USREXIT=NO
DFHCNV TYPE=KEY
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=6, LAST=YES
DFHCNV TYPE=SELECT,OPTION=DEFAULT
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=80, LAST=YES
DFHCNV TYPE=FINAL
```

Figure 13. Conversion table for IVP

defining the conversion table

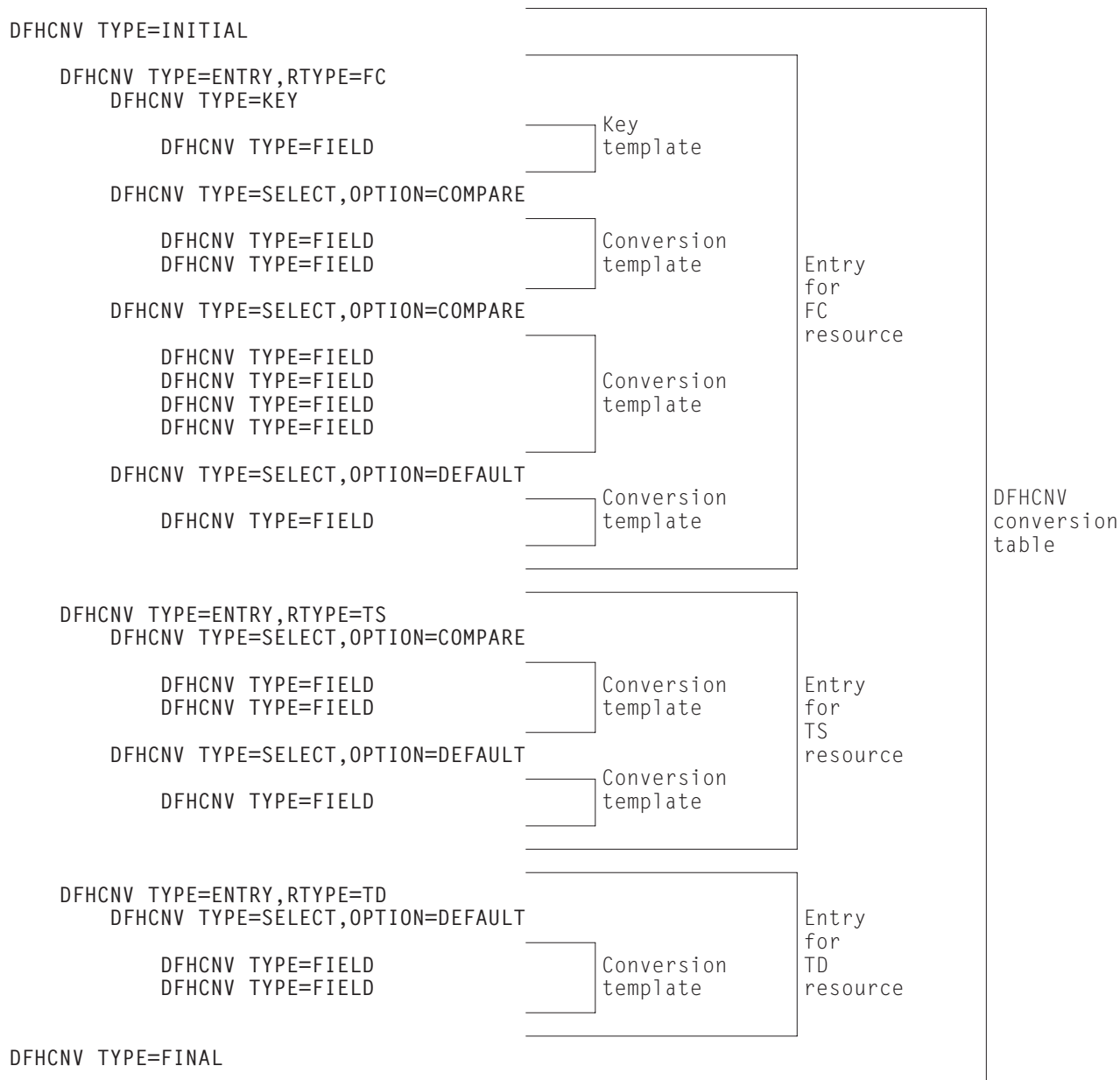
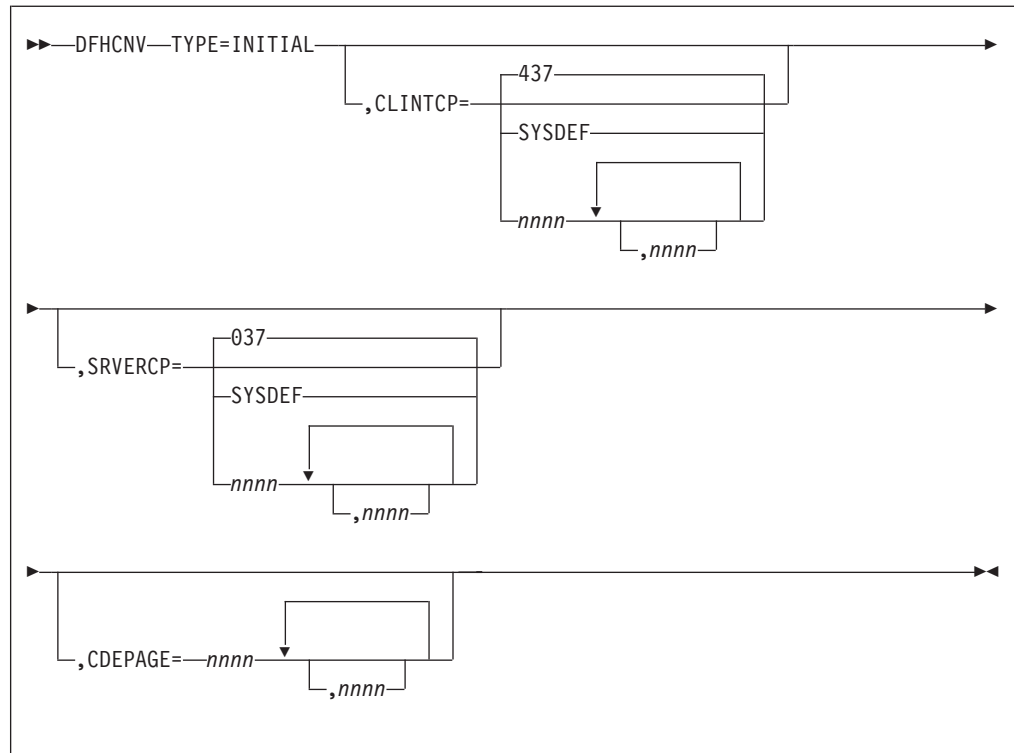


Figure 14. Example of DFHCNV macro sequence

DFHCNV TYPE=INITIAL

The DFHCNV TYPE=INITIAL macro has the following format:



TYPE=INITIAL

Defines the beginning of the conversion table.

CLINTCP={437|SYSDEF|nnnn[,nnnn, ...]}

The first operand defines the default client CCSID to be used when the CLINTCP and CDEPAGE operands are omitted from a DFHCNV TYPE=ENTRY macro.

SYSDEF specifies that the default client code page is determined by the system initialization table parameter CLINTCP. SYSDEF applies only to CICS Transaction Server for z/OS Version 3 Release 1 and later.

For an explanation of code pages, and a list of those that you can specify, see “Character data” on page 45.

SRVERCP={037|SYSDEF|nnnn[,nnnn, ...]}

The first operand defines the server CCSID to be used when the SRVERCP and CDEPAGE operands are omitted from a DFHCNV TYPE=ENTRY macro.

SYSDEF specifies that the default server code page is determined by the system initialization table parameter SRVERCP. SYSDEF applies only to CICS Transaction Server for z/OS Version 3 Release 1 and later.

For an explanation of code pages, and a list of those that you can specify, see “Character data” on page 45.

CDEPAGE=nnnn[,nnnn...]

(Retained for compatibility with earlier releases. Do not use for new definitions.)

Each possible value is equivalent to a pair of CLINTCP and SRVERCP entries or (for user-defined conversion) to a SRVERCP entry.

437

Is equivalent to:
CLINTCP=437

defining the conversion table

SRVERCP=037

932K

Is equivalent to:

CLINTCP=932

SRVERCP=930

932

Is equivalent to:

CLINTCP=932

SRVERCP=931

USR

Is equivalent to:

SRVERCP=USR

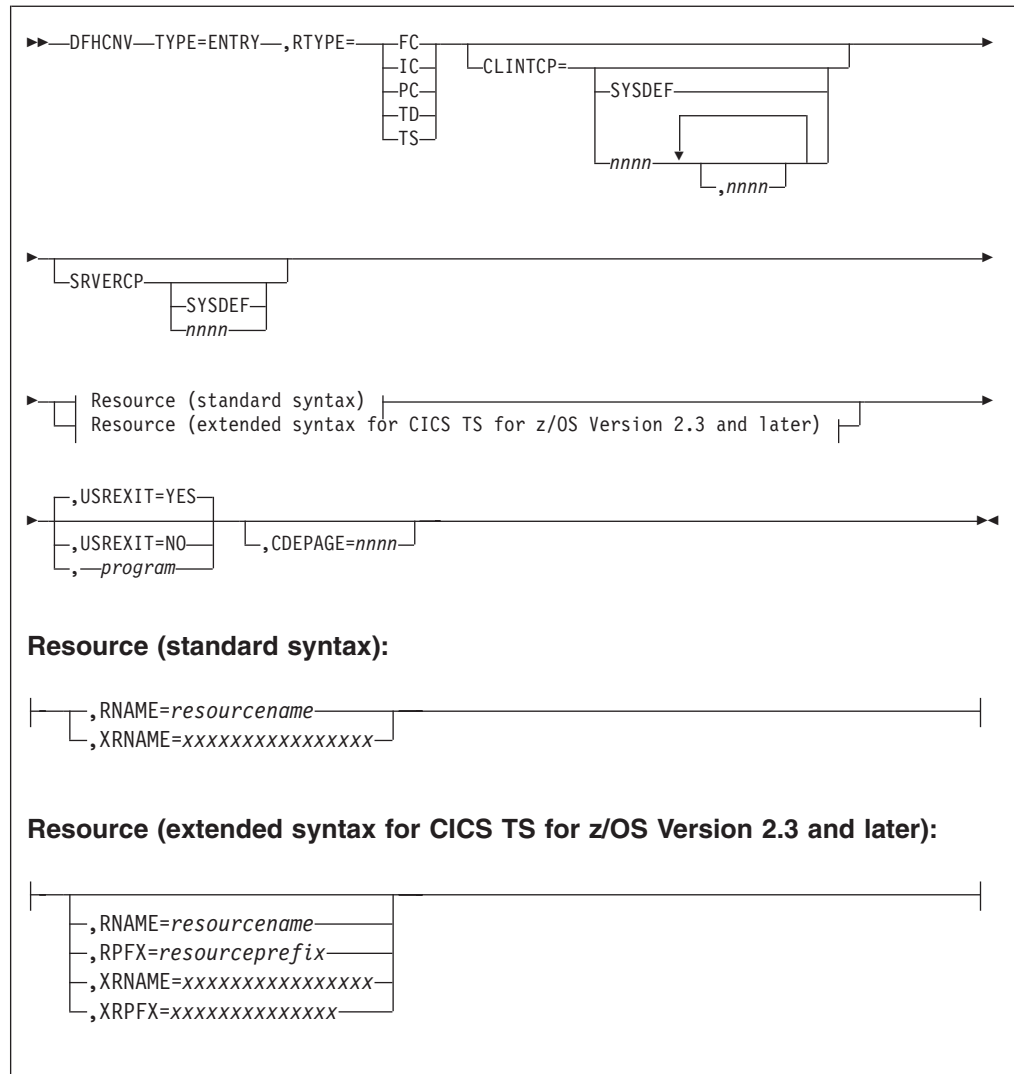
USRD

Is equivalent to:

SRVERCP=USRD

DFHCNV TYPE=ENTRY

The DFHCNV TYPE=ENTRY macro instruction has the following format:



#

TYPE=ENTRY

Specifies that this macro defines a resource by name and type.

RTYPE={FCITSITDIICIPC}

Specifies the type of resource:

- FC** A file
- TS** A temporary storage queue
- TD** A transient data queue
- IC** An interval control start with data
- PC** A program link with a COMMAREA.

CLINTCP={nnnn[,nnnn, ...]SYSDEF}

The first operand defines the default client code page to be used.

SYSDEF specifies that the default client code page is determined by the system initialization table parameter CLINTCP. SYSDEF applies only to CICS Transaction Server for z/OS Version 3 Release 1 and later.

For an explanation of code pages, and a list of those that you can specify, see "Character data" on page 45.

SRVERCP={nnnnSYSDEF}

The operand defines the server code page to be used.

defining the conversion table

| SYSDEF specifies that the server code page is determined by the system
| initialization table parameter SRVERCP. SYSDEF applies only to CICS
| Transaction Server for z/OS Version 3 Release 1 and later.

| For an explanation of code pages, and a list of those that you can specify, see
| "Character data" on page 45.

RNAME=resource name

Specifies the name of the resource in up to eight characters. If shorter, it is padded with blanks; if longer, it is truncated. The name can be:

- A System/390 file name (up to eight characters).
- A TS queue name (up to eight characters).

Note: Although CICS TS for OS/390 Release 3 and above support TS queue names of up to 16 characters, DFHCNV only supports TS queue names of up to 8 characters.

- A TD queue name (up to four characters).
- An IC start transaction id (up to four characters).
- The name of the program being linked (up to eight characters).

RPFX=resource prefix

Applies only to CICS TS for z/OS Version 2.3 and later. Specifies a resource prefix of up to 7 characters for programs, TS queues and files; or 3 characters for TD queues and transactions. The resource prefix allows resources of a particular type to be grouped together using just one macro. All resources of the specified type and prefix will be treated in the same way. Order is important, so the most specific resource names should be at the top of the conversion table, with the least specific prefixes at the bottom. If none of the parameters are specified at this point in the macro, the default template is used for all resources within the specified resource type.

XRNAME=xxxxxxxxxxxxxxxx (RTYPE=TS only)

Specifies the resource name in hexadecimal notation. It can include up to 16 hexadecimal digits, padded with blanks if necessary.

XRPFX=xxxxxxxxxxxxxxxx (RTYPE=TS only)

Applies only to CICS TS for z/OS Version 2.3 and later. Specifies a resource prefix of up to 14 hexadecimal digits. The resource prefix allows resources of a particular type to be grouped together. All resources of the specified type and prefix will be treated in the same way. Order is important, so the most specific resource names should be at the top of the conversion table, with the least specific prefixes at the bottom. If none of the parameters are specified at this point in the macro, the default template is used for all resources within the specified resource type.

USREXIT={YES|NO|program}

Specifies whether the user data conversion exit is called.

YES

User-defined conversion is required for this resource. DFHUCNV is invoked. Code this if you need your customized version of DFHUCNV to convert some data for this resource.

NO

User-defined conversion is not required for this resource. The user-replaceable conversion program is not called. Code this to eliminate the overhead of calling the program unnecessarily.

defining the conversion table

in the following DFHCNV TYPE=FIELD macros, if the record satisfies the comparison defined in this macro (OFFSET and DATA or XDATA options).

DEFAULT

Indicates that the data should be converted according to the specifications in the following DFHCNV TYPE=FIELD macros, if the record has not satisfied the comparison defined in any previous DFHCNV TYPE=SELECT COMPARE macro.

For each resource entry (started by a TYPE=ENTRY macro) the last TYPE=SELECT macro must specify OPTION=DEFAULT. No other TYPE=SELECT macro in the entry should specify OPTION=DEFAULT.

The following options are ignored if OPTION=DEFAULT is coded.

OFFSET=nnnn

Specifies the byte offset in the record at which the comparison should be made, up to a maximum of 65535.

DATA='dd...dd'

(Use only if the data to be tested is defined as DATATYP=CHARACTER, SOSI=NO)

Specifies the comparison data as a character string, with a maximum length of 255 characters. Because you specify this data on the System/390 system, it is in EBCDIC. The system converts the incoming data from ASCII to EBCDIC before checking it against the comparison data, so that EBCDIC is compared with EBCDIC. Outgoing data is in EBCDIC, so the comparison is made in EBCDIC without conversion.

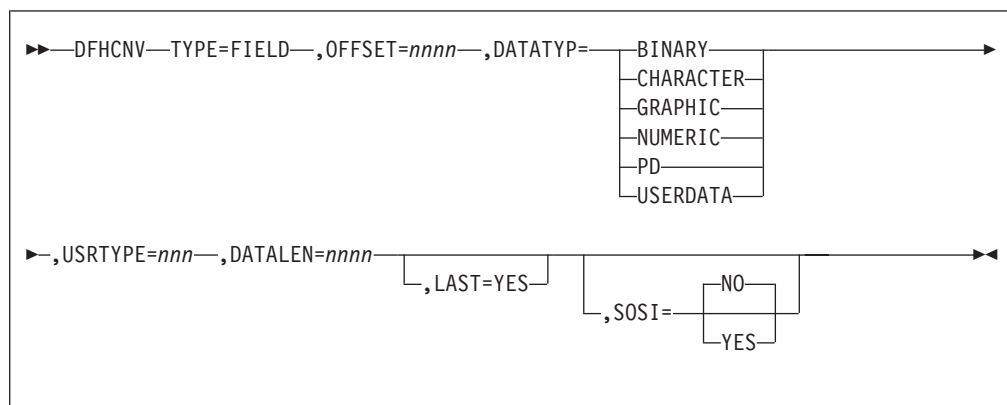
XDATA='xx...xx'

(Use if DATA option is not used)

Specifies the comparison data as a hexadecimal string, with an even number of digits, maximum length 254 digits. Data is compared against this field, without conversion.

DFHCNV TYPE=FIELD

The DFHCNV TYPE=FIELD macro instruction occurs as many times as needed, and has the following format:



TYPE=FIELD

Specifies conversion specifications for a data field. There must be one such statement for each field in a record. You cannot code a TYPE=FIELD macro until you have coded a TYPE=SELECT macro.

OFFSET=nnnn

Specifies the byte offset in the record or key at which the conversion should start, up to a maximum of 65535. (For TYPE=KEY conversions, this is the byte offset from the start of the *key* not from the start of the record. The file's FCT entry defines the offset of the first byte of the key from the start of the record.)

DATATYP={CHARACTER|PD|BINARY|USERDATA|GRAPHIC|NUMERIC}

Specifies the type of conversion required:

CHARACTER

Specifies character fields.

PD

Specifies packed decimal data in System/390 format.

If workstation packed decimal (PD) fields are to be transmitted to a System/390, specify the IBMCOMP and SIGN EBCDIC directives with the CICSCOMP command used to compile a CICS Transaction Server for Windows COBOL/2 application program. If this program sends data to the System/390, packed decimal fields are in System/390-compatible format. Define such fields as PD (no conversion needed). Any packed decimal data in non-System/390 format (for example, workstation native mode) should be defined for USERDATA conversion, and the user-replaceable program DFHUCNV must contain the necessary conversion code.

BINARY

Specifies binary data in big-endian format.

The CICS Transaction Server for Windows user can specify the IBMCOMP directive with the CICSCOMP command used to compile a CICS Transaction Server for Windows COBOL/2 application program that creates binary fields in big-endian-compatible format.

#

By default, COBOL/2 binary fields are held on the workstation in little-endian format, and should be defined as NUMERIC. C language integer fields are always held on the workstation in little-endian format, and should be defined as NUMERIC.

#

#

By default, BINARY data is not converted. This default action can be overridden to allow requests from platforms that support different binary architectures to access the same System/390 resource using the same conversion table.

USERDATA

Specifies data to be converted by the user-replaceable program DFHUCNV. The DFHCCNV conversion code bypasses these fields. See the USRTYPE operand below.

GRAPHIC

Specifies fields that contain DBCS characters only.

NUMERIC

Specifies that binary fields held on the workstation in INTEL format (for example, C Language integer datatype) need to be converted to System/390 format. Integers (four bytes) or short integers (two bytes) can be converted.

#

USRTYPE=nnn

Specifies a value that is made available to the user-replaceable conversion program DFHUCNV. The values you provide can be in the range 80 to 128 (X'50' to X'80'). The default value is 80 (X'50'). If more than one type of

defining the conversion table

user-defined conversion is possible, you can use this value to specify to DFHUCNV what conversion is needed for each field.

This option is ignored if DATATYP=USERDATA is not specified.

DATALEN=n

Specifies the length of the data field to be converted, in bytes, up to a maximum of 65535. For variable length fields, specify the maximum possible length.

If DATATYP=NUMERIC, DATALEN must be 2 or 4.

LAST=YES

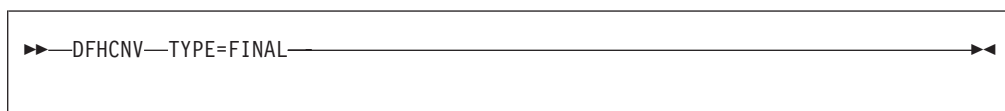
Specifies that this is the last field definition for this TYPE=SELECT statement.

SOSI=YESINO

Enter YES for a mixed string containing SBCS and DBCS characters; enter NO for an SBCS string. This field is valid only if DATATYPE=CHARACTER has been entered in this macro. The default is NO.

DFHCNV TYPE=FINAL

The DFHCNV TYPE=FINAL macro instruction ends the table. It must occur only once, as the last definition.



Hints on coding the macros

CICS does not check the order of the fields defined in the table, or for overlap. This is relevant to the first two hints below:

1. Define entries for the most frequently-used resources first, to reduce search time.
2. Define USERDATA fields in consecutive entries. This reduces the time needed by your conversion program to scan the template.
3. For variable-length fields, define the maximum length required. (Comparisons and conversions are applied to the shorter of the actual data length or the template length. For example, if the data is 100 bytes long but the template describes 120 bytes, up to 100 bytes are converted. If the data is 100 bytes and the template describes 80 bytes, only 80 bytes are converted.)
4. If function-shipped data is accessed only by a remote CICS Transaction Server for Windows or CICS on Open Systems system, and never by the System/390 system, there is no need to provide conversion details. A typical case is a System/390 file used to pass data between CICS Transaction Server for Windows users.
5. CICS Transaction Server for Windows assumes that record key formats are not redefinable, so they must be the same for all redefined record types. If a resource has a key template, then all conversion templates for that resource must exactly replicate the key conversion specified in the key template.

User-defined conversion tables

If you specify `SRVERCP=USR` or `USRD` in a `DFHCNV TYPE=ENTRY` macro, you must provide user-defined conversion tables. The standard conversion program (`DFHCCNV`) uses these tables, and they are made available to the user-replaceable conversion program, `DFHUCNV`.

Place your user-defined conversion tables in the `DFHCNV` macro source, anywhere after the `DFHCNV TYPE=INITIAL` macro. For source readability, the best place is probably after the `DFHCNV TYPE=FINAL` macro.

The following are descriptions of the types of table you may need to define and the way to label each type.

SRVERCP=USR

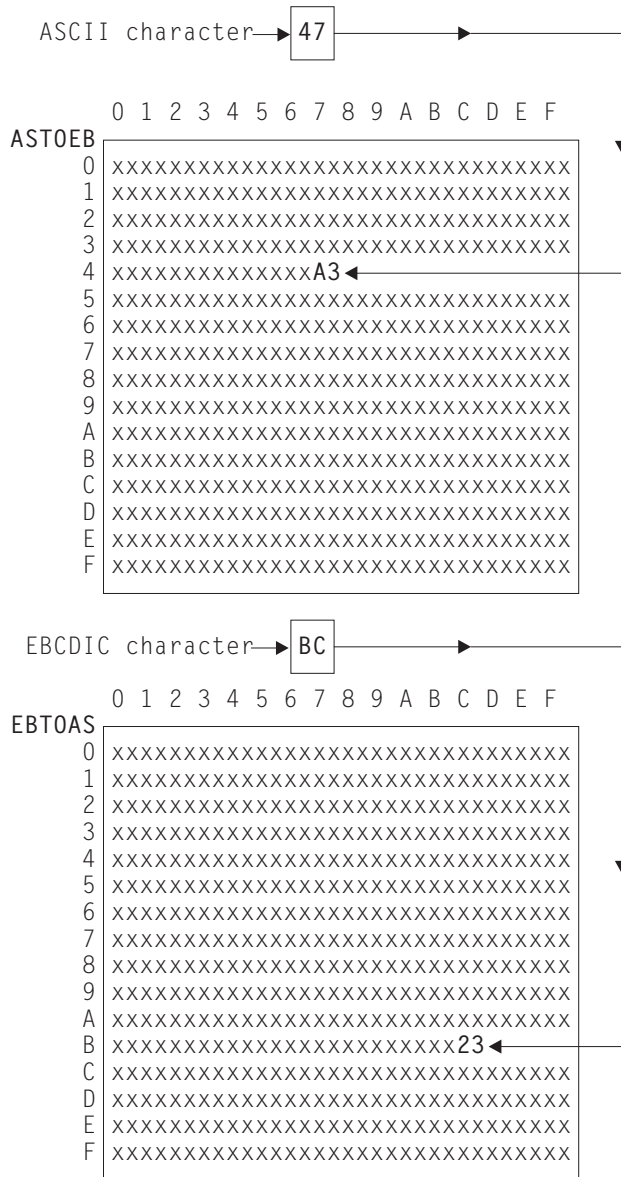
You must provide two character conversion tables, labelled `ASTOEB` and `EBTOAS`. Each table must be 256 bytes long. `ASTOEB` is used for ASCII to EBCDIC conversion and `EBTOAS` is used for EBCDIC to ASCII conversion. The hexadecimal value of a character byte is used as an offset in the conversion table to obtain the converted value of the character. Figure 15 on page 76 illustrates this process.

SRVERCP=USRD

You must provide DBCS character conversion tables labelled `DBASTOEB` and `DBEBTOAS`, in the `DFHCNV` source. These must be after the `DFHCNV TYPE=INITIAL` macro, but otherwise anywhere in the source. Each table must be a list of 256 four-byte pointers and 256 pairs of 256-byte translate tables. The first byte of a DBCS character is used as an index to the list of pointers. Using the first byte of the DBCS character as a hexadecimal offset in the list, the pointer found is the address of a pair of 256-byte translate tables. The second byte of the DBCS character is used as an offset in each of the two 256-byte translate tables to obtain the first and second bytes of the converted DBCS character. Figure 16 on page 77 illustrates this process.

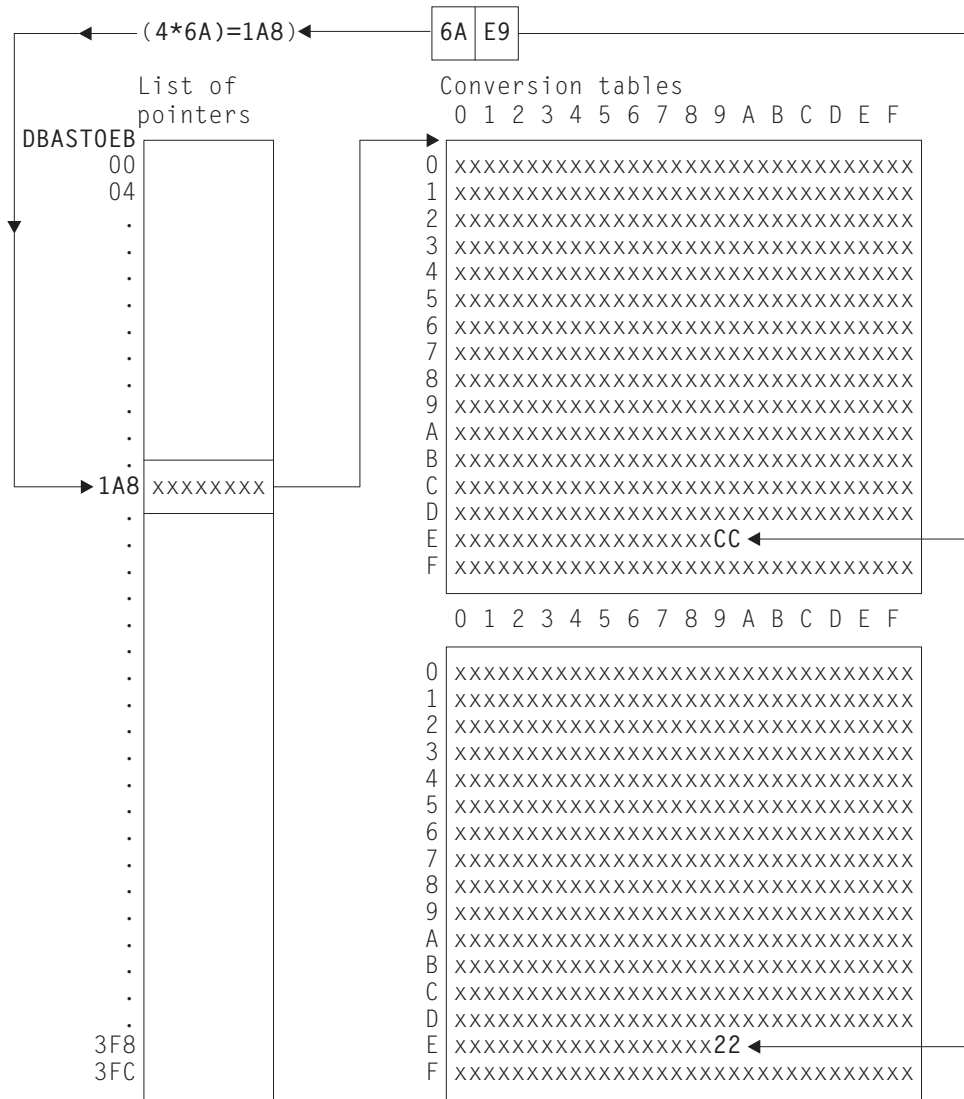
You must also provide an SBCS conversion table as specified under `USR` above.

user-defined conversion tables



In this example, the ASCII character X'47' converts to the EBCDIC character X'A3', and the EBCDIC character X'BC' converts to the ASCII character X'23'. These values have no significance, and are used simply to illustrate the structure of the conversion tables.

Figure 15. Structure of SBCS conversion tables



In this example, the double-byte character X'6AE9' converts to X'CC22'. The value, at offset 6A in the pointer list, is the address of a pair of 256-byte translate tables. At offset E9 in these tables, the byte values are X'CC' and X'22' respectively. These are random values, used purely for illustration.

This is an ASCII-EBCDIC conversion, because the pointer list is labeled DBASTOEB. A complete set of ASCII-EBCDIC tables contains 256 pairs of 256-byte tables, one pair for each possible value of the first byte of a double-byte character. DBEBTOAS is the label of a similar set of EBCDIC-ASCII tables.

Figure 16. Structure of DEBUTS conversion tables

Invalid and undefined DBCS characters

In ASCII and EBCDIC, certain code ranges are valid DBCS code. Any double-byte value outside these ranges is an invalid DBCS character. In the supplied conversion tables, invalid DBCS characters convert to X'FFFF', as defined by the code page architecture.

user-defined conversion tables

Within the valid code range, several thousand double-byte values are defined as actual DBCS characters. A double-byte value within the valid code range, but not defined as a DBCS character, is an undefined DBCS character.

User-defined tables should follow the above conventions for invalid and undefined characters.

Example macros

Figure 17 shows an example of a record layout for a file called VSAM99. The key is offset 0 for length 6, and the record contains no redefinition.

