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HCON Guide and Reference

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Software

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About This Book

This book contains conceptual and procedural information about the Host Connection Program (HCON) facility. Topics covered include an introduction to HCON, as well as more detailed information about using, configuring, and managing HCON.

Note: The information in this book can also be found in the *Hypertext Information Base Library*. This online documentation is designed for use with the InfoExplorer hypertext retrieval system.

Who Should Use This Book

This book is intended for people who want to use, manage, and program the HCON facility. This book gives information from the most basic uses of HCON, such as invoking the facility itself, to the most complex uses, such as managing HCON sessions. It is intended for both beginners and advanced users.

Before you begin the tasks in this book, you should have a working knowledge of networks, local and remote hosts, and client/server architecture.

How to Use This Book

Each chapter lists conceptual information on the chapter topic, followed by procedural articles describing the various tasks associated with the topic.

Highlighting

The following highlighting conventions are used in this book:

Bold	Identifies commands, keywords, files, directories, and other items whose names are predefined by the system.
Italics	Identifies parameters whose actual names or values are to be supplied by the user.
`Monospace`	Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or information you should actually type.

ISO 9000

ISO 9000 registered quality systems were used in the development and manufacturing of this product.

Related Publications

The following books contain information about or related to communications:

AIX and Related Products Documentation Overview, order number 86 A2 71WE.

AIX Topic Index and Glossary, order number 86 A2 57AP.

AIX 4.1 Installation Guide, order number 86 A2 60AP.

AIX 4.2 Installation Guide, order number 86 A2 05AT.

AIX General Programming Concepts : Writing and Debugging Programs, order number 86 A2 65AP.

AIX Communications Programming Concepts, order number 86 A2 70AP.

Hypertext Information Base Library.

3270 Information Display System 3274 Control Unit Customizing Guide

3270 Information Display System 3174 Subsystem Control Unit Customization Guide

3270 Information Display System 3274 Control Unit Customizing Guide Configuration Support. Also, *3270 Control Unit Planning and Setup Customizing Guide*.

3270 Information Display System Data Stream Programmer's Reference.

SNA Format and Protocol Reference Manual: Management Services.

The 4-Port Multiprotocol Interface Adapter Technical Reference.

X.25 Co-Processor/2 Technical Reference.

O'Reilly, Tim; and Todino, Grace. *Managing UUCP and Usenet*. Sebastopol, California: O'Reilly and Associates, Inc., 1990.

Berkeley System Distribution manuals.

Dougherty, Dale; and Todino, Grace. *Using UUCP and Usenet*. Sebastopol, California: O'Reilly and Associates, Inc., 1987.

Ordering Publications

You can order publications from your sales representative or from your point of sale.

If you received a printed copy of *Documentation Overview* with your system, use that book for information on related publications and for instructions on ordering them.

To order additional copies of this book, use order number 86 A2 74WG.