```
02  FILEREC.
03  STAT          PIC X.
03  NUMB          PIC X(6).
03  NAME          PIC X(20).
03  ADDR          PIC X(20).
03  PHONE         PIC X(8).
03  DATEX         PIC X(8).
03  AMOUNT        PIC X(8).
03  COMMENT       PIC X(9).
03  COUNTER1      PIC 9999 USAGE COMP-4.
03  COUNTER2      PIC 9999 USAGE COMP-4.
03  ADDLCMT       PIC X(30).
```

Figure 17. Record layout for VSAM99

Figure 18 gives a full set of conversion macros for file VSAM99. Figure 19 shows the same conversion expressed more briefly, by combining adjoining fields of the same type.

```
DFHCNV TYPE=INITIAL,CLINTCP=437,SRVERCP=037
DFHCNV TYPE=ENTRY,RTYPE=FC,RNAME=VSAM99
DFHCNV TYPE=KEY
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=6, LAST=YES
DFHCNV TYPE=SELECT,OPTION=DEFAULT
DFHCNV TYPE=FIELD,OFFSET=00,DATATYP=CHARACTER,DATALEN=1
DFHCNV TYPE=FIELD,OFFSET=01,DATATYP=CHARACTER,DATALEN=6
DFHCNV TYPE=FIELD,OFFSET=07,DATATYP=CHARACTER,DATALEN=20
DFHCNV TYPE=FIELD,OFFSET=27,DATATYP=CHARACTER,DATALEN=20
DFHCNV TYPE=FIELD,OFFSET=47,DATATYP=CHARACTER,DATALEN=8
DFHCNV TYPE=FIELD,OFFSET=55,DATATYP=CHARACTER,DATALEN=8
DFHCNV TYPE=FIELD,OFFSET=63,DATATYP=CHARACTER,DATALEN=8
DFHCNV TYPE=FIELD,OFFSET=71,DATATYP=CHARACTER,DATALEN=9
DFHCNV TYPE=FIELD,OFFSET=80,DATATYP=BINARY,DATALEN=2
DFHCNV TYPE=FIELD,OFFSET=82,DATATYP=BINARY,DATALEN=2
DFHCNV TYPE=FIELD,OFFSET=84,DATATYP=CHARACTER,DATALEN=30, LAST=YES
DFHCNV TYPE=FINAL
```

Figure 18. Full description of VSAM99


```
DFHCNV TYPE=INITIAL,CLINTCP=437,SRVERCP=037
DFHCNV TYPE=ENTRY,RTYPE=FC,RNAME=VSAM99
DFHCNV TYPE=KEY
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=6, LAST=YES
DFHCNV TYPE=SELECT,OPTION=DEFAULT
DFHCNV TYPE=FIELD,OFFSET=00,DATATYP=CHARACTER,DATALEN=80
DFHCNV TYPE=FIELD,OFFSET=80,DATATYP=BINARY,DATALEN=4
DFHCNV TYPE=FIELD,OFFSET=84,DATATYP=CHARACTER,DATALEN=30, LAST=YES
DFHCNV TYPE=FINAL
```

Figure 19. Condensed description of VSAM99

Note: Be careful when combining adjoining fields, even if they are of the same data type. Do not combine NUMERIC fields. Do not combine fields defined as CHARACTER, if SOSI=YES is specified for one or more of them. Whether you can combine USERDATA fields depends on user-defined data structures and conversion code.

Figure 20 shows a redefined record layout for file VSAM99. Figure 21 shows a set of conversion macros for the redefined record layout in Figure 20.

```
02 FILEREC.
03 STAT          PIC X.
03 NUMB          PIC X(6).
03 NAME          PIC X(20).
03 ADDR          PIC X(20).
03 PHONE         PIC X(8).
03 DATEX         PIC X(8).
03 AMOUNT        PIC X(8).
03 COMMENT       PIC X(9).
03 VARINF1.
03 COUNTER1      PIC 9999 USAGE COMP-4.
03 COUNTER2      PIC 9999 USAGE COMP-4.
03 ADDLCMT       PIC X(30).
03 VARINF2 REDEFINES VARINF1.
03 COUNTER1      PIC 9999 USAGE COMP-4.
03 COUNTER2      PIC 9999 USAGE COMP-4.
03 COUNTER3      PIC 9999 USAGE COMP-4.
03 COUNTER4      PIC 9999 USAGE COMP-4.
03 ADDLCMT2      PIC X(26).
```

Figure 20. Redefined record layout for VSAM99

data conversion examples

```
DFHCNV TYPE=INITIAL
DFHCNV TYPE=ENTRY,RTYPE=FC,RNAME=VSAM99
DFHCNV TYPE=KEY
DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=6,LAST=YES
*
* If offset 00 is a character 'X' use the following
* conversion definitions:
*
DFHCNV TYPE=SELECT,OPTION=COMPARE,OFFSET=00,DATA='X'
DFHCNV TYPE=FIELD,OFFSET=00,DATATYP=CHARACTER,DATALEN=80
DFHCNV TYPE=FIELD,OFFSET=80,DATATYP=BINARY,DATALEN=4
DFHCNV TYPE=FIELD,OFFSET=84,DATATYP=CHARACTER,DATALEN=30,LAST=YES
*
* Otherwise use the following (default)
* conversion definitions
*
DFHCNV TYPE=SELECT,OPTION=DEFAULT
DFHCNV TYPE=FIELD,OFFSET=00,DATATYP=CHARACTER,DATALEN=80
DFHCNV TYPE=FIELD,OFFSET=80,DATATYP=BINARY,DATALEN=8
DFHCNV TYPE=FIELD,OFFSET=88,DATATYP=CHARACTER,DATALEN=26,LAST=YES
DFHCNV TYPE=FINAL
```

Figure 21. Description for redefined record layout for VSAM99

Figure 22 shows user-defined conversion tables, EBTOAS and ASTOEB, illustrating how they are preceded with DFHCNV macros in the source that is submitted to the assembler.

```

*
LABL1  DFHCNV TYPE=INITIAL,CLINTCP=437,SRVERCP=037
*
      DFHCNV TYPE=ENTRY,RTYPE=FC,RNAME=VSAM80
      DFHCNV TYPE=KEY
      DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=BINARY,DATALEN=2
      DFHCNV TYPE=FIELD,OFFSET=2,DATATYP=CHARACTER,DATALEN=4,   X
          LAST=YES
LABLX  DFHCNV TYPE=SELECT,OPTION=COMPARE,OFFSET=6,XDATA='C1C2C3'
      DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=BINARY,DATALEN=2
      DFHCNV TYPE=FIELD,OFFSET=2,DATATYP=CHARACTER,DATALEN=4
      DFHCNV TYPE=FIELD,OFFSET=9,DATATYP=CHARACTER,DATALEN=8,   X
          LAST=YES

      :
      DFHCNV TYPE=ENTRY,RTYPE=TS,RNAME=ABCD
      DFHCNV TYPE=SELECT,OPTION=DEFAULT
      DFHCNV TYPE=FIELD,OFFSET=0,DATATYP=CHARACTER,DATALEN=40
      DFHCNV TYPE=FIELD,OFFSET=40,DATATYP=BINARY,DATALEN=4,     X
          LAST=YES
LABLN  DFHCNV TYPE=FINAL
*
* EXAMPLE OF A USER-DEFINED CONVERSION TABLE EBCDIC to ASCII
EBTOAS DC   XL16'000102030405060708090A0B0C0D0E0F'
      DC   XL16'101112131415161718191A1B1C1D1E1F'
      DC   XL16'202122232425262728292A2B2C2D2E2F'
      DC   XL16'303132333435363738393A3B3C3D3E3F'
      DC   XL16'404142434445464748494A4B4C4D4E4F'
      DC   XL16'505152535455565758595A5B5C5D5E5F'
      DC   XL16'606162636465666768696A6B6C6D6E6F'
      DC   XL16'707172737475767778797A7B7C7D7E7F'
      DC   XL16'80C1C2C3C4C5C6C7C8C98A8B8C8D8E8F'
      DC   XL16'90D1D2D3D4D5D6D7D8D99A9B9C9D9E9F'
      DC   XL16'A0A1E2E3E4E5E6E7E8E9AAABACADAEAF'
      DC   XL16'B0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF'
      DC   XL16'C0C1C2C3C4C5C6C7C8C9CACBCCDCECF'
      DC   XL16'D0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF'
      DC   XL16'E0E1E2A3E4E5E6E7E8E9EAEBECEDEEEF'
      DC   XL16'F0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF'
*
* EXAMPLE OF A USER-DEFINED CONVERSION TABLE ASCII to EBCDIC
*
ASTOEB DC   XL16'000102030405060708090A0B0C0D0E0F'
      DC   XL16'101112131415161718191A1B1C1D1E1F'
      DC   XL16'202122232425262728292A2B2C2D2E2F'
      DC   XL16'303132333435363738393A3B3C3D3E3F'
      DC   XL16'404142434445464748494A4B4C4D4E4F'
      DC   XL16'505152535455565758595A5B5C5D5E5F'
      DC   XL16'606162636465666768696A6B6C6D6E6F'
      DC   XL16'707172737475767778797A7B7C7D7E7F'
      DC   XL16'808182838485868788898A8B8C8D8E8F'
      DC   XL16'909192939495969798999A9B9C9D9E9F'
      DC   XL16'A0A1A2A3A4A5A6A7A8A9AAABACADAEAF'
      DC   XL16'B0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF'
      DC   XL16'C0818283848586878889CACBCCDCECF'
      DC   XL16'D0919293949596979899DADBDCDDDEDF'
      DC   XL16'E0E1A2A3A4A5A6A7A8A9EAEBECEDEEEF'
      DC   XL16'F0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF'
      END   DFHCNVBA

```

Figure 22. SBCS user-defined conversion table

Assembling and link-editing the conversion programs

In z/OS, you can use either of the standard procedures DFHAUPLE and DFHAUPLK to assemble the DFHCNV table.

assembling conversion programs

If your CICS product is CICS/VSE 2.3 or CICS Transaction Server for VSE/ESA, or if your CICS product can run with z/OS, you can optimize CICS virtual storage use by link-editing the DFHCNV table and the DFHUCNV program with a MODE statement specifying AMODE(31) and RMODE(ANY). The table and program are then loaded above the 16MB line if enough CICS storage is available.

On VSE or VSE/ESA systems, for a successful link-edit, before assembly:

- Insert the following statement in front of the DFHCNV source:

```
PUNCH ' PHASE DFHCNV,*'.
```

- Insert the following statement after the DFHCNV=FINAL instruction:

```
END DFHCNVBA
```

The user-replaceable conversion program

This section describes the user-replaceable data conversion program.

User-named conversion programs

Important

This section applies only to CICS Transaction Server for z/OS, Version 2 Release 2 and later.

Releases of CICS TS for z/OS from Version 2.2 onwards allow you to replace DFHUCNV, the default user-replaceable conversion program supplied with your CICS on System/390 product, by one or more user-named conversion programs.

DFHUCNV is invoked if:

- A conversion template is not defined for the resource, *or*
- A conversion template is defined for the resource and the template specifies USREXIT=YES.

A user-named conversion program is invoked if:

- A conversion template is defined for the resource and the template specifies USREXIT=*userprogram*

where *userprogram* is the name of the user-supplied conversion program.

In the following sections, the generic term “DFHUCNV” represents both the (possibly customized) IBM-supplied conversion program and user-named conversion programs.

DFHUCNV

For an explanation of why you might need to amend or replace DFHUCNV, refer to “User/CICS conversion” on page 60. If you find that the standard conversion supplied by DFHCCNV meets your needs, you don’t need to use DFHUCNV.

DFHUCNV is described in the following topics:

- “Input to DFHUCNV” on page 83:
This describes the parameter list (DFHUVNDS), which points to the data, the templates, the conversion table, and so on. It also describes the structure of the conversion and key templates created by your DFHCNV resource definition macros.
- “Supplied user-replaceable conversion program” on page 91:

This lists the commented version of DFHUCNV that is supplied with your CICS System/390 product.

With this information you can write your own conversion program, using the supplied program as a base.

Input to DFHUCNV

The first statement in the supplied version of DFHUCNV is a DFHCNV TYPE=DSECT macro, which generates DSECTs that describe the parameter list (see “Parameter list (DFHUVNDS)”) and the conversion template (see the general description of conversion and key templates in “Conversion and key templates” on page 64 and the reference information in “Conversion and key templates” on page 87).

DFHUCNV starts with a DFHCNV TYPE=DSECT in the following format:

```
DFHCNV TYPE=DSECT
```

The DFHCNV TYPE=DSECT macro generates the following:

- The DFHUNVDS DSECT, which maps the parameter list in the COMMAREA passed by DFHCCNV.
- An assembler DSECT for field conversion records (these are the basic components of a template; see Figure 25 on page 87).
- Equates for resource types and field types.

Parameter list (DFHUVNDS): Figure 23 on page 84 shows the DFHUNVDS DSECT, which maps the parameter list passed to DFHUCNV in the COMMAREA. If a parameter is zero, no data is available. *If you do not create a conversion template for the resource, DFHUCNV is invoked, but only the following fields in the parameter list contain data:*

```
UNVRSTP  
UNVRNMP  
UNVDIRP  
UNVOVLY
```

user-replaceable conversion program

DFHUNVDS	DSECT		
UNVRSTP	DS	AL4	PTR-TO-RESOURCE TYPE
UNVRNMP	DS	AL4	PTR-TO-RESOURCE NAME
UNVDIRP	DS	AL4	PTR-TO-CONVERSION DIRECTIVE
CNVRQATE	EQU	X'02'	REQUEST ASCII TO EBCDIC
CNVRPETA	EQU	X'04'	RESPONSE EBCDIC TO ASCII
UNVDTMP	DS	AL4	PTR-TO-DATA CONV TEMPLATE
UNVDLNP	DS	AL4	PTR-TO-DATA TEMPLATE LENGTH
UNVKTMP	DS	AL4	PTR-TO-KEY CONV TEMPLATE
UNVKLNP	DS	AL4	PTR-TO-KEY TEMPLATE LENGTH
UNVATEP	DS	AL4	PTR-TO-ASCII/EBCDIC TRANS TABLE
UNVETAP	DS	AL4	PTR-TO-EBCDIC/ASCII TRANS TABLE
UNVATED	DS	AL4	PTR-TO-DBCS ASCII/EBCDIC TRANS TABLE
UNVETAD	DS	AL4	PTR-TO-DBCS EBCDIC/ASCII TRANS TABLE
UNVOVLY	DS	0H	OVERLAY SECTION
	ORG	UNVOVLY	TS REQUEST OVERLAY
UNVTSDP	DS	AL4	PTR-TO-TS DATA
UNVTSLNP	DS	AL4	PTR-TO-TS DATA LENGTH
	ORG	UNVOVLY	TD REQUEST OVERLAY
UNVTDDP	DS	AL4	PTR-TO-TD DATA
UNVTDLNP	DS	AL4	PTR-TO-TD DATA LENGTH
	ORG	UNVOVLY	IC REQUEST OVERLAY
UNVICDP	DS	AL4	PTR-TO-IC DATA
UNVICLNP	DS	AL4	PTR-TO-IC DATA LENGTH
	ORG	UNVOVLY	PC REQUEST OVERLAY
UNVPCDP	DS	AL4	PTR-TO-PC DATA
UNVPCLNP	DS	AL4	PTR-TO-PC DATA LENGTH
	ORG	UNVOVLY	FC REQUEST OVERLAY
UNVFCDP	DS	AL4	PTR-TO-FC DATA
UNVFCLNP	DS	AL4	PTR-TO-FC DATA LENGTH
UNVFCKP	DS	AL4	PTR-TO-FC KEY
UNVFCKLP	DS	AL4	PTR-TO-FC KEY LENGTH
	ORG	,	
UNVMRTNE	DS	A	PTR-TO-MBCS TRANSLATION ROUTINE
UNVCLIDP	DS	AL4	A "client" CCSID
*			(for example, 00819)
UNVSRIDP	DS	AL4	A "server" CCSID
*			(for example, 00285)

Figure 23. DFHUNVDS—DSECT that maps the parameter list passed to DFHUCNV

The following is a detailed description of the parameters:

UNVRSTP

Points to a one-byte resource type that indicates the resource being referenced by this request. The meanings of the resource types are defined in DSECT DFHCNVDS. The resource types are FC, IC, TS, TD, and PC.

UNVRNMP

Points to an eight-character field containing the resource name, padded with blanks if necessary. These may be:

- For an FC request, an eight-byte file name
- For a TS request, an eight-byte TS queue name
- For a TD request, a four-byte TD queue name
- For an IC request, a four-byte transaction name
- For a PC request, an eight-byte program name.

UNVDIRP

Points to a one-byte field that shows what conversion is required:

- CNVRQATE (X'02') indicates a request needing conversion from client encoding to server encoding.
- CNVRPETA (X'04') indicates a response needing conversion from server encoding to client encoding.

UNVDTMP

Points to the start of the conversion template found by CICS to match this resource. If UNVDTMP is zero no template was found.

UNVDLNP

Points to a field that gives the length of the conversion template. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

UNVKTMP (file control requests only)

Points to the start of the template found by CICS for the key part of the request or response. If UNVKTMP is zero, either there is no key template or the record is accessed by relative record number or relative byte address.

UNVKLNP (file control requests only)

Points to a field that gives the length of the key conversion template. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

UNVATEP

Points to a 256-byte SBCS translation table used for converting character data from client encoding to server encoding.

UNVETAP

Points to a 256-byte SBCS translation table used for converting character data from server encoding to client encoding.

UNVATED

Points to a DBCS translation table used for converting character data from client encoding to server encoding.

UNVETAD

Points to a DBCS translation table used for converting character data from server encoding to client encoding.

The overlay section depends on resource type:

TS requests:

UNVTSDP

Points to the start of the TS record being read or written. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

UNVTSLNP

Points to a field that gives the length of the TS record.

TD requests:

UNVTDDP

Points to the start of the TD record being read or written.

UNVTDLNP

Points to a field that gives the length of the TD record. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

user-replaceable conversion program

IC requests:

UNVICDP

Points to the “from” area of an IC START request.

UNVICLNP

Points to a field that gives the length of the “from” area. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

PC requests:

UNVPCDP

Points to the start of the COMMAREA being supplied.

UNVPCLNP

Points to a field that gives the length of the COMMAREA. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

FC requests:

UNVFCDP

Points to the start of the file control record being read or written.

UNVFCCLNP

Points to a field that gives the length of the file control record. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

UNVFCCKP

Points to the start of the key for the file control record being read or written.

UNVFCCKLP

Points to a field that gives the length of the key. The field is:

- A fullword for CICS TS for z/OS, Version 2.2 and later
- A half-word for all other CICS on System/390 products

UNVMRTNE

Points to a translation routine that must be used for translations to or from an MBCS code page. The relevant client code pages are 954, 964, and 970.

The routine expects Register 1 to point to a structure defined by the DFHUNVM DSECT:

DFHUNVM DSECT			
UNVMTABP	DS	AL4	Set to value in UNVATED or UNVETAD
UNVMINP	DS	AL4	Address of source data
INVMINL	DS	FL4	Length of source data
UNVMOUTP	DS	AL4	Address of target buffer
UNVMOUTL	DS	FL4	Length of target buffer

UNVCLIDP (applies only to CICS TS for z/OS Version 2.2 and later)

Points to a fullword field that gives the IBM-defined CCSID, for example 00819, corresponding to the “client” code page.

UNVSRIDP (applies only to CICS TS for z/OS Version 2.2 and later)

Points to a fullword field that gives the IBM-defined CCSID, for example 00285, corresponding to the “server” code page.

Conversion and key templates: In the COMMAREA, fields UNVDTMP and UNVDLNP point to the conversion template and its length. Fields UNVKTMP and UNVKLNP point to the key template and its length. Figure 24 illustrates the use and meaning of these fields.

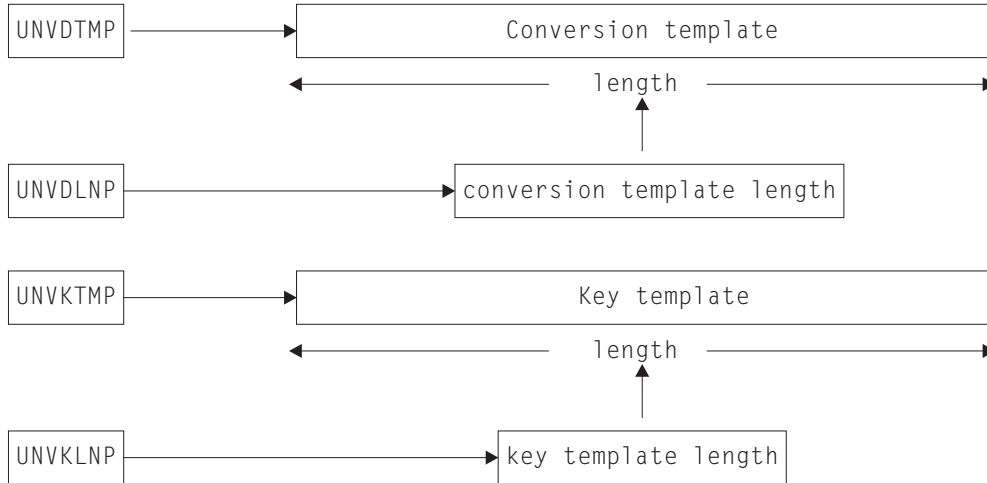


Figure 24. Parameter fields and the conversion templates

Each type of template consists of field conversion records, one for each field in the data record or key. Each field conversion record has the same layout, shown under "Field conversion records" on page 88, and mapped by a supplied DSECT, DFHCNVDS (see "DFHCNVDS, DSECT for field conversion records" on page 89). Figure 25 shows the relationship between a template, field conversion records, and DFHCNVDS. The figure shows DFHCNVDS overlaying the first field conversion record in a template for a data record or key with six fields.

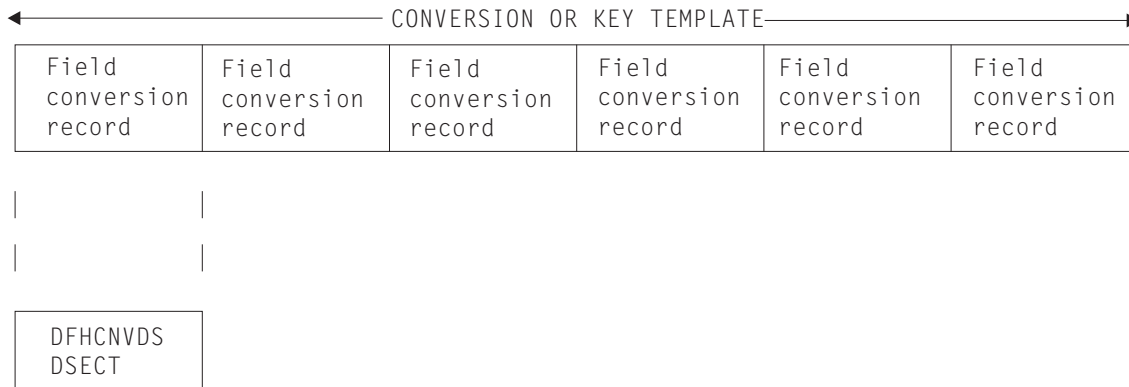


Figure 25. Field conversion records and a conversion or key template

user-replaceable conversion program

Field conversion records: For CICS TS for z/OS, Version 2.2 and later, a field conversion record has the following layout:

Table 40. Layout of a field conversion record for CICS TS for z/OS, Version 2.2 and later

CNVRLN	CNVRTYPE	Reserved	CNVDATTY	CNVDATAO	CNVDATAL
Record length	Record type	Reserved	Data type	Data offset	Data length
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5-8	Byte 9-12

For all CICS on System/390 products other than CICS TS for z/OS Version 2.2 and later, a field conversion record has the following layout:

Table 41. Layout of a field conversion record for CICS on System/390 products other than CICS TS for z/OS Version 2.2 and later

CNVRLN	CNVRTYPE	Reserved	CNVDATTY	CNVDATAO	CNVDATAL
Record length	Record type	Reserved	Data type	Data offset	Data length
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5-6	Byte 7-8

In Table 40 and Table 41, record length and type refer to the length and type of the field conversion record. The names in the top row are those used in the DSECT DFHCNVDS which maps field conversion records (see Figure 26 on page 89 and Figure 27 on page 90). A template has as many field conversion records as are necessary to describe all the fields in the data record or key.

For DFHUCNV, CNVRLN is X'0C' for releases of CICS TS for z/OS from Version 2.2 onwards, and X'08' for all other CICS on System/390 products. CNVRTYPE is always X'04' (field). DFHUCNV must interpret CNVDATTY values in the range X'50' through X'80' according to user specifications, and apply the appropriate conversions. DFHUCNV should ignore fields with CNVDATTY values outside the range X'50' to X'80'.

EQUATEs in DFHCNVDS: Note that DFHCNVDS contains EQUATEs that are useful in your conversion program, as follows:

For resource type addressed by the parameter list:

CNVFC	FILE CONTROL
CNVTS	TEMPORARY STORAGE
CNVTD	TRANSIENT DATA
CNVIC	INTERVAL CONTROL
CNVPC	PROGRAM CONTROL

For field type in the template:

DTBIN	BINARY
DTPD	PACKED DECIMAL
DTCHAR	CHARACTER
DTMIX	MIXED CHARACTER
DTDBCS	DBCS CHARACTER
DTNUM	INTEL INTEGER

Two additional EQUATEs, DTUSRMIN and DTUSRMAX, define the limits of the range of data types (X'50' to X'80') reserved for user definition. Ensure that DFHUCNV can deal with any data type in this range that can be used in your installation.

The supplied DFHUCNV program contains examples of the use of CNVTS, DTUSRMIN, and DTUSRMAX—see “Supplied user-replaceable conversion program” on page 91.

DFHCNVDS, DSECT for field conversion records:

CICS TS for z/OS, Version 2.2 and later, version:

```
DFHCNVDS DSECT
*
* PROVIDES A MAPPING OF THE FIELD CONVERSION RECORDS USED
* WHEN DECIDING WHETHER TO CONVERT USER DATA.
* A SET OF FIELD DEFINITIONS MAKE UP A TEMPLATE
*
CNVRLEN DS AL1 LENGTH OF THIS RECORD
CNVRTYPE DS XL1 TYPE OF RECORD
*
* EQUATES FOR RECORD TYPES
*
CNVTFLD EQU X'04' FIELD (ONLY VALID TYPE IN
* TEMPLATE)
CNVOVLY DS 0H
**
**
ORG CNVOVLY TYPE FIELD
DS XL1 RESERVED
CNVDATTY DS XL1 DATA TYPE
*
* EQUATES FOR DATA TYPES
*
DTBIN EQU X'01' BINARY
DTPD EQU X'02' PACKED DECIMAL
DTCHAR EQU X'03' CHARACTER
DTMIX EQU X'04' MIXED CHARACTER
DTDBCS EQU X'05' DBCS
DTNUM EQU X'06' NUMERIC
DTUSRMIN EQU X'50' MINIMUM USER DATA TYPE
DTUSRMAX EQU X'80' MAXIMUM USER DATA TYPE
*
CNVDATA0 DS AL4 DATA OFFSET
CNVDATAL DS AL4 DATA LENGTH
**
*
* EQUATES FOR RESOURCE TYPES
*
CNVFC EQU X'01' FILE CONTROL
CNVTS EQU X'02' TEMP STORAGE
CNVTD EQU X'03' TRANS DATA
CNVIC EQU X'05' INTERVAL CONTROL
CNVPC EQU X'06' PROGRAM CONTROL
```

Figure 26. DFHCNVDS, DSECT that maps conversion/key templates passed to DFHUCNV. This is the CICS TS for z/OS, Version 2.2 and later, version.

user-replaceable conversion program

DFHCNVDS, DSECT for field conversion records:

Non-CICS TS for z/OS, Version 2.2 and later, version:

```
DFHCNVDS DSECT
*
* PROVIDES A MAPPING OF THE FIELD CONVERSION RECORDS USED
* WHEN DECIDING WHETHER TO CONVERT USER DATA.
* A SET OF FIELD DEFINITIONS MAKE UP A TEMPLATE
*
CNVRLEN DS AL1 LENGTH OF THIS RECORD
CNVRTYPE DS XL1 TYPE OF RECORD
*
* EQUATES FOR RECORD TYPES
*
CNVTFLD EQU X'04' FIELD (ONLY VALID TYPE IN
* TEMPLATE)
CNVOVLY DS 0H
**
**
ORG CNVOVLY TYPE FIELD
DS XL1 RESERVED
CNVDATTY DS XL1 DATA TYPE
*
* EQUATES FOR DATA TYPES
*
DTBIN EQU X'01' BINARY
DTPD EQU X'02' PACKED DECIMAL
DTCHAR EQU X'03' CHARACTER
DTMIX EQU X'04' MIXED CHARACTER
DTDBCS EQU X'05' DBCS
DTNUM EQU X'06' NUMERIC
DTUSRMIN EQU X'50' MINIMUM USER DATA TYPE
DTUSRMAX EQU X'80' MAXIMUM USER DATA TYPE
*
CNVDATA0 DS AL2 DATA OFFSET
CNVDATAL DS AL2 DATA LENGTH
**
*
* EQUATES FOR RESOURCE TYPES
*
CNVFC EQU X'01' FILE CONTROL
CNVTS EQU X'02' TEMP STORAGE
CNVTD EQU X'03' TRANS DATA
CNVIC EQU X'05' INTERVAL CONTROL
CNVPC EQU X'06' PROGRAM CONTROL
```

Figure 27. DFHCNVDS, DSECT that maps conversion/key templates passed to DFHUCNV. This is the version for all CICS on System/390 products other than CICS TS for z/OS, Version 2.2 and later.

Supplied user-replaceable conversion program

Figure 28 lists the version of DFHUCNV supplied with CICS TS for z/OS, Version 2.2 and later. Figure 29 on page 97 lists the version of DFHUCNV supplied with all other CICS on System/390 products. Both versions are written in assembler.

The supplied version of DFHUCNV checks for a resource type of TS. If it finds one, it scans down the passed template looking for fields defined with a type in the user-data range. If any are present, DFHUCNV converts them as characters; you can rewrite the conversion code to your own requirements.

User-replaceable conversion program—CICS TS for z/OS, Version 2.2 and later, version:

```

*   MODULE NAME = DFHUCNV
*
*   DESCRIPTIVE NAME = C.I.C.S./.....
**       CICS TS for Windows USER CONVERSION SAMPLE PROGRAM
**
*
*   TRANSACTION NAME = Cxxx
**       NOT A TRANSACTION
*
*   STATUS =n.n.n
*
*   FUNCTION =
*       THIS IS A SAMPLE PROGRAM FOR USER DATA CONVERSION
*       IT IS INVOKED AS A RESULT OF A FUNCTION
*       SHIPPED REQUEST OR RESPONSE VIA THE LU2 REMOTE SERVER
*       OR LU6.2 HOST MIRROR PROGRAM. IT IS ACTUALLY CICS
*       LINKED FROM DFHCCNV TO ALLOW A USER PROGRAM TO
*       CONVERT DATA OF TYPE USERDATA AS DEFINED IN THE
*       CICS TS for Windows CONVERSION MACROS (DFHCCNV).
*
*       THIS PROGRAM IS CALLED FOR EACH EXEC CICS REQUEST/RESPONSE
*       FOR WHICH DATA EXISTS FOR CONVERSION FROM ASCII TO EBCDIC.
*       IF A REQUEST DOES NOT CONTAIN ANY SUCH DATA, THIS PROGRAM
*       IS NOT INVOKED. THE PROGRAM IS INVOKED BEFORE THE CICS
*       CONVERSION PROGRAM (DFHCCNV) ATTEMPTS ANY CONVERSION
*       INBOUND FROM CICS TS for Windows (ASCII TO EBCDIC) OR
*       OUTBOUND FROM CICS TS for Windows (EBCDIC TO ASCII).
*
*       A COMMAREA IS PASSED WITHIN WHICH IS A SERIES OF POINTERS
*       TO INFORMATION THAT CAN BE USED BY THE PROGRAM TO
*       DETERMINE HOW TO CONVERT ANY RELEVANT DATA. THIS PROGRAM
*       SHOULD ONLY CONVERT DATA OF TYPE USERDATA AS INDICATED IN
*       THE CONVERSION TEMPLATES. ANY DATA OF TYPE CHARACTER
*       WILL BE CONVERTED BY THE CICS CONVERSION MODULE DFHCCNV.
*
*       SEE A LATER DESCRIPTION FOR WHAT THE SAMPLE DOES
*

```

*Figure 28. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 1 of 6). **This is the CICS TS for z/OS, Version 2.2 and later, version.***

user-replaceable conversion program

```
* NOTES :
*   DEPENDENCIES = S/370
*       IN A CICS MVS/XA ENVIRONMENT, THIS PROGRAM SHOULD BE
*       LINKED WITH RMODE(ANY) AND RMODE(31). ALL ADDRESSES SHOULD
*       BE TREATED AS 31 BIT.
*   RESTRICTIONS =
*       NONE
*   REGISTER CONVENTIONS =
*       STANDARD EXEC
*   PATCH LABEL = Via DFHPATCH macro
*   MODULE TYPE = EXECUTABLE
*   PROCESSOR = ASSEMBLER
*   ATTRIBUTES = READ ONLY, SERIALY REUSABLE
*
*   ENTRY POINT = DFHUCNV
*
*   PURPOSE =
*       THIS IS THE ONLY ENTRY POINT FOR ALL FUNCTIONS
*
*   LINKAGE =
*       EXEC CICS LINK FROM DFHCCNV IS THE ONLY WAY THIS PROGRAM
*       IS INVOKED
*
*   INPUT =
*       THE PARAMETERS ARE PASSED USING A COMMAREA AND THE
*       DSECT DFHUNVDS DESCRIBES THE STRUCTURE OF THESE PARAMETERS
*       THIS DSECT IS INCLUDED IN THIS PROGRAM BY ISSUING THE
*       DFHCNV TYPE=DSECT MACRO CALL.
*
*   OUTPUT =
*       NO SPECIFIC PARAMETERS ARE RETURNED, AS THE PURPOSE OF
*       THIS PROGRAM IS PERFORM CONVERSION ON USER DATA.
*
*   EXIT-NORMAL =
*       NORMAL RETURN IS VIA AN EXEC CICS RETURN
*
*   EXIT-ERROR =
**      SAME AS EXIT NORMAL
*
*-----*
*
*   EXTERNAL REFERENCES =
*       NONE
*
*   ROUTINES =
*       NONE
*
*   DATA AREAS =
*       NONE
*
```

Figure 28. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 2 of 6). This is the CICS TS for z/OS, Version 2.2 and later, version.

user-replaceable conversion program

```
* CONTROL BLOCKS =
*   THE 2 MAIN CONTROL BLOCKS REFERENCED ARE
*   DFHUNVDS
*   DESCRIBES THE PARAMETER LIST PASSED IN THE COMMAREA FROM
*   DFHCCNV. IT IS BASICALLY CONSISTS OF A LIST OF POINTERS
*   TO INFORMATION OF INTEREST TO THIS USER PROGRAM. THE FIRST
*   PART OF THE LIST IS FIXED, AND THE SECOND PART CONSISTS
*   OF OVERLAYS DEPENDING ON THE RESOURCE TYPE IN QUESTION.
*   DFHCNVDS
*   DESCRIBES THE STRUCTURE OF INDIVIDUAL FIELDS IN THE
*   PASSED TEMPLATE.
*
* GLOBAL VARIABLES =
*   NONE
*
* TABLES =
*   DATA FROM THE DFHCNV TABLE IS USED BUT THE NECESSARY
*   ADDRESSES ARE OBTAINED BY DFHCCNV AND PASSED IN THE
*   COMMAREA
*
* MACROS =
*   NONE
*
*-----*
*
* DESCRIPTION
*   WHAT THIS SAMPLE DOES
*
*   DFHUCNV EXECUTES AS AN EXEC CICS PROGRAM.
*   DFHUCNV IS CALLED FOR ALL EXEC CICS REQUESTS/RESPONSES THAT
*   HAVE RESULTED FROM A CICS TS for Windows FUNCTION SHIP REQUEST
*   AND MAY REQUIRE CONVERSION OF USER DATA FROM ASCII TO EBCDIC
*   OR VICE VERSA. THE FIRST THING THAT THE SAMPLE DOES IS TO
*   OBTAIN ADDRESSABILITY TO THE PASSED COMMAREA, AND THEN
*   CHECK THAT THE REQUEST IS A TEMPORARY STORAGE (TS) REQUEST.
*   IF NOT WE JUST RETURN.
*   NEXT WE CHECK IF DFHCCNV MANAGED TO LOCATE A CONVERSION
*   TEMPLATE FOR THE RESOURCE (TS QUEUE) WITH THIS NAME.
*   IF ONE WAS NOT FOUND (UNVDTMP IS ZERO) THIS MEANS THAT
*   NO CONVERSION INFORMATION WAS PROVIDED (USING DFHCNV MACROS)
*   FOR THIS RESOURCE. IN THIS CASE WE WILL NEVER BE ABLE TO
*   LOCATE ANY USERDATA FIELDS, SO WE JUST RETURN.
*   ASSUMING WE DID HAVE A TEMPLATE, WE NOW SCAN DOWN THE
*   TEMPLATE USING THE SUPPLIED TEMPLATE PTR AND LENGTH. THE
*   MAPPING OF THIS IS PROVIDED BY DFHCNVDS WHICH GIVES
*   THE STRUCTURE OF THE CONSTITUENT FIELDS.
*   EACH FIELD IS EXAMINED, AND WHEN ONE OF TYPE USERDATA
*   IS FOUND WE DO SOME FURTHER CHECKS AS FOLLOWS.
*
```

*Figure 28. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 3 of 6). **This is the CICS TS for z/OS, Version 2.2 and later, version.***

user-replaceable conversion program

```
*      IT IS POSSIBLE THAT THE CONVERSION TEMPLATE HAS
*      DEFINITIONS FOR OFFSETS (AND OFFSETS PLUS LENGTHS) THAT ARE
*      GREATER THAN THE ACTUAL DATA ON THE EXEC REQUEST/RESPONSE.
*      OBVIOUSLY IT IS VERY IMPORTANT TO DETERMINE THE LESSER OF
*      THE ACTUAL DATA AND THE PARTICULAR TEMPLATE FIELD DEFINITION
*      TO ENSURE WE DO NOT PERFORM CONVERSION OFF THE END OF THE
*      REAL DATA. ONCE THESE CHECKS ARE DONE THE USERDATA FIELD
*      CAN BE TRANSLATED AS APPROPRIATE. PURELY AS AN EXAMPLE,
*      THE SAMPLE PROGRAM CONVERTS THE USERDATA FIELDS AS CHARACTER,
*      BUT IN A REAL PROGRAM, YOU WOULD PERFORM YOUR OWN SPECIAL
*      TESTING AND CONVERSION AT THIS POINT.
*      THIS LAST STEP IS REPEATED FOR EACH FIELD IN THE TEMPLATE
*      OF TYPE USERDATA, UNTIL THE END OF THE TEMPLATE IS FOUND,
*      AT WHICH TIME A RETURN IS MADE TO THE CALLER (DFHCCNV).
*
*      WHEN WRITING A VERSION OF THIS PROGRAM TO EXECUTE IN A
*      CICS MVS/XA ENVIRONMENT, YOU MUST BE PREPARED TO HANDLE
*      ALL ADDRESSES AS POSSIBLY 31 BIT, AS DFHCCNV AND THE
*      DFHCNV TABLE (CONTAINING THE TEMPLATES) WILL BE LOADED
*      ABOVE THE 16M LINE.
*
*      CAVEAT
*
*      FULLWORD VALUES ARE NOW PASSED IN THE FOLLOWING
*      FIELDS:
*
*          CNVDATAL
*          CNVDATAO
*
*          UNVFCLNP
*          UNVFCKLP
*          UNVICLNP
*          UNVPCLNP
*          UNVTDLNP
*          UNVTSLNP
*
*****
```

*Figure 28. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 4 of 6). **This is the CICS TS for z/OS, Version 2.2 and later, version.***

user-replaceable conversion program

```

DFHUCNV DFHCNV TYPE=DSECT
CSECT
B IDBYP
DFHVM UCNV,ENTRY=DFHUCNV,RMODE=ANY
IDBYP DS 0H
DFHREGS ,
OC EIBCALEN,EIBCALEN ANY COMMAREA ?
BZ RETURN NO, JUST RETURN
L R2,DFHEICAP
USING DFHUNVDS,R2 ADDRESSABILITY TO COMMAREA
L R10,UNVRSTP ADDRESS THE RESOURCE TYPE
CLI 0(R10),CNVTS IS IT A TEMPORARY STORAGE TYPE
BNE RETURN NO, JUST RETURN
ICM R10,B'1111',UNVDTMP IS THERE A CONVERSION TEMPLATE ?
BZ RETURN NO, JUST RETURN
USING DFHCNVDS,R10 ADDRESSABILITY TO CONVERSION RECS
L R4,UNVDLNP
L R5,0(0,R4) GET TOTAL TEMPLATE LENGTH
AR R5,R10 END OF TEMPLATE
PROCESS DS 0H
CR R10,R5 HAVE WE REACHED THE END OF TEMPL
BNL RETURN YES
CLI CNVRTYPE,CNVTFLD DOUBLE CHECK ITS A FIELD TYPE REC
BNE RETURN NO, BETTER RETURN
CLI CNVDATTY,DTUSRMIN IN THE USER RANGE ?
BL NEXTREC NO, TOO LOW
CLI CNVDATTY,DTUSRMAX IN THE USER RANGE ?
BH NEXTREC NO, TOO HIGH
L R4,UNVDIRP CHECK THE TYPE OF CONVERSION
CLI 0(R4),CNVRQATE ASCII TO EBCDIC REQUEST
BNE TRYEBC NO...
L R6,UNVATEP YES, ADDRESS THE RELEVANT TABLE
B CONT1
TRYEBC DS 0H MUST BE EBCDIC TO ASCII
L R6,UNVETAP ADDRESS THE RELEVANT TABLE
CONT1 DS 0H
*
* GET LOWER VALUE OF ACTUAL LENGTH AND POTENTIAL LENGTH
* INTO R4
L R4,UNVTSLNP
L R4,0(0,R4) PICK UP ACTUAL TS DATA LENGTH
LTR R4,R4 JUST CHECK ITS POSITIVE
BNP RETURN IF NOT RETURN
L R7,CNVDATAO GET THE OFFSET FROM THE TEMPLATE
CR R7,R4 IS THE OFFSET PAST THE DATA
BNL NEXTREC YES, TRY THE NEXT RECORD
A R7,CNVDATAL ADD IN THE LENGTH(TEMPLATE)
CR R7,R4 COMPARE OFFSET+LEN WITH REAL DATA
BH LENOK
LR R4,R7
LENOK DS 0H

```

Figure 28. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 5 of 6). **This is the CICS TS for z/OS, Version 2.2 and later, version.**

user-replaceable conversion program

```
*          HERE R4 SHOULD BE THE SMALLER OF THE 2 LENGTHS
*          NOW CALCULATE THE REAL LENGTH FOR CONVERSION
S          R4,CNVDATAO          SUBTRACT THE OFFSET
L          R7,UNVTSDP          ADDRESS ACTUAL DATA
A          R7,CNVDATAO          ....PLUS OFFSET

*
* R7 POINTS AT THE START OF WHERE WE TRANSLATE AND R4
* INDICATES THE LENGTH (ENSURING WE DONT GO FURTHER THAN THE
* ACTUAL DATA)
*
TRANSMOR DS    0H
          CH    R4,=H'256'          AT LEAST 256 BYTES TO DO
          BL    TRREST              NO
          TR    0(256,R7),0(R6)     TRANSLATE 256 BYTES
          SH    R4,=H'256'          DECREMENT THE COUNT
          AH    R7,=H'256'          INCREMENT THE POINTER
          B     TRASMOR              DO SOME MORE
TRREST   DS    0H
          LTR   R4,R4                ANY LEFT TO DO ?
          BNP   DONETR              NO
          SH    R4,=H'1'            DECREMENT THE COUNTER FOR THE TR
          EX    R4,TRNSLT
          B     DONETR
TRNSLT   TR    0(0,R7),0(R6)
DONETR   DS    0H                  ALL DATA TRANSLATED
NEXTREC  DS    0H
          SR    R4,R4
          IC    R4,CNVRLLEN         GET LENGTH OF THIS RECORD
          AR    R10,R4              AND ADDRESS THE NEXT ONE
          B     PROCESS
RETURN   DS    0H
          EXEC  CICS RETURN
          END   DFHUCNV
```

Figure 28. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 6 of 6). **This is the CICS TS for z/OS, Version 2.2 and later, version.**

User-replaceable conversion program—non-CICS TS for z/OS, Version 2.2 and later, version:

```

*   MODULE NAME = DFHUCNV
*   DESCRIPTIVE NAME = C.I.C.S./.....
**       CICS TS for Windows USER CONVERSION SAMPLE PROGRAM
*
*   TRANSACTION NAME = Cxxx
**       NOT A TRANSACTION
*
*           5665-403
*
*   STATUS = n.n.n
*
*   FUNCTION =
*       THIS IS A SAMPLE PROGRAM FOR USER DATA CONVERSION
*       IT IS INVOKED AS A RESULT OF A FUNCTION
*       SHIPPED REQUEST OR RESPONSE VIA THE LU2 REMOTE SERVER
*       OR LU6.2 HOST MIRROR PROGRAM. IT IS ACTUALLY CICS
*       LINKED FROM DFHCCNV TO ALLOW A USER PROGRAM TO
*       CONVERT DATA OF TYPE USERDATA AS DEFINED IN THE
*       CICS TS for Windows CONVERSION MACROS (DFHCCNV).
*
*       THIS PROGRAM IS CALLED FOR EACH EXEC CICS REQUEST/RESPONSE
*       FOR WHICH DATA EXISTS FOR CONVERSION FROM ASCII TO EBCDIC.
*       IF A REQUEST DOES NOT CONTAIN ANY SUCH DATA, THIS PROGRAM
*       IS NOT INVOKED. THE PROGRAM IS INVOKED BEFORE THE CICS
*       CONVERSION PROGRAM (DFHCCNV) ATTEMPTS ANY CONVERSION
*       INBOUND FROM CICS TS for Windows (ASCII TO EBCDIC) OR
*       OUTBOUND FROM CICS TS for Windows (EBCDIC TO ASCII).
*
*       A COMMAREA IS PASSED WITHIN WHICH IS A SERIES OF POINTERS
*       TO INFORMATION THAT CAN BE USED BY THE PROGRAM TO
*       DETERMINE HOW TO CONVERT ANY RELEVANT DATA. THIS PROGRAM
*       SHOULD ONLY CONVERT DATA OF TYPE USERDATA AS INDICATED IN
*       THE CONVERSION TEMPLATES. ANY DATA OF TYPE CHARACTER
*       WILL BE CONVERTED BY THE CICS CONVERSION MODULE DFHCCNV.
*
*       SEE A LATER DESCRIPTION FOR WHAT THE SAMPLE DOES
*
*

```

*Figure 29. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 1 of 6). **This is the version for all CICS on System/390 products other than CICS TS for z/OS, Version 2.2 and later.***

user-replaceable conversion program

```
* NOTES :
*   DEPENDENCIES = S/370
*       IN A CICS MVS/XA ENVIRONMENT, THIS PROGRAM SHOULD BE
*       LINKED WITH RMODE(ANY) AND RMODE(31). ALL ADDRESSES SHOULD
*       BE TREATED AS 31 BIT.
*   RESTRICTIONS =
*       NONE
*   REGISTER CONVENTIONS =
*       STANDARD EXEC
*   PATCH LABEL = Via DFHPATCH Macro
*   MODULE TYPE = EXECUTABLE
*   PROCESSOR = ASSEMBLER
*   ATTRIBUTES = READ ONLY, SERIALY REUSABLE
*   ENTRY POINT = DFHUCNV
*
*   PURPOSE =
*       THIS IS THE ONLY ENTRY POINT FOR ALL FUNCTIONS
*
*   LINKAGE =
*       EXEC CICS LINK FROM DFHCCNV IS THE ONLY WAY THIS PROGRAM
*       IS INVOKED
*
*   INPUT =
*       THE PARAMETERS ARE PASSED USING A COMMAREA AND THE
*       DSECT DFHUNVDS DESCRIBES THE STRUCTURE OF THESE PARAMETERS
*       THIS DSECT IS INCLUDED IN THIS PROGRAM BY ISSUING THE
*       DFHUCNV TYPE=DSECT MACRO CALL.
*
*   OUTPUT =
*       NO SPECIFIC PARAMETERS ARE RETURNED, AS THE PURPOSE OF
*       THIS PROGRAM IS PERFORM CONVERSION ON USER DATA.
*
*   EXIT-NORMAL =
*       NORMAL RETURN IS VIA AN EXEC CICS RETURN
*
*   EXIT-ERROR =
**      SAME AS EXIT NORMAL
*
*-----*
*
*   EXTERNAL REFERENCES =
*       NONE
*
*   ROUTINES =
*       NONE
*
*   DATA AREAS =
*       NONE
```

*Figure 29. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 2 of 6). **This is the version for all CICS on System/390 products other than CICS TS for z/OS, Version 2.2 and later.***

user-replaceable conversion program

```
* CONTROL BLOCKS =
*   THE 2 MAIN CONTROL BLOCKS REFERENCED ARE
*   DFHUNVDS
*   DESCRIBES THE PARAMETER LIST PASSED IN THE COMMAREA FROM
*   DFHCCNV. IT IS BASICALLY CONSISTS OF A LIST OF POINTERS
*   TO INFORMATION OF INTEREST TO THIS USER PROGRAM. THE FIRST
*   PART OF THE LIST IS FIXED, AND THE SECOND PART CONSISTS
*   OF OVERLAYS DEPENDING ON THE RESOURCE TYPE IN QUESTION.
*   DFHCNVDS
*   DESCRIBES THE STRUCTURE OF INDIVIDUAL FIELDS IN THE
*   PASSED TEMPLATE.
*
* GLOBAL VARIABLES =
*   NONE
*
* TABLES =
*   DATA FROM THE DFHCNV TABLE IS USED BUT THE NECESSARY
*   ADDRESSES ARE OBTAINED BY DFHCCNV AND PASSED IN THE
*   COMMAREA
*
* MACROS =
*   NONE
*
*-----*
*
* DESCRIPTION
*   WHAT THIS SAMPLE DOES
*
*   DFHUCNV EXECUTES AS AN EXEC CICS PROGRAM.
*   DFHUCNV IS CALLED FOR ALL EXEC CICS REQUESTS/RESPONSES THAT
*   HAVE RESULTED FROM A CICS TS for Windows FUNCTION SHIP REQUEST
*   AND MAY REQUIRE CONVERSION OF USER DATA FROM ASCII TO EBCDIC OR
*   VICE VERSA. THE FIRST THING THAT THE SAMPLE DOES IS TO
*   OBTAIN ADDRESSABILITY TO THE PASSED COMMAREA, AND THEN
*   CHECK THAT THE REQUEST IS A TEMPORARY STORAGE (TS) REQUEST.
*   IF NOT WE JUST RETURN.
*   NEXT WE CHECK IF DFHCCNV MANAGED TO LOCATE A CONVERSION
*   TEMPLATE FOR THE RESOURCE (TS QUEUE) WITH THIS NAME.
*   IF ONE WAS NOT FOUND (UNVDTMP IS ZERO) THIS MEANS THAT
*   NO CONVERSION INFORMATION WAS PROVIDED (USING DFHCNV MACROS)
*   FOR THIS RESOURCE. IN THIS CASE WE WILL NEVER BE ABLE TO
*   LOCATE ANY USERDATA FIELDS, SO WE JUST RETURN.
*   ASSUMING WE DID HAVE A TEMPLATE, WE NOW SCAN DOWN THE
*   TEMPLATE USING THE SUPPLIED TEMPLATE PTR AND LENGTH. THE
*   MAPPING OF THIS IS PROVIDED BY DFHCNVDS WHICH GIVES
*   THE STRUCTURE OF THE CONSTITUENT FIELDS.
*   EACH FIELD IS EXAMINED, AND WHEN ONE OF TYPE USERDATA
*   IS FOUND WE DO SOME FURTHER CHECKS AS FOLLOWS.
```

*Figure 29. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 3 of 6). **This is the version for all CICS on System/390 products other than CICS TS for z/OS, Version 2.2 and later.***

user-replaceable conversion program

```
*      IT IS POSSIBLE THAT THE CONVERSION TEMPLATE HAS
*      DEFINITIONS FOR OFFSETS (AND OFFSETS PLUS LENGTHS) THAT ARE
*      GREATER THAN THE ACTUAL DATA ON THE EXEC REQUEST/RESPONSE.
*      OBVIOUSLY IT IS VERY IMPORTANT TO DETERMINE THE LESSER OF
*      THE ACTUAL DATA AND THE PARTICULAR TEMPLATE FIELD DEFINITION
*      TO ENSURE WE DO NOT PERFORM CONVERSION OFF THE END OF THE
*      REAL DATA. ONCE THESE CHECKS ARE DONE THE USERDATA FIELD
*      CAN BE TRANSLATED AS APPROPRIATE. PURELY AS AN EXAMPLE,
*      THE SAMPLE PROGRAM CONVERTS THE USERDATA FIELDS AS
*      CHARACTER, BUT IN A REAL PROGRAM, YOU WOULD PERFORM YOUR
*      OWN SPECIAL TESTING AND CONVERSION AT THIS POINT.
*      THIS LAST STEP IS REPEATED FOR EACH FIELD IN THE TEMPLATE
*      OF TYPE USERDATA, UNTIL THE END OF THE TEMPLATE IS FOUND,
*      AT WHICH TIME A RETURN IS MADE TO THE CALLER (DFHCCNV).
*
*      WHEN WRITING A VERSION OF THIS PROGRAM TO EXECUTE IN A
*      CICS MVS/XA ENVIRONMENT, YOU MUST BE PREPARED TO HANDLE
*      ALL ADDRESSES AS POSSIBLY 31 BIT, AS DFHCCNV AND THE
*      DFHCVN TABLE (CONTAINING THE TEMPLATES) WILL BE LOADED
*      ABOVE THE 16M LINE.
*
*-----*
*
* CHANGE ACTIVITY :
**
*      $MOD(DFHUCNV),COMP(ISC),PROD(CICS/MVS)
*
*      PN= REASON REL YYMMDD HDXIII : REMARKS
*      P0= REASON REL YYMMDD HDXIII : Implicit flag.
*      $01 Reserved for APAR fix
*      $02 Reserved for APAR fix
*      $03 Reserved for APAR fix
*      $D1 Reserved for DCR
*      $D2 Reserved for DCR
*      $D3 Reserved for DCR
*      $H1 Reserved for hardware support
*      $H2 Reserved for hardware support
*      $H3 Reserved for hardware support
*      $L0      210 880722 HD1HSS : CREATE DFHUCNV
*      $L1 Reserved for line item
*      $L2 Reserved for line item
*      $L3 Reserved for line item
*      $P1 Reserved for PTM
*      $P2 Reserved for PTM
*      $P3 Reserved for PTM
*
*****
```

*Figure 29. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 4 of 6). **This is the version for all CICS on System/390 products other than CICS TS for z/OS, Version 2.2 and later.***

user-replaceable conversion program

```

DFHUCNV DFHCNV TYPE=DSECT
CSECT
B IDBYP
DFHVM UCNV,ENTRY=DFHUCNV
IDBYP DS 0H
DFHREGS ,
OC EIBCALEN,EIBCALEN ANY COMMAREA ?
BZ RETURN NO, JUST RETURN
L R2,DFHEICAP
USING DFHUNVDS,R2 ADDRESSABILITY TO COMMAREA
L R10,UNVRSTP ADDRESS THE RESOURCE TYPE
CLI 0(R10),CNVTS IS IT A TEMPORARY STORAGE TYPE?
BNE RETURN NO, JUST RETURN
ICM R10,B'1111',UNVDTMP IS THERE A CONVERSION TEMPLATE ?
BZ RETURN NO, JUST RETURN
USING DFHCNVDS,R10 ADDRESSABILITY TO CONVERSION RECS
L R4,UNVDLNP
SR R5,R5
LH R5,0(0,R4) GET TOTAL TEMPLATE LENGTH
AR R5,R10 END OF TEMPLATE
PROCESS DS 0H
CR R10,R5 HAVE WE REACHED END OF TEMPLATE?
BNL RETURN YES
CLI CNVRTYPE,CNVTFD DOUBLE CHECK ITS A FIELD TYPE REC
BNE RETURN NO, BETTER RETURN
CLI CNVDATTY,DTUSRMIN IN THE USER RANGE ?
BL NEXTREC NO, TOO LOW
CLI CNVDATTY,DTUSRMAX IN THE USER RANGE ?
BH NEXTREC NO, TOO HIGH
L R4,UNVDIRP CHECK THE TYPE OF CONVERSION
CLI 0(R4),CNVRQATE ASCII TO EBCDIC REQUEST
BNE TRYEBC NO...
L R6,UNVATEP YES, ADDRESS THE RELEVANT TABLE
B CONT1
TRYEBC DS 0H MUST BE EBCDIC TO ASCII
L R6,UNVETAP ADDRESS THE RELEVANT TABLE
CONT1 DS 0H
*
```

*Figure 29. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 5 of 6). **This is the version for all CICS on System/390 products other than CICS TS for z/OS, Version 2.2 and later.***

user-replaceable conversion program

```

*      GET LOWER VALUE OF ACTUAL LENGTH AND POTENTIAL LENGTH
*      INTO R4
L      R4,UNVTSLNP
LH     R4,0(0,R4)           PICK UP ACTUAL TS DATA LENGTH
LTR    R4,R4               JUST CHECK ITS POSITIVE
BNP    RETURN              IF NOT RETURN
LH     R7,CNVDATAO         GET THE OFFSET FROM THE TEMPLATE
CR     R7,R4               IS THE OFFSET PAST THE DATA
BNL    NEXTREC            YES, TRY THE NEXT RECORD
AH     R7,CNVDATAL         ADD IN THE LENGTH(TEMPLATE)
CR     R7,R4               COMPARE OFFSET+LEN WITH REAL DATA
BH     LENOK
LR     R4,R7
LENOK  DS      0H
*      HERE R4 SHOULD BE THE SMALLER OF THE 2 LENGTHS
*      NOW CALCULATE THE REAL LENGTH FOR CONVERSION
SH     R4,CNVDATAO         SUBTRACT THE OFFSET
L      R7,UNVTSDP          ADDRESS ACTUAL DATA
AH     R7,CNVDATAO         ....PLUS OFFSET
*
*      R7 POINTS AT THE START OF WHERE WE TRANSLATE AND R4
*      INDICATES THE LENGTH (ENSURING WE DON'T GO FURTHER THAN THE
*      ACTUAL DATA)
TRANSMOR DS      0H
CH     R4,=H'256'          AT LEAST 256 BYTES TO DO
BL     TRREST              NO
TR     0(256,R7),0(R6)     TRANSLATE 256 BYTES
SH     R4,=H'256'          DECREMENT THE COUNT
AH     R7,=H'256'          INCREMENT THE POINTER
B      TRANSMOR            DO SOME MORE
TRREST DS      0H
LTR    R4,R4               ANY LEFT TO DO ?
BNP    DONETR              NO
SH     R4,=H'1'            DECREMENT THE COUNTER FOR THE TR
EX     R4,TRNSLT
B      DONETR
TRNSLT TR     0(0,R7),0(R6)
DONETR DS      0H          ALL DATA TRANSLATED
NEXTREC DS      0H
SR     R4,R4
IC     R4,CNVRLLEN         GET LENGTH OF THIS RECORD
AR     R10,R4              AND ADDRESS THE NEXT ONE
B      PROCESS
RETURN DS      0H
EXEC   CICS RETURN
DFHPATCH
END    DFHUCNV

```

Figure 29. DFHUCNV, user-replaceable conversion program for CICS on System/390—CICS Transaction Server for Windows link (Part 6 of 6). **This is the version for all CICS on System/390 products other than CICS TS for z/OS, Version 2.2 and later.**

Study the supplied version of DFHUCNV and its introductory comments. This will enable you to write your own conversion program. If you are running in an XA environment, your program must be able to handle 31-bit addresses.

Part 2. Server Support for CICS Clients

This part of the book describes how to set up a CICS on System/390 system to act as a server to the CICS Universal Client, the CICS Client elements of the CICS Transaction Gateway products, and the CICS Transaction Gateway client daemons (hereafter all jointly referred to as *CICS Clients*).

Important

- This part of the book describes the support for CICS Clients provided by:
 - CICS Transaction Server for z/OS
 - CICS Transaction Server for OS/390
 - CICS Transaction Server for VSE/ESA

The support for Clients provided by these products is identical, *except that*:

- In CICS Transaction Server for VSE/ESA, the autoinstall user program is not called for autoinstall of Client virtual terminals.
- CICS Transaction Server for VSE/ESA does not support:
 - The Resource Access Control Facility (RACF)
 - TCP/IP connections to Clients.
- Because of platform-specific variations, CICS/VSE Version 2.3's support for Clients is described in a separate manual—*CICS/VSE 2.3 Server Support for CICS Clients*, SC33-1712.

This part of the book contains the following topics:

- Chapter 7, "Introduction to CICS Clients," on page 105
- Chapter 8, "Installing server support for Clients," on page 111
- Chapter 9, "Data conversion for Clients," on page 127
- Chapter 10, "Application programming for Clients," on page 135
- Chapter 11, "Problem determination for Clients," on page 139
- Chapter 12, "Recovery after a restart of CICS," on page 141
- Chapter 13, "Restrictions on Client support," on page 143
- Chapter 14, "Migration considerations," on page 145

Chapter 7. Introduction to CICS Clients

CICS Clients are a family of workstation products that provide a standard set of functions for **client/server** computing.

What is a CICS Client?

Terminology

In this book, we use the term *CICS Clients* to mean all of the following:

- The CICS Universal Client, which runs on:
 - AIX Version 5.3
 - Linux® on Intel®, which comprises:
 - Red Hat Enterprise Linux Version 4 with kernel 2.6 and glibc 2.3.2
 - Novell LINUX Desktop 9
 - SUSE LINUX Desktop Version 1 with kernel 2.4 and glibc 2.3.2
 - SUSE LINUX Enterprise Server 9
 - Linux on POWER®, which comprises:
 - Red Hat Enterprise Linux Version 4 with kernel 2.6 and glibc 2.3.2
 - SUSE LINUX Enterprise Server Version 9 with 64-bit kernel 2.6 and glibc 2.3.2
 - Microsoft® Windows 2000 Professional with service pack 4
 - Microsoft Windows XP Professional with service pack 1
- The CICS Client elements of the CICS Transaction Gateway products (which are available on all the platforms listed below)
- The client daemons of the CICS Transaction Gateway products

A CICS Client is not a full-function CICS system, but contains code to enable it to access the services of CICS systems. (*Services* mean things like transactions and programs.) CICS systems to which Clients are connected are known as CICS servers.

Each CICS Client is designed to run on a particular operating system. Each can attach to a common range of CICS systems, using a variety of protocols. CICS Clients thus allow users to access resources owned by CICS server-systems, from a variety of operating environments.

There is a CICS Client for each of the following operating systems:

- AIX
- Microsoft Windows 2000
- Microsoft Windows XP
- Solaris
- HP-UX
- Linux 390

Each Client can attach to any or all of the following CICS servers:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA
- CICS/VSE Version 2.3
- CICS/400
- CICS Transaction Server for Windows
- CICS on Open Systems

What functions do CICS Clients provide?

CICS Clients provide a standard set of functions for client/server computing. This section gives an overview of the most important functions; it is not meant to be exhaustive.

The External Call Interface

The External Call Interface (ECI) is an application programming interface (API) that allows a non-CICS program running on a Client to call a CICS program located on a CICS server. This enables the Client to make use of existing server routines that could be used, for example, to make enquiries on a database.

The Client program can make the following types of call to a CICS server:

- Program-link calls, which can be **synchronous** (that is, the calling program waits for a response from the linked-to program), or **asynchronous** (that is, the two programs continue to execute independently).
- Calls to retrieve a response from a previous asynchronous call.
- Calls that return a value indicating the status of the CICS system. This allows an application to test for availability of the CICS server or to monitor it by waiting for a change in its status.

Dynamic routing of ECI calls

CICS Transaction Server for z/OS and CICS Transaction Server for OS/390 Release 3 allow you to route ECI calls dynamically. In these products, if a program defined as DYNAMIC is the subject of an ECI program-link call from a CICS Client, the dynamic routing program is invoked, and can select a remote region on which the server program is to execute.

This means that CICS Clients can benefit from the workload balancing capabilities of CICS TS for OS/390 Release 3 and later.

For definitive information about how to route program-link requests dynamically, see your *Intercommunication Guide*.

The External Presentation Interface

The External Presentation Interface (EPI) is an API that allows a non-CICS Client program to appear to a CICS server as one or more standard 3270 terminals. This enables the Client to access, for example, CICS on System/390 transactions written for 3270 terminals, without needing to change the System/390 code.

The Client program can start CICS transactions and send and receive standard 3270 datastreams to and from the transactions. It can present the 3270 data to the user by emulating a 3270 terminal, or by means of a graphical user interface such as Windows (Windows Clients).

The EPI consists of a set of calls that can be made from a Client program.

Depending on the Client version and platform, the Client program can be written in any of a number of languages, including:

- C
- C++
- COBOL
- Java™
- Visual Basic (on Windows client).

The EPI calls are provided in a library that is linked to the application. Among the functions available are calls to:

- Initialize the EPI.
- Terminate the EPI.
- Obtain a list of CICS servers to which a virtual terminal may attach.
- Attach a virtual terminal.
- Detach a virtual terminal.
- Start a transaction for a virtual terminal.
- Send data from a virtual terminal to a transaction.
- Obtain details of an “event” that has occurred for a virtual terminal. An example of an event is when the transaction is expecting a reply from the virtual terminal.
- Obtain detailed error information for the last error that occurred for a virtual terminal.

The External Security interface

The External Security Interface (ESI) is an API that allows a non-CICS Client program to verify and change the passwords used by Clients to connect to a CICS server.

Terminal emulation

CICS Clients can run 3270 terminal emulators. A Client terminal emulator transmits or receives standard CICS transaction routing flows to or from a CICS server. This allows a user to interact with the server, and run transactions, as if the Client were a locally-attached 3270 terminal.

It is possible to run multiple terminal emulators on a single Client. The emulators can be connected to the same CICS server, or to different servers. In the former case, each instance of the emulator requires a unique name and represents a separate terminal to the server.

Users can customize the colors and keyboard mapping of their emulators.

What protocols are supported?

Any CICS Client can use the LU 6.2 (APPC) communication protocol to communicate with any CICS on System/390 server. Some CICS Client–CICS on System/390 combinations support the use of the Transport Control Protocol/Internet Protocol (TCP/IP). Support for TCP/IP is described in “TCP/IP support” on page 108.

APPC

CICS on System/390-CICS Client applications can use the APPC communication protocol. Single- or parallel-session connections can be used.

On CICS on System/390 systems, you can use autoinstall to define APPC connections to Clients dynamically, on their first use. You can autoinstall both single-session and parallel-session APPC connections. Alternatively, you can use the RDO CEDA DEFINE and INSTALL commands to define static connections to Clients.

APPC links to CICS Clients support data synchronization levels (sync levels) 0 and 1.

TCP/IP support

Client–CICS on System/390 TCP/IP communication is supported in two ways:

1. Via TCP62 and AnyNet®
2. Natively, via ECI over TCP/IP.

Using TCP62 and AnyNet

Important

This section applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390

This method requires IBM TCP62 support to be installed on the Client workstation. TCP62 is a protocol mapper that enables partner APPC applications to communicate using TCP/IP. It extracts SNA definitions from the Client and uses them when communicating with CICS. The AnyNet feature of VTAM is also required.

The System/390 servers supported are:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390

The Clients supported are those for:

- Microsoft Windows NT
- Microsoft Windows 2000
- Microsoft Windows XP

Both the ECI and the EPI are supported.

For information about how to use TCP62 and AnyNet to set up a TCP/IP connection to a CICS Client, see “Using TCP62 and AnyNet” on page 112.

Using ECI over TCP/IP

Important

This section applies only to CICS Transaction Server for z/OS, Version 2 Release 2 and later.

This method allows Clients to use TCP/IP directly to CICS without any intervening products such as TCP62.

The only System/390 servers supported are releases of CICS Transaction Server for z/OS from Version 2.2 onwards.

All Clients are supported.

Only the ECI (not the EPI nor the ESI) is supported.

This is the preferred method of setting up TCP/IP connections between Clients and CICS on System/390, because:

- It does not require an intervening product to perform TCP/IP-to-SNA datastream conversion.
- It simplifies the administration of large networks of Clients, because TCP/IP is easier to configure than SNA.

- It reduces the cost of administration of large networks of Clients.
- To migrate to it, existing client and server programs that communicate via APPC do not have to be rewritten.

For information about how to set up an ECI over TCP/IP connection to a CICS Client, see “Using ECI over TCP/IP” on page 114.

Benefits of Client support

CICS on System/390's support for CICS Clients has the following benefits:

- Company managers can migrate to client/server solutions quickly, in a staged manner, by:
 1. Using the Client 3270 emulator to run existing CICS on System/390 3270 applications.
 2. Using the EPI to add graphical user interface (GUI) front-ends to existing CICS on System/390 3270 applications. This should increase end-user satisfaction and productivity.
 3. Using the ECI to develop new client/server applications in which the display and processing logic is appropriately split between the client and the server.Different applications at different stages in the above migration scenario can coexist on the same client.
- The handling of code page translation between EBCDIC (used on CICS on System/390) and ASCII (used on workstations) is simplified.
- CICS on System/390's support for autoinstall of connections and virtual terminals means that systems developers can design large CICS client/server networks without being concerned about the problems of installing and maintaining definitions of all the clients in all the servers; or of installing and maintaining definitions of all the different virtual 3270 terminals in all the clients.

It also means that system administrators do not have to extend the resource definitions of server systems when a new client is added to the network.
- Users of CICS on System/390 3270 applications benefit from the improved end-user interfaces available to intelligent workstations.

Further information about Clients

For programming information about the Client ECI and EPI APIs, see the *CICS Transaction Gateway: Programming Guide*, SC34-6141, and the *CICS Transaction Gateway: Programming Reference*, SC34-6140. The remainder of this document deals with setting up and administering the CICS on System/390 side of the Client-server link.

Chapter 8. Installing server support for Clients

Important

This chapter applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA

It is intended to be read in conjunction with the *Resource Definition Guide* for your CICS on System/390 system, and with Chapter 3, “Resource definition for communication with non-System/390 systems,” on page 17.

The following is a checklist of the things you must do to install CICS on System/390 support for CICS Clients:

- #
- #
- #
- #
- Install the supplied resource definition groups, DFHCLNT and DFHIPECI—see “Installing the DFHCLNT and DFHIPECI resource groups”
- Define the CSCC and CIEO transient data queues—see “Defining the CSCC and CIEO transient data queues”
- Install connections to the Clients—see “Installing connections to Clients” on page 112
- Install some Client virtual terminals—see “Installing Client virtual terminals” on page 116
- Specify the level of security to be used for Client-CICS on System/390 links—see “Setting up security” on page 124
- Specify the code pages to be used for data conversion—see Chapter 9, “Data conversion for Clients,” on page 127.

Installing the DFHCLNT and DFHIPECI resource groups

For general Client support, you must install the CICS-supplied resource definition group, DFHCLNT, which includes definitions of the CICS on System/390 internal transactions, CCIN and CTIN, and of the programs they use. CCIN allows Clients to pass information to the server, such as the client code page to be used for data conversion between ASCII and EBCDIC. CTIN is required to install remote definitions of Client virtual terminals.

If you want to use ECI over TCP/IP, you must install the DFHIPECI CICS-supplied resource definition group, which includes definitions of the internal CICS transaction, CIEP, and CIEP’s associated program, DFHIPEP.

The DFHIPECI resource group is included in the default CICS startup group list, DFHLIST.

Defining the CSCC and CIEO transient data queues

Messages relating to APPC-connected Clients are written to the CSCC transient data queue. If you use APPC-connected Clients, you must define CSCC to CICS. There is a sample definition in the supplied resource definition group, DFHDCTG. The sample defines CSCC as an indirect extrapartition destination, pointing to CSSL.

Installation of Client support

Messages relating to Clients connected to CICS by native TCP/IP are written to the CIEO transient data queue. If your Clients use ECI over TCP/IP (see “Using ECI over TCP/IP” on page 108), you must define CIEO to CICS. There is a sample definition in the DFHDCTG resource group. The sample defines CIEO as an indirect extrapartition destination, pointing to CSSL.

```
# The DFHDCTG resource definition group is included in the default CICS startup
# group list, DFHLIST.
```

For further information about transient data queues, see your CICS on System/390 *Resource Definition Guide*.

Installing connections to Clients

Unless you are using ECI over TCP/IP exclusively (see “Using ECI over TCP/IP” on page 108), you must install APPC connections to the Clients. The connections can be single- or parallel-session links.

Static APPC definitions

You can use CEDA DEFINE and INSTALL commands to create static definitions.

For information about defining APPC connections to non-System/390 systems, see Chapter 3, “Resource definition for communication with non-System/390 systems,” on page 17.

Autoinstalled APPC connections

The preferred method of installing APPC connections to Clients is to use autoinstall. If you use autoinstall, you must create some suitable CONNECTION and SESSIONS template definitions, if these do not already exist.

For information about autoinstall and defining templates, see your CICS on System/390 *Resource Definition Guide*. For information about customizing your autoinstall user program to handle APPC connections, see your CICS on System/390 *Customization Guide*.

A connection is autoinstalled on CICS on System/390 when the Client initiates communication. (This could be, for example, when the end-user issues a `cicscli /s=servername` command to connect to the CICS on System/390 server, a `cicsterm /s=servername` command to start a 3270 emulator session, or when an ECI or EPI program is started on the Client.)

Using TCP/IP

TCP/IP communication between Clients and CICS on System/390 is supported in two ways:

1. Via TCP62 and AnyNet—see “Using TCP62 and AnyNet”
2. Via ECI over TCP/IP—see “Using ECI over TCP/IP” on page 114.

Using TCP62 and AnyNet

Important

This section applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390

System/390 software required: TCP/IP via TCP62 requires the AnyNet feature of VTAM. The other System/390 software you require depends on the level of VTAM you are running. Table 42 shows the acceptable software combinations.

Table 42. System/390 software required for TCP/IP via TCP62. Each row lists an acceptable software combination.

<ul style="list-style-type: none"> • VTAM Version 3 Release 4.2 • Multi-Protocol Transport Feature of VTAM Version 3 Release 4.2 • C/370™ Version 2 or later • MVS/ESA™ SP™ Version 3 Release 1.3 or later • TCP/IP Version 2 Release 2.1 or later
<ul style="list-style-type: none"> • VTAM Version 4 Release 2 • AnyNet Feature of VTAM Version 4 Release 2 • C/370 Version 2 or later • MVS/ESA SP Version 3 Release 1.3 or later • TCP/IP Version 2 Release 2.1 or later
<ul style="list-style-type: none"> • VTAM Version 4 Release 3 • AnyNet Feature of VTAM Version 4 Release 3 • Language Environment® for MVS™ Version 1 or later • MVS/ESA SP Version 3 Release 1.3 or later • TCP/IP Version 2 Release 2.1 or later
<ul style="list-style-type: none"> • VTAM Version 4 Release 4 (also shipped as part of OS/390 Release 3 and above) • AnyNet (integrated into VTAM Version 4 Release 4) • Language Environment for MVS Version 1 Release 3 or later • MVS/ESA SP Version 4 Release 3 or later • TCP/IP Version 3 Release 1 or later

Enabling TCP/IP via TCP62: Enabling CICS to communicate with a Client using TCP/IP via TCP62 requires actions on z/OS, CICS, VTAM, and the Client workstation.

On z/OS: On z/OS, you must:

1. Install a TCP major node. For example:

```

ABHTCP  VBUILD  TYPE=TCP,
          CONTIMER=25,
          DGTIMER=40,
          DNSUFFIX=HURSLEY.IBM.COM,
          EXTIMER=5,
          IATIMER=60,
          PORT=397,
          TCB=10,
          TCPIPJOB=TCPIP
ABH1GRP  GROUP  ISTATUS=ACTIVE
ABH1LINE LINE  ISTATUS=ACTIVE
ABH1PU   PU     ISTATUS=ACTIVE
    
```

This defines the AnyNet interface between TCP/IP and VTAM. For further information about how to do this, see the *Guide to SNA over TCP/IP* manual, SC31-6527.

2. Install a CDRSC major node. For example:

```

AP23ACDS VBUILD TYPE=CDRSC
TCPDGRP  GROUP
IYCNT999 CDRSC  ALSLIST=ABH1PU,MODETAB=MTCICS
    
```

This defines the remote Client device and instructs VTAM to route any session requests through the TCP/IP Physical Unit (ALSLIST).

installation of Client support

3. Check that the Physical Unit (PU) for the AnyNet interface is active. If it is in a PCON2 state, check that VTAM has a STEPLIB to:

```
DSN=PP.ADLE370.OS390R2.SCEERUN
```

#

This library should be present by default.

On CICS and VTAM: On CICS, you must:

1. Define an APPC connection to the Client workstation. (The connection can be statically defined, or autoinstalled.)
 - On the MODENAME option of the SESSIONS definition, specify the same modename as that specified in the Client INI file. (The default modename in the Client INI file is TCP62.)
 - On the MAXIMUM option of the SESSIONS definition, specify the second value as zero—that is, that CICS is to have no contention winners. For example, MAXIMUM(8,0) means that the modeset is to support eight sessions, and that CICS is to be the contention loser in each case.
2. Set the TCP/IP system initialization parameter to 'YES'.
3. Add an entry to the VTAM logon mode (LOGMODE) table for the modename specified on the SESSIONS definition. This entry specifies the class of service required for the group of sessions.

On the Client workstation: On the Client workstation, you must install TCP62 support and configure the Client initialization (INI) file.

Using ECI over TCP/IP

Important

This section applies only to CICS Transaction Server for z/OS, Version 2 Release 2 and later.

Enabling ECI over TCP/IP: Enabling ECI over TCP/IP requires actions on CICS and the Client workstation.

On CICS: On CICS, you must:

1. Create a TCPIPSERVICE definition for ECI over TCP/IP. You can use the definition in RDO group DFH\$SOT as supplied, edit it to suit your requirements, or create your own definition.

A TCPIPSERVICE for ECI over TCP/IP requires SOCKETCLOSE(NO) to be specified. The recommended method to achieve a timeout for a task initiated through ECI over TCP/IP is to specify an RTIMOUT value on the mirror transaction. The standard mirror transaction, CPMI, is defined with profile DFHCICSA, which has RTIMOUT(NO). This means that long-running mirrors will wait indefinitely for data unless you customize the RTIMOUT value for the mirror transaction.

The supplied TCPIPSERVICE definition specifies an attach-time security level of VERIFY and a TCP/IP port number of 1435. If you want some of your Clients to use LOCAL security and others to use VERIFY, you must create two TCPIPSERVICE definitions. The two definitions should have different security attributes and must listen on different ports. In each Client initialization file, specify that the Client should use the port for the appropriate security level.

2. Install your TCPIPSERVICE definitions.
3. Set the TCPIP system initialization parameter to 'YES'.

On the Client workstation: On the Client workstation, you must:

1. Edit the Client initialization file. In the initialization file, code a server section like the following example:

```
SECTION SERVER = ECICLNT
  DESCRIPTION=TCP/IP Server
  UPPERCASESECURITY=N
  USENPI=N
  PROTOCOL=TCPIP
  NETNAME=hostname.example.com
  PORT=1435
  CONNECTTIMEOUT=0
  TCPKEEPALIVE=N
ENDSECTION
```

Notes:

- a. On the PORT option, specify the number of the TCP/IP port to be used for conversations with CICS.
 - b. On the NETNAME option, specify the TCP/IP name of the CICS System/390 server—for example, winvmb.hursley.ibm.com.
2. Optionally, uninstall TCP62 support.
 3. When starting the client, use a command line input of `cicscli /s=ECICLNT`, so that the ECICLNT section of the initialization file is used when the client starts.

When setting up Clients to use ECI over TCP/IP, bear the following in mind:

- Only the ECI, not the EPI nor the ESI, is supported. You must ensure that applications that issue EPI or ESI calls are not run on an ECI over TCP/IP connection.
- The mirror transaction on CICS System/390 must not be defined as remote. It should use a profile that specifies a timeout—see “Enabling Ping support.”

Enabling Ping support: ECI over TCP/IP support includes support for conversation-level and connection-level ping. These ping flows are initiated from CICS if a Client becomes unresponsive, *but only if the mirror transaction is running with a profile that specifies a timeout*. The default mirror does not have a timeout. To enable ping support you must use a mirror profile that specifies a timeout. If you don't, and a Client becomes disconnected due to a connection failure, any current conversations with the Client could be suspended indefinitely.

When a timeout occurs, CICS does the following:

1. If the Client supports conversation-level ping, CICS tries to ping a specific conversation. This attempts to confirm whether a conversation is still active on the connection.
2. If the Client does not support conversation-level ping, or the conversation-level ping request times out, CICS tries a connection-level ping. This queries whether a connection to the Client still exists in TCP/IP.
3. If the connection-level ping request times out, CICS uninstalls the Client from CICS. Any state associated with the Client is lost. Any suspended tasks associated with the Client are abended.

If a connection fails during an ECI extended conversation, CICS detects this when the ping timeout processing occurs. The conversation is abended.

Port sharing in a CICSplex: Port sharing, used as a method of load balancing in a CICSplex, is supported for TCP/IP-connected Clients.

Installation of Client support

When a Client is installed into CICS, the install request is routed to a particular CICS region. The sockets domain in that region allocates an ephemeral port for use with the Client during the rest of the time for which it is installed. The ephemeral port is not shared, so an affinity between the Client and the CICS region on which it is installed is established. Until the client is uninstalled or the connection fails (forcing the Client to be re-installed), all subsequent work is routed to the correct CICS region through the unshared ephemeral port.

Installing Client virtual terminals

If the EPI or the Client terminal emulator is to be used, the Client virtual terminals must be installed on CICS on System/390. Client virtual terminals are defined to CICS on System/390 as remote 3270 terminals.

Note the following:

- CICS Clients do not ship remote terminal definitions to CICS on System/390 for use as virtual terminals. Instead, you define the virtual terminals to CICS on System/390 as remote 3270 devices, using either static definitions or autoinstall. If you use autoinstall, an autoinstall model is used as the basis for the virtual terminal.
- VTAM definitions are not required for Client virtual terminals.
- Although CICS Clients do not ship definitions of virtual terminals to CICS on System/390, once installed virtual terminals can be shipped by CICS on System/390 to connected CICS systems. Therefore transaction routing can be used from a Client virtual terminal.

Using static definitions

You can use CEDA DEFINE and INSTALL commands to create static definitions of Client terminals. When you use static definitions:

- Client EPI programs reserve particular definitions for their use by quoting the TERMIDs on the NetName parameter of CICS_EpiAddTerminal calls (see “How CICS installs Client terminals” on page 120). For information about the CICS_EpiAddTerminal function, see the *CICS Transaction Gateway: Programming Reference* manual.
- A workstation user chooses a particular definition for an emulator session by quoting the TERMID on the /n (NetName) parameter of the `cicsterm` command used to start the emulator.

Figure 30 on page 117 and Figure 31 on page 118 are example TERMINAL and TYPETERM definitions for Client terminals.

Example Client terminal definition

Note that:

- On the TERMINAL definition:
 - TERMINAL is the name by which the terminal is to be known to the Client—that is, the name that the Client will quote on the NetName parameter of CICS_EpiAddTerminal calls, or on the /n parameter of a `cicsterm` command.

Note that the terminal names passed by Clients are case-sensitive. That is, if a Client passes a name that contains lowercase letters, CICS does not translate it into uppercase. CICS searches for a remote terminal definition whose TERMINAL name is the same combination of mixed or lowercase letters.

- NETNAME should be allowed to take its default value.
 - REMOTESYSTEM must be the name of the connection to the Client.
 - Specify REMOTENAME if you want to use an alias terminal identifier by which the terminal will be known to CICS. (Do not specify REMOTENAME if the TERMINAL definition is to be used as an autoinstall model.)
 - USERID must be left blank—you cannot use preset security with Client virtual terminals.
- On the TYPETERM definition, value 2 of the CGCSGID option should specify the code page to be used by the CICS on System/390 server for data conversion. You can use value 1 to specify the server character set. Alternatively, by leaving value 1 set to '00000', you can allow CICS to choose a default character set, deduced from the server code page—see “The EPI and terminal emulator” on page 131.
 - On both definitions, some inessential options have been omitted. You can allow these to take their default values.

```

DEFINE TERMINAL(VT12) GROUP(CLEPIVT)
OVERTYPE TO MODIFY
CEDA DEFine
Terminal ==> VT12
Group ==> CLEPIVT
AUTINSTModel ==> No No|Yes|Only
AUTINSTName ==>
TERMINAL IDENTIFIERS
TYpeterm ==> CLIVT
NEtname ==>
CONSOLE ==> No No|0-99
REMOTESystem ==> CLIA
REMOTESYSnet ==>
REMOTENAME ==>
ASSOCIATED PRINTERS
PRINTERCopy ==> No No|Yes
ALTPRINTCopy ==> No No|Yes
PIPELINE PROPERTIES
TAsklimit ==> No No|1-32767
OPERATOR DEFAULTS
OPERPID ==>
OPERPriority ==> 000 0-255
OPERRs1 ==> 0 0-24,...
OPERSecurity ==> 1 1-64,...
PRESET SECURITY
Userid ==>
TERMINAL USAGES
TEmpriority ==> 000 0-255
Inservice ==> Yes Yes|No
SESSION SECURITY
ATTachsec ==> Local Local|Identify|Verify|
Persistent|Mixidpe
BINDPassword ==> PASSWORD NOT SPECIFIED
BINDSecurity ==> No No|Yes
    
```

Figure 30. Example TERMINAL definition for statically defined Client virtual terminal

Installation of Client support

Here is an example TYPETERM definition to accompany the preceding TERMINAL definition. It is based on the CICS-supplied TYPETERM, DFHLU2.

```
DEFINE TYPETERM(CLIVT) GROUP(CLEPIVT)
OVERTYPE TO MODIFY
CEDA DEFINE
  TYpeterm ==> CLIVT
  Group ==> CLEPIVT
RESOURCE TYPE
  DEViCe ==> LUTYPE2
  TERmmodel ==> 2
  SESSiontype ==>
  LDclst ==>
  SHippable ==> Yes No|Yes
MAPPING PROPERTIES
  PAGesize ==> 024 , 080 0-999
  ALTPage ==> 000 , 000 0-999
  ALTSuffix ==>
  FMhparm ==> No No|Yes
  OBOperid ==> No No|Yes
PAGING PROPERTIES
  AUTOPage ==> No No|Yes
DEVICE PROPERTIES
  DEFscreen ==> 024 , 080 0-999
  AUDiblealarm ==> Yes No|Yes
  EXtendedds ==> Yes No|Yes
  Query ==> A11 No|Cold|All
  SOsi ==> No No|Yes
  BAcKtrans ==> No No|Yes
  CGcsgid ==> 00000 , 00037 0-65535
SESSION PROPERTIES
  AScii ==> No No|7|8
  SENdsizE ==> 01536 0-30720
  RECEivesize ==> 00256 0-30720
  BRacket ==> Yes Yes|No
  LOGMode ==>
DIAGNOSTIC DISPLAY
  ERRLastline ==> Yes No|Yes
  ERRIntensify ==> Yes No|Yes
  ERRColor ==> No No|Blue|Red|Pink|Green|
  Turquoise|Yellow|NEutral
  ERRHilighT ==> No No|Blink|Reverse|Underline
OPERATIONAL PROPERTIES
  AUTOConnect ==> No No|Yes|All
  ATi ==> Yes No|Yes
  CReatesess ==> No No|Yes
  RELreq ==> Yes No|Yes
  DIScreq ==> Yes Yes|No
MESSAGE RECEIVING PROPERTIES
  ROutedmsgS ==> A11 All|None|Specific
  LOGOnmsg ==> Yes No|Yes
APPLICATION FEATURES
  BUildchain ==> Yes No|Yes
  USerarealen ==> 000 0-255
  Ioarealen ==> 00256 , 04000 0-32767
  UCtran ==> Yes No|Yes|Tranid
```

Figure 31. Example TYPETERM definition for statically defined Client virtual terminal

Using autoinstall

The preferred method of defining Client terminals is to use autoinstall, because it is more convenient when many terminals connect to a single server.

Autoinstall models

If you use autoinstall, you may need to create some model terminal definitions (that is, `TERMINAL-TYPETERM` pairs) for use with Client terminals, unless you have some existing ones that are suitable. The CICS-supplied autoinstall model `DFHLU2` may be appropriate (it is the default if the Client does not specify a model name). Value 2 of the `CGCSGID` option of the `TYPETERM` definitions should specify the code page to be used by the CICS on System/390 server for data conversion.

Note: Because Client virtual terminals are not “seen” by VTAM, there is no need to create matching entries for the autoinstall models in the VTAM `LOGMODE` table.

The autoinstall model used to install a virtual terminal is determined using the following sequence:

1. **For EPI programs:** From the `DevType` parameter of the `CICS_EpiAddTerminal` function, if specified by the Client EPI program. (For details of EPI calls, see the *CICS Transaction Gateway: Programming Reference* manual.)
For the Client terminal emulator: From the `/m` (Modelname) parameter of the `cicsterm` command used to start the emulator, if specified by the workstation user.
2. The CICS-supplied autoinstall model, `DFHLU2`.

The autoinstall user program cannot choose a different autoinstall model.

Terminal identifiers

The terminal identifier (`TERMID`) passed to the CICS autoinstall function at install of a virtual terminal is determined using the following sequence:

1. **For EPI programs:** From the `NetName` parameter of the `CICS_EpiAddTerminal` function, if specified by the Client EPI program.
For the Client terminal emulator: From the `/n` parameter of the `cicsterm` command used to start the emulator, if specified by the workstation user.
Note that the terminal names passed by Clients are case-sensitive—that is, if they contain lowercase letters, these are not translated into uppercase by CICS.
2. A name generated automatically by CICS. `TERMID`s generated by CICS for autoinstalled Client terminals consist of a 1-character prefix and a 3-character suffix. The default prefix is `\`. 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 a Client virtual terminal is autoinstalled, CICS generates a 3-character suffix that it has not recorded as being in use.

You can use the `VTPREFIX` system initialization parameter to override the default prefix assigned to CICS-generated `TERMID`s. Use `VTPREFIX` to specify a different prefix, reserved for virtual terminals, on each TOR on which Client virtual terminals are to be installed. This ensures that the `TERMID`s of Client terminals autoinstalled on each system are unique in your transaction routing network. This in turn prevents the conflicts that could occur if two or more terminal-owning regions ship definitions of Client virtual terminals to the same application-owning region.

If such a naming conflict does occur—that is, if a Client virtual terminal is shipped to an AOR on which a remote terminal of the same name is already installed—the autoinstall user program is invoked in the AOR. Your user program can resolve the conflict by allocating an alias terminal identifier to the

Installation of Client support

shipped definition. (For details of writing an autoinstall user program to install shipped definitions, see your CICS on System/390 *Customization Guide*.)

Notes:

- a. You can specify VTPREFIX as a system initialization override, or by coding an entry in the system initialization table (SIT).
- b. When specifying a prefix, ensure that TERMIDs generated by CICS for Client terminals do not conflict with those generated by your autoinstall user program for user terminals, or with the names of any other terminals or connections.
- c. Client terminal definitions are not recovered after a restart. Immediately after a restart, no Client terminals are in use, and so when CICS generates TERMIDs it begins again at the start of its sequence. This means that CICS does *not* always generate the same TERMID for any given Client terminal. This in turn means that server applications cannot assume that a particular CICS-generated TERMID always equates to a particular Client terminal.

CICS TS for OS/390 and CICS TS for z/OS only

If your server programs do make this assumption, you can use your autoinstall user program to allocate alias TERMIDs, by which the virtual terminals will be known to CICS, in a consistent manner. For further details, see “Writing EPI server programs” on page 135.

For definitive information about the VTPREFIX system initialization parameter, see your CICS on System/390 *System Definition Guide*.

CICS TS for OS/390 and CICS TS for z/OS only

The autoinstall user program:

For brevity, the TERMID specified by the Client or the CICS-generated “VTPREFIX” name is referred to as the **supplied name**. The Client always knows the virtual terminal by the supplied name. However, your autoinstall user program can allocate an alias, by which the virtual terminal will be known to CICS.

One reason for using your autoinstall program to assign aliases to Client terminals might be to ensure that particular identifiers relate consistently to particular Client terminals. Whether this consistency is required depends on how your server applications are coded—see “Writing EPI server programs” on page 135.

Your autoinstall user program cannot change the autoinstall model.

For further information about writing a user program to control the installation of Client virtual terminals, see your CICS on System/390 *Customization Guide*.

How CICS installs Client terminals

When an EPI program issues a **CICS_EpiAddTerminal** call, or the workstation user uses the **cicsterm** command to start an emulator session, the Client invokes the CTIN transaction to install or reserve the terminal definition on CICS on System/390.

Table 43 relates the parameters passed by the Client to the way in which CICS installs the Client terminal.

Table 43. How CICS installs definitions of Client virtual terminals

CICS_EpiAddTerminal parameters or cicsterm specified		CICS actions			
NetName	DevType or Model-name	Static definition exists?	Result	TERMINAL	Autoinstall model
Yes	No	Yes	Use static definition ¹⁰	Client-specified	-
Yes	No	No	Call fails	-	-
Yes	Yes	No	Autoinstall	Client-supplied ¹¹	Client-specified
Yes	Yes	Yes	Use static definition ¹⁰	Client-specified	-
No	No	-	Autoinstall	CICS-supplied ¹¹	DFHLU2
No	Yes	-	Autoinstall	CICS-supplied ¹¹	Client-specified

Note: Definitions of Client virtual terminals are *not* deleted by the CICS on System/390 timeout delete mechanism that operates on shipped terminal definitions. ¹²

Defining a Client-attached printer

This section tells you how to define a printer that is locally attached to a Client workstation. As when defining any Client virtual terminal, you can either create a static definition, or use autoinstall. DFHLU3 is a suitable autoinstall model for a Client-attached printer.

Figure 32 on page 122 and Figure 33 on page 123 show example TERMINAL and TYPETERM definitions for a Client-attached printer.

Example static definition of a Client-attached printer

Note that:

- On the TERMINAL definition:
 - TERMINAL is the name by which the terminal is to be known to the Client. Note that the terminal names passed by Clients are case-sensitive. That is, if a Client passes a name that contains lowercase letters, CICS does not

10. A static definition is used only if its REMOTESYSTEM attribute points to a connection to the correct Client, and it is not currently in use. If the definition points to an incorrect Client, or is in use, the call fails.

11. In CICS Transaction Server for OS/390 and CICS Transaction Server for z/OS, the autoinstall user program may allocate an alias by which the terminal will be known to CICS. The Client knows the terminal by the supplied name.

12. That is, the timeout delete mechanism does not operate on the remote definitions of Client terminals installed on the CICS on System/390 system on which the CTIN transaction runs. It does operate on Client definitions that are shipped to a back-end CICS Transaction Server for OS/390, CICS Transaction Server for z/OS, or CICS Transaction Server for VSE/ESA system.

installation of Client support

translate it into uppercase. CICS searches for a remote terminal definition whose TERMINAL name is the same combination of mixed or lowercase letters.

- NETNAME should be allowed to take its default value.
- REMOTESYSTEM must be the name of the connection to the Client.
- USERID must be left blank—you cannot use preset security with Client virtual terminals.
- The PRINTER and ALTPRINTER options are not supported. CICS on System/390 does not provide support for the CICS print key. Any screen print function must be implemented entirely within the Client in its role as a “TOR”; CICS on System/390 is unaware of any such support.
- On the TYPETERM definition, value 2 of the CGCSGID option should specify the code page to be used by the CICS on System/390 server for data conversion. You can use value 1 to specify the server character set. Alternatively, by leaving value 1 set to '00000', you can allow CICS to choose a default character set, deduced from the server code page—see “The EPI and terminal emulator” on page 131.
- On both definitions, some inessential options have been omitted. You can allow these to take their default values.

```

DEFINE TERMINAL(CPR1) GROUP(CLEPIVT)
OVERTYPE TO MODIFY
CEDA DEFine
  TErmiNal    ==> CPR1
  GrOuP      ==> CLEPIVT
  AUTINSTModEl ==> No           No|Yes|Only
  AUTINSTName ==>
  TERMINAL IDENTIFIERS
  TYpeterm   ==> CLIATPR
  NEtname    ==>
  CONSOLE    ==> No           No|0-99
  REMOTESyStem ==> CLIA
  REMOTESYsnet ==>
  REMOTEName ==>
  ASSOCIATED PRINTERS
  PRINTERCopy ==> No           No|Yes
  ALTPRINTCopy ==> No           No|Yes
  PIPELINE PROPERTIES
  TAsklimit   ==> No           No|1-32767
  OPERATOR DEFAULTS
  OPERPID     ==>
  OPERPriority ==> 000         0-255
  OPERRs1     ==> 0           0-24,...
  OPERSecurity ==> 1         1-64,...
  PRESET SECURITY
  Userid      ==>
  TERMINAL USAGES
  TErmpriority ==> 000         0-255
  Inservice   ==> Yes         Yes|No
  SESSION SECURITY
  Attachsec   ==> Local       Local|Identify|Verify|
                                     Persistent|Mixidpe
  BINDPassword ==>           PASSWORD NOT SPECIFIED
  BINDSecurity ==> No         No|Yes

```

Figure 32. Example TERMINAL definition for a Client-attached printer

Here is an example TYPETERM definition to accompany the preceding TERMINAL definition.

```

DEFINE TYPETERM(CLIATPR) GROUP(CLEPIVT)
OVERTYPE TO MODIFY
CEDA DEFINE
  TYPeterm ==> CLIATPR
  Group ==> CLEPIVT
RESOURCE TYPE
  DEVIce ==> LUTYPE3
  TERmmodel ==> 2
  SESSiontype ==>
  LDclst ==>
  SHippable ==> Yes No|Yes
MAPPING PROPERTIES
  PAGesize ==> 024 , 080 0-999
  ALTPage ==> 024 , 080 0-999
  ALTSuffix ==>
  FMhparm ==> No No|Yes
  OBOperid ==> No No|Yes
PAGING PROPERTIES
  AUTOPage ==> Yes No|Yes
DEVICE PROPERTIES
  DEFscreen ==> 024 , 080 0-999
  EXTendedds ==> Yes No|Yes
  Query ==> A11 No|Cold|A11
  S0si ==> No No|Yes
  BAcKtrans ==> No No|Yes
  CGcsgid ==> 00000 , 00037 0-65535
SESSION PROPERTIES
  AScii ==> No No|7|8
  SENdsizE ==> 00256 0-30720
  RECEivesize ==> 00256 0-30720
  BRacket ==> Yes Yes|No
  LOGMode ==>
OPERATIONAL PROPERTIES
  AUTOConnect ==> No No|Yes|A11
  ATi ==> Yes No|Yes
  TTi ==> Yes Yes|No
  CReatesess ==> No No|Yes
  RELreq ==> Yes No|Yes
  DIScreq ==> Yes Yes|No
MESSAGE RECEIVING PROPERTIES
  ROutedmsgs ==> A11 A11|None|Specific
  LOGOnmsg ==> No No|Yes
APPLICATION FEATURES
  BUildchain ==> No No|Yes
  USerarealen ==> 000 0-255
  Ioarealen ==> 00512 , 00000 0-32767
  UCtran ==> No No|Yes|Tranid
  
```

Figure 33. Example TYPETERM definition for a Client-attached printer

Setting up security

Important

In CICS Transaction Server for z/OS and CICS Transaction Server for OS/390, CICS intercommunication security is described in detail in the *CICS-RACF Security Guide*. In CICS Transaction Server for VSE/ESA, it is described in the *CICS Transaction Server for VSE/ESA Security Guide*. This section is intended to be read in conjunction with your CICS security manual; it describes security considerations that are specific to CICS Clients and CICS on System/390.

Users of external security managers (ESMs) other than the Resource Access Control Facility (RACF) or the CICS Transaction Server for VSE/ESA ESM should read this section in conjunction with the documentation for their own ESM.

Bind security (APPC only)

Bind-time security is not supported on CICS Client-CICS on System/390 APPC links. Therefore, specify BINDSECURITY(NO) on the CONNECTION definitions that define Clients to CICS on System/390.

Link security (APPC only)

Link security provides the lowest level of resource security for intercommunication links. It defines the total set of resources that can be accessed across the connection.

To specify link security for a CICS Client-CICS on System/390 APPC connection:

1. On the SECURITYNAME option of the CONNECTION definition, specify a user ID for the link.
2. Define a profile to your ESM for the link user ID, which must be a valid RACF user ID. Users of the connection will be able to access only those resources that the link user ID is authorized to access.

If you do not specify a user ID on SECURITYNAME, the authority of the link is that of the CICS default user.

User security

User (attach-time) security:

- Defines how individual users of an intercommunication link are to be checked.
- Affects the resources that individual users are able to access. Unless you specify LOCAL user security (in which case all potential users share the authority of the link user ID), you must define user profiles to your ESM.

If you are using APPC links, specify the level of user-security on the ATTACHSEC option of the CONNECTION definition that defines the Client to CICS on System/390.

If you are using ECI over TCP/IP, specify the level of user-security on the ATTACHSEC option of the TCPIPSERVICE definition for ECI over TCP/IP.

The valid values of ATTACHSEC for CICS Client-System/390 links are LOCAL and VERIFY.

#

For APPC links, if you specify ATTACHSEC(VERIFY), you must also specify USEDFTUSER(YES). If you do not, the first time the Client tries to initialize the connection to CICS on System/390 you see security violation messages DFHZN2701 and DFHZC2047 and an SDUMP is taken. (This is because, when trying to attach the CCIN transaction, the Client does not include the password and user ID required by CICS on System/390.)

If a Client does not support VERIFY attach-time security, you must specify ATTACHSEC(LOCAL) and rely on link security.

Note: Do not specify preset security when defining Client virtual terminals or models used for autoinstalling virtual terminals. Preset security is not supported for virtual terminals because attach-time security is used to verify users of CICS Client-CICS on System/390 links.

CICS-supplied transactions

CCIN and CIEP (which is used for ECI over TCP/IP) are category 3 transactions—that is, they are exempt from security checking.

CTIN is a category 2 transaction—that is, it is always associated with a terminal.

You should specify:

To CICS

For CCIN and CIEP

RESSEC(NO) and CMDSEC(NO) on the transaction resource definition.

For CTIN

RESSEC(YES) and CMDSEC(YES) on the transaction resource definition.

The supplied definitions in the DFHCLNT and DFHIPECI CSD groups specify these values.

To your ESM

For CTIN

If your external security manager is RACF, a transaction profile that specifies UACC(NONE); and an access list that contains the user IDs (or groups containing user IDs) of users who access CICS from Client workstations. For example:

```
RDEFINE GCICSTRN INTERCOM UACC(NONE)
      ADDMEM(CEHP,CEHS,CPMI, . . . ,CTIN, . . . )
      NOTIFY(security_admin_userid)
      OWNER(userid or groupid)
PERMIT INTERCOM CLASS(GCICSTRN) ID(intrgrp1,..,intrgrpz)
      ACCESS(READ)
```

System initialization parameters

To activate security on CICS Client-CICS on System/390 links, you need to specify the following system initialization parameters:

DFLTUSER=name,	To specify the CICS default userid	*
SEC=YES,	To turn on security checking	*
XTRAN=YES,	To turn on transaction security	*

For detailed information about these parameters, see your CICS on System/390 *System Definition Guide*.

Chapter 9. Data conversion for Clients

Important

Information in this chapter about data conversion for the EPI and the Client terminal emulator function applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA

If you are using a **channel** to perform data conversion, read “Data conversion using channels” in the *CICS Application Programming Guide* instead of this topic. Channels are available in CICS Transaction Server for z/OS Version 3 Release 1 onwards.

For detailed information about data conversion between CICS workstation products and CICS on System/390 systems, see Chapter 6, “Data conversion for communication with non-System/390 systems,” on page 43. This chapter describes considerations specific to conversion between CICS Clients and CICS on System/390.

The CICS on System/390 server must translate between its EBCDIC encoding of character data and the ASCII encoding used by the attached Clients.

For the EPI:

- Data conversion is done by the terminal-owning region (TOR)—that is, the CICS on System/390 region on which the Client virtual terminals are installed.
- No data conversion is performed for TCTUAs or COMMAREAs; these are not returned to Client programs.
- Only standard conversion—that is, conversion handled by the CICS on System/390 conversion program, DFHCCNV, using supported code pages—is possible. Non-standard conversion—that is, conversion that relies on user-defined conversion tables or user-code in the user-replaceable program, DFHUCNV—is not supported.

For the ECI:

- Data conversion is done in the region to which the Client is connected.
- Both standard and non-standard conversion is supported.

The client code page

This section describes the client code pages supported for the ECI, EPI, and Client terminal emulator.

The ECI

The client code pages supported for the ECI are the same as those supported by CICS on System/390 for distributed program link (DPL) requests. They are listed in “CICS-supported conversions” on page 45.

The client code page is specified by the Client. For example, for the Universal
Client for Windows the client code page is specified by running the Client
configuration tool and doing one of the following:

data conversion

- # • Checking the box labeled “Use OEM codepage”. This sets the value of the USEOEMCP parameter to Y in the Client section of the ctg.ini initialization file.
- #
- # • Specifying a value for the field labeled “Codepage identifier override”. This sets the value of the CCSID parameter in the Client section of the ctg.ini initialization file.
- #

If the CICS Universal Client finds that the CCSID parameter in the ctg.ini file has a value, it sends that value to the server as the client CCSID. Otherwise, it issues either a GetACP function call to obtain the ANSI code page or a GetOEMCP call to obtain the OEM code page, and sends that code page to the server.

The client code page can be redefined by a CHCP command.

The EPI and terminal emulator

The client code pages supported for the EPI and the terminal emulator function are shown in Table 44.

The client code page is specified by the Client, as described for the ECI.

For the EPI and terminal emulator, if the client code page is invalid, CICS uses code page 850.

Table 44. EPI code pages. The client code pages supported by CICS on System/390 for the EPI, and the default server code page for each one.

National language group	Supported client code pages for EPI	Default server code page
Arabic	00864	00420
Arabic	01089	00420
Arabic	01256	00420
Arabic	05352	16804
Arabic	09448	16804
Arabic	17248	16804
Baltic Rim	00901	01156
# Baltic Rim	00902	01157
Baltic Rim	00921	01112
# Baltic Rim	00922	01122
Baltic Rim	01257	01112
Baltic Rim	05353	01156
Cyrillic	00808	01154
Cyrillic	00848	01158
Cyrillic	00849	01154
Cyrillic	00855	01025
Cyrillic	00866	01025
Cyrillic	00872	01154
Cyrillic	00915	01025
Cyrillic	01124	01123
Cyrillic	01125	01123
Cyrillic	01131	01025

Table 44. EPI code pages (continued). The client code pages supported by CICS on System/390 for the EPI, and the default server code page for each one.

National language group	Supported client code pages for EPI	Default server code page
Cyrillic	01251	01025
Cyrillic	05347	01154
Devanagari	00806	01137
Farsi	01098	01097
Greek	00813	00875
Greek	00869	00875
Greek	01253	00875
Greek	04909	04971
Greek	05349	04971
Greek	09061	04971
Hebrew	00856	00424
Hebrew	00862	00424
Hebrew	00867	12712
Hebrew	00916	00424
Hebrew	01255	00424
Hebrew	05351	12712
Hebrew	09447	12712
Japanese	00932	00930
Japanese	00942	00930
Japanese	00943	00930
Japanese	00954	00930
Japanese	05050	01390
Korean	00934	00933
Korean	00944	00933
Korean	00949	00933
Korean	00970	00933
Korean	01363	00933
Lao	01133	01132
Latin-1 and Latin-9	00437	00500
Latin-1 and Latin-9	00819	00500
Latin-1 and Latin-9	00850	00500
Latin-1 and Latin-9	00858	00500
Latin-1 and Latin-9	00923	00924
Latin-1 and Latin-9	00924	00924 Note: EBCDIC/EBCDIC conversion not supported.
Latin-1 and Latin-9	01047	01047 Note: EBCDIC/EBCDIC conversion not supported.
Latin-1 and Latin-9	01252	00500

data conversion

Table 44. EPI code pages (continued). The client code pages supported by CICS on System/390 for the EPI, and the default server code page for each one.

National language group	Supported client code pages for EPI	Default server code page
Latin-1 and Latin-9	05348	01148
Latin-2	00852	00870
Latin-2	00912	00870
Latin-2	01250	00870
Latin-2	05346	01153
Latin-2	09044	01153
Latin-5	00857	01026
Latin-5	00920	01026
Latin-5	01254	01026
Latin-5	05350	01155
Latin-5	09049	01155
Simplified Chinese	00946	00935
Simplified Chinese	01381	00935
Simplified Chinese	01383	00935
Simplified Chinese	01386	00935
Simplified Chinese	05488	01388
Thai	01161	01160
Thai	01162	01160
Thai	09066	09030
Traditional Chinese	00938	00937
Traditional Chinese	00948	00937
Traditional Chinese	00950	00937
Traditional Chinese	00964	00937
Traditional Chinese	01370	01371
Urdu	00868	00918
Urdu	01006	00918
Vietnamese	01129	01130
Vietnamese	01163	01164
Vietnamese	01258	01130
Vietnamese	05354	01164

The server code page and character set

This section describes the server code pages and character sets supported for the ECI, EPI, and Client terminal emulator.

The ECI

The server code pages supported for the ECI are the same as those supported by CICS on System/390 for DPL requests. They are listed in “CICS-supported conversions” on page 45.

The server code page is determined from the conversion table, DFHCNV, installed on CICS on System/390.

The EPI and terminal emulator

The server code pages and character sets supported for the EPI and the terminal emulator function are shown in Table 45. The code pages are a subset of those supported for the ECI.

The server code page is determined from value 2 of the CGCSGID option of the TYPETERM used to install the virtual terminal definition. If the server code page, or the combination of client and server code pages, is invalid, the installation of the virtual terminal is rejected. If no server code page is specified, CICS uses a default, which it deduces from the value of the client code page, as shown in Table 44 on page 128.

You can use value 1 of the CGCSGID field of the TYPETERM definition to specify the server character set for the EPI. If you specify an invalid character set, the installation of the virtual terminal is rejected. Alternatively, you can use the default character set supplied by CICS on System/390. Table 45 shows the server character sets and code pages supported for the EPI.

From CICS TS for z/OS Version 2.2 onwards, the supported character sets and codepages listed reflect the CGCSGID returned by a 3270 device in response to a Query Reply. Table 45 highlights all the differences between CICS TS for z/OS Version 2.2 (and later) and earlier CICS releases.

In CICS TS for z/OS Version 2.2 and later, if you want to use a unique National Language group use the code page and character set values.

Table 45. EPI character sets and server code pages. The character sets and server code pages supported by CICS on System/390 for the EPI.

National language group	Supported character sets for EPI and default	Supported server code pages for EPI	Character set used by CICS for DBCS	Code page used by CICS for DBCS
Arabic	00235	00420	—	—
Arabic	01461	00420	—	—
Baltic Rim	01305	01112	—	—
Baltic Rim	01393	01156	—	—
Cyrillic	01150	01025	—	—
Cyrillic	01326	01123	—	—
Cyrillic	01381	01154	—	—

data conversion

Table 45. EPI character sets and server code pages (continued). The character sets and server code pages supported by CICS on System/390 for the EPI.

National language group	Supported character sets for EPI and default	Supported server code pages for EPI	Character set used by CICS for DBCS	Code page used by CICS for DBCS
Cyrillic	01388	01158	—	—
Estonian	01307	01122	—	—
Estonian	01391	01157	—	—
Greek	00925	00875	—	—
Greek	01371	00875	—	—
Hebrew	00941	00424	—	—
Hebrew	01147	00803	—	—
Hebrew	01357	00803	—	—
Hebrew	1356	00424	—	—
Japanese	00101	00931 00037 ¹	01001	00300
Japanese	01172	00930 00290 ¹	01001	00300
Japanese	01172	00939 01027 ¹	01001	00300
Japanese	65535	01390 00290 ¹	65535	00300
Japanese	65535	01399 01027 ¹	65535	00300
Korean	01173	00933 00833 ¹	00934	00834
Korean	65535	01364 00833 ¹	65535	00834
Latin-1 and Latin-9	00695	01140	—	—
Latin-1 and Latin-9	00695	01141	—	—
Latin-1 and Latin-9	00695	01142	—	—
Latin-1 and Latin-9	00695	01143	—	—
Latin-1 and Latin-9	00695	01144	—	—
Latin-1 and Latin-9	00695	01145	—	—
Latin-1 and Latin-9	00695	01146	—	—
Latin-1 and Latin-9	00695	01147	—	—
Latin-1 and Latin-9	00695	01148	—	—
Latin-1 and Latin-9	00695	01149	—	—
Latin-1 and Latin-9	00697	00037	—	—
Latin-1 and Latin-9	00697	00273	—	—
Latin-1 and Latin-9	00697	00277	—	—
Latin-1 and Latin-9	00697	00278	—	—
Latin-1 and Latin-9	00697	00280	—	—
Latin-1 and Latin-9	00697	00284	—	—

Table 45. EPI character sets and server code pages (continued). The character sets and server code pages supported by CICS on System/390 for the EPI.

National language group	Supported character sets for EPI and default	Supported server code pages for EPI	Character set used by CICS for DBCS	Code page used by CICS for DBCS
Latin-1 and Latin-9	00697	00285	—	—
Latin-1 and Latin-9	00697	00297	—	—
Latin-1 and Latin-9	00697	00500	—	—
Latin-1 and Latin-9	00697	00871	—	—
Latin-1 and Latin-9	00697	01047	—	—
Latin-1 and Latin-9	01353	00924	—	—
Latin-2	00695	01148	—	—
Latin-2	00697	00500	—	—
Latin-2	00959	00870	—	—
Latin-2	01375	01153	—	—
Latin-5	01152	01026	—	—
Latin-5	01378	01155	—	—
Simplified Chinese	00103	09127 00836 ¹	00937	00837
Simplified Chinese	01174	00935 00836 ¹	00937	00837
Simplified Chinese	65535	01388 00836 ¹	65535	00837
Traditional Chinese	01175	00937 00037 ¹	00935	00835
Traditional Chinese	65535	01371 01159 ¹	65535	00835
Vietnamese	01336	01130	—	—
Vietnamese	01397	01164	—	—

Notes:

1. In CICS TS for z/OS Version 2.2 and later, use this value for the server code page. It provides SBCS and DBCS translation.

Binary data conversion

For the ECI, binary data is converted, or not, as specified by the Client.

For the EPI, there is no binary data that needs to be converted.

Defining code pages to CICS on System/390

Bearing in mind the rules outlined above, this is what you code in your DFHCNV table, in the region or regions in which your server programs run, for each program invoked by the ECI:

- A DFHCNV TYPE=ENTRY entry, on which the SRVERCP operand specifies the server code page to be used to translate the communications area (COMMAREA).

data conversion

- DFHCNV TYPE=FIELD entries, on which the DATALEN and DATATYP operands specify, respectively, the length and type of each data field in the COMMAREA.

Note: It is **not** necessary to code, on the CLINTCP and SRVERCP operands of the DFHCNV TYPE=INITIAL macro, the code pages used with CICS Clients.

For definitive information about coding DFHCNV macros to specify code pages, see “Defining the conversion table” on page 63.

Chapter 10. Application programming for Clients

Important

Information in this chapter about EPI server programs and Client-attached printers applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA

This chapter gives advice on writing CICS on System/390 server programs to be invoked from CICS Clients.

Writing ECI server programs

Writing a server program to be invoked by the Client External Call Interface (ECI) is similar to writing one to be invoked by a distributed program link (DPL) request. ECI server programs can issue the same subset of EXEC CICS commands as DPL server programs (except that they cannot issue syncpoints, whereas DPL servers can do so if the client program specifies SYNCONRETURN on the LINK command). Thus, the commands an ECI server program *cannot* issue are:

- Terminal-control commands referring to its principal facility
- Commands that set or inquire on terminal attributes
- BMS commands
- Signon and signoff commands
- Batch data interchange commands
- Commands addressing the TCTUA
- Syncpoint commands.

For further information about writing DPL server programs, see your CICS on System/390 *Intercommunication Guide* and *Application Programming Reference* manual.

Writing EPI server programs

The following restrictions apply to CICS on System/390 server programs that are invoked from the Client External Presentation Interface (EPI):

- They must not use:
 - A terminal control (TC) data stream that includes 14- or 16-bit addresses or structured fields. This is because the CICS Transaction Gateway and CICS Universal Client support only the ASCII-7 subset of the 3270 data stream architecture. Only 12-bit SBA addressing is supported. Consequently, the maximum screen size for EPI terminals is 27 rows by 132 columns.
 - Basic mapping support (BMS) partition support.
 - BMS paging.
 - The purge function to cancel ATI requests queued against the terminal. If a CICS transaction uses EXEC CICS START with the DELAY option to schedule transactions to a terminal resource autoinstalled by a user application, the user application should ensure that delayed ATI requests are not lost when the terminal resource is deleted. See your server documentation to determine the effects of deleting a terminal resource when delayed ATI requests are outstanding.
 - The terminal control commands EXEC CICS ISSUE DISCONNECT or EXEC CICS ISSUE PASS.

#

application programming for Clients

- A Client virtual terminal cannot be a target of an EXEC CICS ROUTE command.
- A Client virtual terminal cannot be the target of the CMSG message-routing transaction.
- If you are using CICS-generated TERMIDs, your server programs must not rely on TERMIDs being allocated consistently to particular Client terminals. (If, on the other hand, TERMIDs are always nominated, in a consistent way, by your Client EPI programs, this restriction may not apply.)

A Client terminal can be deleted by the Client sending a **CICS_EpiDelTerminal** request, by an end user shutting down a Client terminal emulator or the Client itself, or if a connection failure occurs. When it is reinstalled, CICS does not necessarily generate the same TERMID as it had previously.

This has implications for the way in which your server programs are written. For example:

- Your server programs derive temporary storage queue names from the TERMID (to associate each queue with a particular end user). Problems of data mismatch could occur if the queue is not deleted by transaction end (possibly due to a failure).

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. However, if you have a large number of server applications, it may not be possible to check or change them all.

- Your server 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, and reinstalled with a different TERMID, the started transaction could fail because the TERMID no longer exists.

CICS TS for OS/390 and CICS TS for z/OS only

If your server programs cannot be rewritten, your autoinstall user program could allocate aliases to the CICS-generated TERMIDs. It could, for example, use a mapping file to relate particular aliases to particular Client workstations (identified by connection name).

If your server programs are located on a back-end AOR, the autoinstall user program is invoked in the AOR when a virtual terminal is shipped in, just as for any other shipped definition. It could, if necessary, allocate an alias terminal identifier to the shipped definition.

For information about writing an autoinstall user program to control the installation of Client virtual terminals and shipped definitions, see your CICS on System/390 *Customization Guide*.

- # Note also that an EPI **client** application cannot:
- Use basic mapping support (BMS) paging.
 - Determine the alternate screen size of the terminal resource definition, although it can determine the default screen size.

Client-attached printers

A CICS on System/390 application can communicate with a Client-attached printer by starting a transaction against it, using an EXEC CICS START TERMID command.

A Client-attached printer accepts a 3270 data stream which contains set buffer address (SBA) commands, and a 3270 write control character (WCC) with the print bit set on. An application can use any of the following command sequences, followed by EXEC CICS PRINT, to print data successfully:

- BMS SEND MAP or SEND TEXT with the PRINT option specified
- BMS SEND MAP or SEND TEXT without the PRINT option, followed by BMS SEND CONTROL with the PRINT option
- TC SEND of an appropriate data stream, with the CTLCHAR option.

There are some restrictions:

- It is not possible for an application to initiate printing indirectly by starting the basic mapping support (BMS) paging transaction against the printer by a BMS ROUTE command, followed by BMS SEND MAP or SEND TEXT commands with the PRINT and PAGING options, followed by a BMS SEND PAGE command.
- A Client-attached printer does not support the NLEOM data stream (generated by BMS SEND MAP or SEND TEXT with the NLEOM option).

Chapter 11. Problem determination for Clients

Important

This chapter applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA

This chapter tells you where to find information to help you diagnose Client-related problems.

Trace points

Client-related trace points are in the range AP 3000-AP 3075; they are listed in your CICS on System/390 *Diagnosis Reference* manual.

Notes:

1. Turning on TC level 2 tracing causes the amount of trace information produced to increase significantly.
2. Turning on TC level 2 tracing when you are using DBCS code pages with Client virtual terminals causes the amount of trace information to increase substantially.

For advice about how to use CICS trace, see your CICS on System/390 *Problem Determination Guide*.

Messages

Messages relating to Client support are in the range DFHZC3202-DFHZC3249 and
are written to the CSCC transient data queue (TDQ).

ECI over TCP/IP error messages are in the range DFHIE0001-DFHIE1213 and are
written to the CIEO TDQ.

Both sets of messages are listed in your CICS on System/390 *Messages and*
Codes manual.

Abend codes

Abend codes relating to APPC-attached Clients are in the ranges AXTP-AXTR and
AZAD-AZAK. Abend codes relating to TCP/IP-attached Clients are AIEB and AITH.

All abend codes are described in your CICS on System/390 *Messages and Codes* manual.

Chapter 12. Recovery after a restart of CICS

Important

Information in this chapter about the EPI and the Client terminal emulator function applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA

This chapter describes how users of attached Client workstations are affected if CICS on System/390 is restarted.

After a restart of CICS on System/390, APPC sessions to CICS Clients are recovered automatically.

Note: If CICS on System/390 is using VTAM persistent sessions support, VTAM holds on to the sessions to the Client until the restart occurs; they are then unbound by CICS. (Using persistent sessions causes a restart to take slightly longer than it otherwise would.)

There are some restrictions on the use of persistent sessions with CICS Clients—see Chapter 13, “Restrictions on Client support,” on page 143.

For TCP/IP connected Clients, when CICS restarts after a failure it has no
knowledge of any Clients that may have been installed. The Clients must be
re-installed.

Recovering the Client terminal emulator

If CICS on System/390 is restarted it is not necessary to restart the Client terminal emulator. The user should:

1. Hit Enter after CICS on System/390 has crashed.

The following is displayed on the emulator screen:

```
CCL7045E Connection lost with server 'CICSSNA'  
CCL7020I Press Clear to continue
```

2. Hit the Clear key.

CCL7045E is displayed on the operator information line.

3. Wait for a minute or so after CICS has come back up while CICS reacquires the connection.
4. If the restart interrupted a Client transaction, rerun the transaction, if necessary. To discover whether a rerun is required, you may have to investigate whether any updates to resources were completed successfully.

Client EPI and ECI programs

In the event of a failure and restart of CICS on System/390, Client EPI and ECI programs are responsible for:

- Displaying appropriate messages on the workstation
- Taking any recovery actions that may be necessary.

recovery after CICS restart

For information about writing Client EPI and ECI programs, see the *CICS Transaction Gateway: Programming Guide*.

If a restart interrupts a Client EPI or ECI program, the end user may need to rerun the associated transaction. Note that CICS Clients do not support synchronization level (synclevel) 2 conversations. Therefore, to discover whether a rerun is required, you may have to investigate whether any updates to resources were completed successfully.

Chapter 13. Restrictions on Client support

Important

Information in this chapter about the CCIN and CTIN transactions, the EPI, Client virtual terminals, and the Client terminal emulator function, applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA

There are some restrictions on CICS on System/390 support for CICS Clients.

The following general restrictions apply:

- The CCIN and CTIN transactions (invoked by the Client to exchange connection details with the server and to install Client terminals) can run only on a CICS system that is directly connected to the Client. A CICS system that is directly connected to the Client can, however, use normal transaction routing and function shipping flows to communicate with any other CICS system.

If an EPI request is routed to a back-end AOR, the AOR can be any currently-supported release of CICS.

If an ECI request is to a back-end AOR, the AOR must be one of the following:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA
- CICS/VSE 2.3
- CICS/400

The information passed by the Client to CICS on System/390 by means of the CCIN transaction is not passed by CICS on System/390 to a back-end AOR.)

- APPC connections to Clients support data synchronization levels (synclevels) 0 and 1 only.
- When acting as a server to a CICS Client using the EPI, CICS on System/390:
 - Does not support the use of a PF key specified on the TASKREQ option of a TRANSACTION definition to start the transaction from a Client virtual terminal.
 - Does not support use of the print key specified on the PRINT system initialization parameter from a Client virtual terminal.
 - Does not display the good morning panel when a Client terminal is installed. Note that you can use the CICSTERM command to specify the initial transaction for a CICS Client.
- You can make only limited use of VTAM persistent sessions support to recover APPC connections to Clients automatically after a failure. If you define your Client connections to use persistent sessions, the only sessions that are recovered are those on:
 - Statically defined APPC connections
 - Autoinstalled single-session APPC connections.

These sessions are recovered only if:

- No virtual terminals were installed on the connection at the time of the failure.
 - For autoinstalled connections, the value of the AIRDELAY system initialization parameter is greater than zero.
- You can use the execution diagnostic facility (EDF) in single-terminal mode from a Client emulator, to test a CICS on System/390 server transaction.

restrictions

EDF in two-terminal mode is supported only when both of the terminals and the transaction reside on the same CICS system; that is, when no Client terminal is involved.

- When running a Client emulator, you cannot use the CESN or CESF transactions to sign on to (or off from) the CICS region to which the Client is directly attached.
- EPI server transactions running in the CICS region to which the Client is directly attached can issue EXEC CICS SIGNON or SIGNOFF commands only if the virtual terminal has been installed as signon capable.

Note: Transactions started at a virtual terminal installed as signon capable are executed with the authorities assigned to either the default user defined by the DFLTUSER system initialization parameter or the user currently signed on at the terminal.

- You cannot install more than 512 virtual terminals per Client connection. This limit is necessary to prevent service attacks. An attempt to install more than 512 virtual terminals results in message DFHZC3206; the request to install the virtual terminal is rejected. A response code of DISASTER with a reason code of INVALIDREQUEST is sent to the Client.
- You cannot use preset security with Client virtual terminals.
- You cannot use the EXEC CICS or CECI ISSUE PASS command with Client virtual terminals. (ISSUE PASS is used to disconnect a VTAM terminal from CICS, and transfer it to another CICS terminal-owning region.)
- On CICS System/390 products other than CICS Transaction Server for OS/390 Release 3, the CEMT INQUIRE TERMINAL command does not return information about Client virtual terminals. However, the EXEC CICS INQUIRE TERMINAL command does.
- If you discard or reinstall a (statically defined or autoinstalled) connection to a Client workstation, and the connection is in use, the workstation end user must shut down and restart the Client before being able to continue.
- For APPC connections to Clients, if you discard or reinstall a (statically defined or autoinstalled) Client virtual terminal, and the CTIN transaction has been run to install or reserve the terminal but not to release it, the workstation end user must restart the EPI program or terminal emulator that uses the virtual terminal, if he or she wants to continue to use it.

As well as these general restrictions, there are some restrictions on server programs invoked from the ECI and EPI—see Chapter 10, “Application programming for Clients,” on page 135.

#

Chapter 14. Migration considerations

Important

Information in this chapter about the EPI and the Client terminal emulator function applies to:

- CICS Transaction Server for z/OS
- CICS Transaction Server for OS/390
- CICS Transaction Server for VSE/ESA

This chapter describes the effects that CICS on System/390 support for CICS Clients could have on an existing CICS on System/390 system.

Moving to a client/server environment

When you first install Client support, it is likely that most, if not all, of your existing CICS on System/390 transactions use 3270 data streams. To migrate to client/server solutions in a staged manner, you could use the following sequence:

1. Use the Client 3270 emulator to run, unchanged, existing CICS on System/390 3270 applications.
2. Use the EPI to add graphical user interface (GUI) front ends to existing CICS on System/390 3270 applications.
3. Use the ECI to develop new client/server applications in which the display and processing logic is appropriately split between the client and the server.

Using existing applications as servers

You need to decide which of your CICS on System/390 applications are suitable for use as servers to CICS Clients. See Chapter 10, “Application programming for Clients,” on page 135.

Data conversion

You should review your use of CICS on System/390 data conversion facilities.

The External Call Interface

If the ECI is used by a Client, consider the following:

- The *client* code page is *always* specified by the Client. Any client code page specified in the CICS conversion table, DFHCNV, is overridden by the Client. (The code page overridden is the value of the CLINTCP option on the DFHCNV TYPE=ENTRY macro for the server program.)
- The *server* code page is that specified in the DFHCNV conversion table (on the DFHCNV TYPE=ENTRY macro for the server program).
- For binary data conversion, the default binary format defined on DFHCNV TYPE=FIELD entries is overridden by the Client.

The External Presentation Interface

If the EPI is used by a Client, consider the following:

- Data conversion is done in the terminal-owning region.
- The *client* code page is specified by the Client. If the Client specifies an invalid code page, code page 850 is used.

migration

- The *server* code page is determined from CICS on System/390's remote definition of the virtual Client terminal. The second value of the CGCSGID option of the TYPETERM definition is used, if specified. If a value is specified, it must be a code page that is supported by CICS on System/390. If no value is specified, a default code page is used, as shown in Table 44 on page 128.
- No binary data conversion is required for the EPI.

For more information about defining code pages and conversion tables for data conversion between CICS on System/390 and non-System/390 systems, see Chapter 6, "Data conversion for communication with non-System/390 systems," on page 43.

Part 3. Appendixes

Bibliography

This section lists those books in the System/390 and non-System/390 CICS libraries that are related to intercommunication.

Note: To help you find the information you need, some books are listed in more than one category.

CICS Family intercommunication books

CICS Family: Communicating from CICS on System/390, SC34-6474
CICS Family: Interproduct Communication, SC34-6473

CICS on System/390 intercommunication books

CICS Transaction Server for z/OS Version 3 Release 1

CICS Distributed Transaction Programming Guide, SC34-6438-00
CICS External Interfaces Guide, SC34-6449-00
CICS Front End Programming Interface User's Guide, SC34-6436-00
CICS Intercommunication Guide, SC34-6448-00
CICS Internet Guide, SC34-6450-00

CICS Transaction Server for z/OS Version 2 Release 3

CICS Distributed Transaction Programming Guide, SC34-6236-00
CICS External Interfaces Guide, SC34-6244-00
CICS Front End Programming Interface User's Guide, SC34-6234-00
CICS Intercommunication Guide, SC34-6243-00
CICS Internet Guide, SC34-6245-00

CICS Transaction Server for z/OS Version 2 Release 2

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CICS Transaction Gateway and CICS Universal Client

CICS Transaction Gateway: Programming Guide, SC34-6141
CICS Transaction Gateway: Programming Reference, SC34-6140
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Accessibility

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

You can perform most tasks required to set up, run, and maintain your CICS system in one of these ways:

- using a 3270 emulator logged on to CICS
- using a 3270 emulator logged on to TSO
- using a 3270 emulator as an MVS system console

IBM Personal Communications provides 3270 emulation with accessibility features for people with disabilities. You can use this product to provide the accessibility features you need in your CICS system.

Index

Numerics

3270 Terminal Emulator 107

A

APPC protocol, for Client-CICS on System/390
links 107
application programming
 ECI server programs 135
 EPI server programs 135
ASCII, translation to EBCDIC 109, 127
asynchronous processing 8
ATI (automatic transaction initiation) 8
ATTACHSEC option, CEDA DEFINE
 CONNECTION 124
 effect on signon attributes 36
 specification 35
autoinstall
 Client terminals 118
 connections to Clients 112
automatic transaction initiation (ATI) 8

B

benefits of Client support 109
bibliography 109
binary data, conversion of 133
binary integers (INTEL format), conversion of 73

C

C programming language, integer datatype
 conversion 73
CCIN transaction 111
CGCSGID option, CEDA DEFINE TYPETERM 116,
 119
CICS Clients
 benefits of support for 109
 defining connections on CICS on System/390 112
 defining virtual terminals to CICS on
 System/390 116
 for AIX 105
 for HP-UX 105
 for Linux 390 105
 for Microsoft Windows 105
 for Sun Solaris 105
 functions provided
 External Call Interface 106
 External Presentation Interface 106
 External Security Interface 107
 terminal emulation 107
 overview 105
 protocols for CICS on System/390 links 107
 servers supported 105
CICS Transaction Server for OS/390 9
CICS Transaction Server for VSE/ESA 9
CICS Transaction Server for z/OS 9

CICS_EpiAddTerminal function 116, 119
CICS-supplied resource definition group,
 DFHCLNT 111
CICS-supplied resource definition group,
 DFHIPECI 111
CICS-supplied transactions
 CCIN 111
 CTIN 111
CICS/VSE 9
cicsterm command 116, 119
CIEO, transient data queue 111
client code page, how determined 127
Client-attached printer, defining to CICS 121
client/server computing 105
CLINTCP 64
CLINTCP operand, DFHCNV TYPE=INITIAL
 macro 134
code pages
 client, how determined 127
 defining to CICS on System/390 133
 server, how determined 131
connection
 definition (for parallel sessions) 26
 security 35
conversion templates 64, 66, 87, 90, 91
 field conversion records 87, 88, 89, 90, 91
CSCC, transient data queue 111
CTIN transaction 111

D

data conversion
 Arabic conversions 47
 assembling/link-editing the conversion programs 81
 Baltic Rim conversions 48
 binary data 133
 binary integers (INTEL format) 73
 C programming language, integer datatype 73
 character data 45
 client code page 127
 conversion process 58
 conversion templates 66
 Cyrillic conversions 48
 defining code pages to CICS on System/390 133
 defining the conversion table 63, 81
 Devanagari conversions 49
 DSECT for data conversion template 89, 90
 Farsi conversions 49
 Greek conversions 49
 Hebrew conversions 50
 IVP (initial program verification) 65
 Japanese conversions 51
 key templates 66
 Korean conversions 52
 Lao conversions 52
 Latin-1 conversions 53
 Latin-2 conversions 54
 Latin-5 conversions 55

data conversion (*continued*)
 Latin-9 conversions 53
 migration considerations 145
 nonstandard conversion 60
 program 22
 resource definition 63, 81
 sequence of conversion processing 61
 server code page 131
 simplified Chinese conversions 55
 standard conversion 60
 support for 109
 table 22
 Thai conversions 56
 traditional Chinese conversions 56
 types of conversion 44
 Urdu conversions 57
 Vietnamese conversions 57
 where conversion takes place 43
 data synchronization 143
 DATALEN operand, DFHCNV TYPE=FIELD
 macro 134
 DATATYP operand, DFHCNV TYPE=FIELD macro 134
 DB2 database access 7, 8
 DBCS (double-byte character set)
 defining DBCS data fields 73
 included in standard conversion 44
 invalid and undefined characters 77
 mixed strings, SBCS/DBCS 74
 user-defined conversion tables 75, 78
 DevType parameter
 of CICS_EpiAddTerminal call 119
 DFHCCNV, standard conversion program 60
 DFHCICSA, supplied profile 20
 DFHCLNT resource definition group 111
 DFHCNV
 CICSplex management 64
 DFHCNV TYPE=DSECT macro 83
 DFHCNV TYPE=ENTRY macro
 SRVERCP operand 133
 DFHCNV TYPE=FIELD macro
 DATALEN operand 134
 DATATYP operand 134
 DFHCNV TYPE=INITIAL macro
 CLINTCP operand 134
 SRVERCP operand 134
 DFHCNV, resource definition macro 63, 81
 coding examples 78
 coding hints 74
 example sequence 65
 macro types 63
 TYPE=ENTRY 68
 TYPE=FIELD 72
 TYPE=FINAL 74
 TYPE=INITIAL 66
 TYPE=IVP 65
 TYPE=KEY 71
 TYPE=SELECT 71
 DFHCNVDS, DSECT for field conversion records 89,
 90
 DFHIPECI resource definition group 111
 DFHSG PROGRAM=TCP macro 18
 DFHUCNV, user-replaceable conversion program 82
 conversion template 87
 DFHCNV TYPE=DSECT macro 83
 DSECT for data conversion template 89, 90
 DSECT for parameter list 84
 in conversion process 60, 62
 parameter list, DFHUCNV 83
 resource definition 22
 supplied version 91
 DFHUNVDS, DSECT for DFHUCNV parameter list 84
 distributed transaction processing (DTP) 8
 DL/I database access 4, 6, 8
 DPL (distributed program link) 6, 135
 COMMAREA 7
 performance optimization 7
 syncpointing 16
 DTP (distributed transaction processing) 8

E

EBCDIC, translation to ASCII 109, 127
 ECI (External Call Interface)
 overview 106
 restrictions on server programs 135
 EDF (execution diagnostic facility) 143
 EPI (External Presentation Interface)
 CICS_EpiAddTerminal function 116, 119
 defining Client terminals to CICS 116
 defining Client-attached printer to CICS 121
 overview 106
 restrictions on server programs 135
 ESI (External Security Interface)
 overview 107
 ESM (external security manager) 124
 execution diagnostic facility (EDF) 143
 external security manager (ESM) 124
 EXTSEC transaction attribute 35

F

field conversion records 87, 90, 91
 file security 36
 function shipping 3
 from CICS Transaction Server for Windows,
 syncpointing 16

G

generation, system 18

I

INBFMH operand, CEDA DEFINE PROFILE 20
 initialization, system 18
 installation checklist for Client support 111
 invalid DBCS characters 77
 IVP (initial program verification), data conversion
 table 65

L

- LU 6.2
 - monitoring restriction 6
 - supported functions 3, 11
- LUTYPE6.2 protocol, for Client-CICS on System/390
 - links 107

M

- messages 139
- migration
 - data conversion 145
 - moving to a client/server environment 145
 - server programs 145
- mirror program and transaction
 - definition 20
 - security 34
- monitoring restriction, CICS Transaction Server for Windows network name 6
- moving to a client/server environment 145

N

- NetName parameter
 - of CICS_EpiAddTerminal call 116, 119

O

- OPERRSL, terminalsession attribute 35
- OPERSECURITY, terminalsession attribute 35

P

- performance optimization, DPL 7
- persistent sessions, restriction on 143
- planning 11, 17
 - resource definition 11
 - syncpointing 14
- problem determination, for CICS Clients
 - abend codes 139
 - messages 139
 - trace points 139
- protocols for Client-CICS on System/390 links
 - APPC 107
 - TCP/IP 107

R

- RACF (Resource Access Control Facility) 124
- remote definitions
 - CICS Transaction Server for Windows terminals 28
 - terminals 5
 - transactions 5
- Resource Access Control Facility (RACF) 124
- resource definition 17
 - CIEO transient data queue 111
 - Client terminals
 - using autoinstall 118
 - using static definitions 116

- resource definition (*continued*)
 - connections to Clients
 - using autoinstall 112
 - using static definitions 112
 - CSCC transient data queue 111
 - data conversion 63, 81
 - defining code pages to CICS on System/390 133
 - defining the conversion table 63
 - DFHCLNT resource group 111
 - DFHIPECI resource group 111
 - LU 6.2 18
 - CONNECTION for parallel sessions 26
 - data conversion program 22
 - mirror program and transaction 20
 - remote terminal 28
 - remote TYPETERM 30
 - SESSIONS for parallel sessions 27
 - workstation TERMINAL 23
 - workstation TYPETERM 25
 - planning 11
- restrictions
 - DPL 6
 - on ECI server programs 135
 - on EPI server programs 135
 - sync levels supported 143
 - transaction routing 6
 - VTAM persistent sessions 143
- RSL attribute
 - file 36
 - program 34
 - transaction 34, 36
- RSLC, transaction attribute 34, 36

S

- security 31
 - attach-time 124
 - bind-time 124
 - CICS on Open Systems, CICS/400
 - specifications 32
 - connection 35
 - file 36
 - link 124
 - mirror program and transaction 34
 - of CICS-supplied transactions 125
 - session 35
 - signon table 36
 - system initialization parameters 125
 - temporary storage 36
 - transaction 35
 - transient data 36
 - user 36, 124
- server code page, how determined 131
- server programs
 - for use with ECI 135
 - for use with EPI 135
- server support
 - data conversion
 - binary data 133
 - client code page 127
 - server code page 131

- server support (*continued*)
 - migration 145
 - problem determination
 - messages 139
 - trace points 139
 - resource definition
 - CIEO transient data queue 111
 - Client terminals 116
 - Client-attached printer 121
 - connections to Clients 112
 - CSCC transient data queue 111
 - DFHCLNT resource group 111
 - DFHIPECI resource group 111
 - restrictions
 - on ECI server programs 135
 - on EPI server programs 135
 - sync levels supported 143
 - VTAM persistent sessions 143
 - security 124, 125
- server support for Clients
 - installation checklist 111
- sessions
 - definition (for parallel sessions) 27
 - security 35
- signon table 36
- SQL database access 6
- SRVERCP 64
- SRVERCP operand, DFHCNV TYPE=ENTRY
 - macro 133
- SRVERCP operand, DFHCNV TYPE=INITIAL
 - macro 134
- sync level support 143
- syncpointing 14, 17
 - DPL 16
 - function shipping from CICS on System/390 14
 - function shipping from CICS Transaction Server for Windows 16
 - synchronization level (synclevel) 14
- SYSDEF value for DFHCNV and SRVERCP 64
- system generation 18
- system initialization 18
- system initialization parameters
 - DFLTUSER 125
 - SEC 125
 - security-related 125
 - VTPREFIX 119
 - XTRAN 125

T

- TCP/IP protocol, for Client-CICS on System/390
 - links 107
- temporary storage, security 36
- terminal emulation 107
- Terminal Emulator
 - cicsterm command 116, 119
- trace points 139
- transaction routing 4
- transaction security 35
- TRANSEC transaction attribute 34, 35
- transient data queue, CIEO 111

- transient data queue, CSCC 111
- transient data, security 36

U

- undefined DBCS characters 77
- user security 36

V

- virtual terminals, for use by Clients 116
- VTAM persistent sessions 143
- VTAM/NCP definitions 39
- VTPREFIX, system initialization parameter 119

W

- workstation, programmable
 - LU 6.2 TERMINAL definition on CICS on System/390 23
 - LU 6.2 TYPETERM definition on CICS on System/390 25
- writing server programs
 - for use with the ECI 135
 - for use with the EPI 135

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