Contents

Chapter 1. Host Connection Program Overview

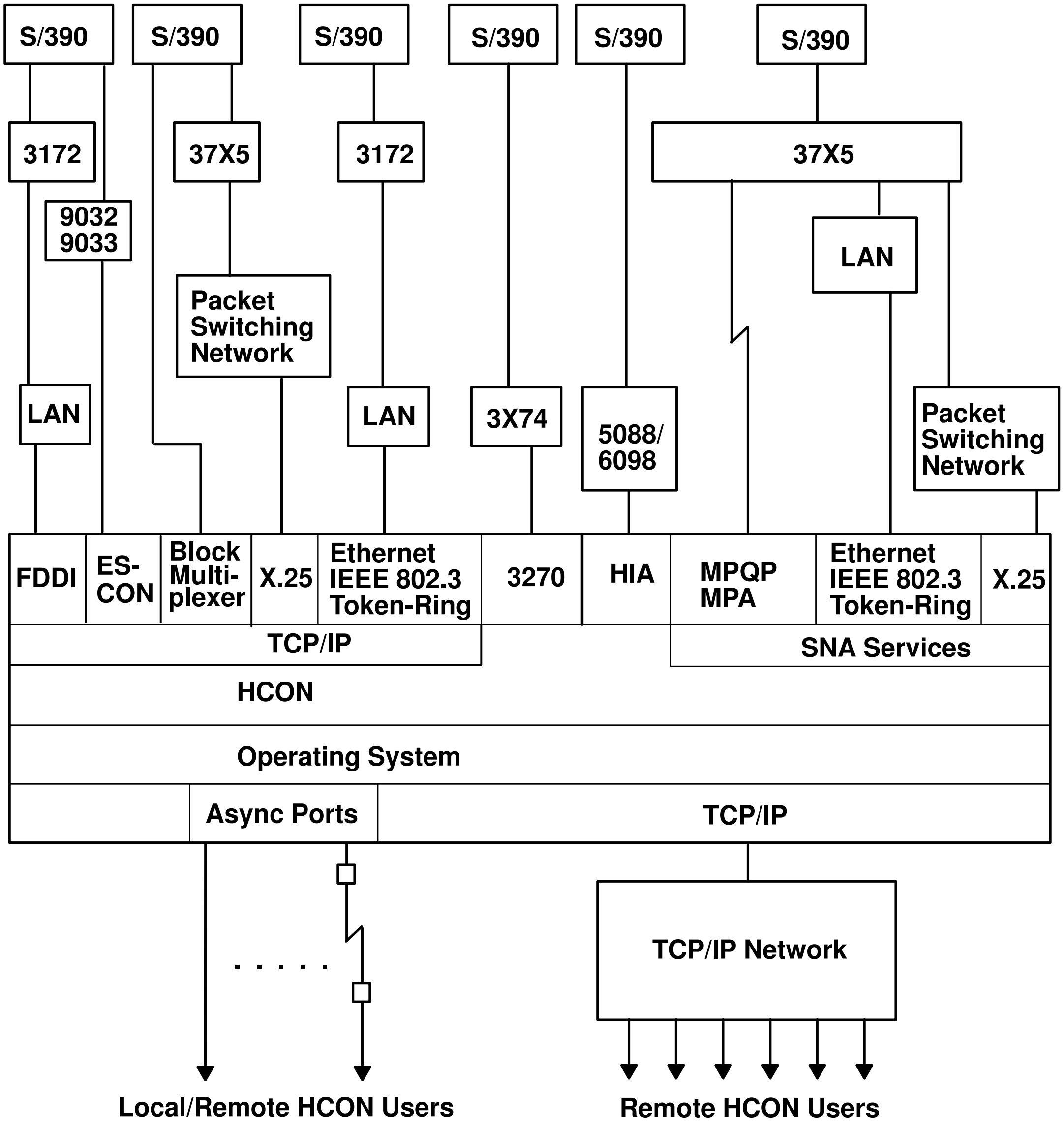
The Host Connection Program is a 3270 connectivity application for the AIX environment. The Host Connection Program (HCON) emulates a subset of 327X functions and features, and it allows end users at AIX terminals to connect to an IBM System/370 host and appear to the host as an attached IBM 3270 Display Terminal or printer. HCON facilitates file transfers between the workstation and the IBM System/370 host, allows printer emulation, and provides High-Level Language Application Programming Interface (HLLAPI) support for user-provided workstation applications to communicate with 3270 sessions.

HCON connectivity can be:

- System Network Architecture (SNA) connection in a Type 2.1 low-entry networking (LEN) node attachment
- Distributed Function Terminal (DFT) SNA attachment to an IBM 3274/3174 or IBM 9370 Workstation Subsystem Controller
- Transmission Control Protocol/Internet Protocol (TCP/IP) Telnet 3270 connection
- DFT Non-SNA attachment to a 5088/6098 Graphics Control Unit.

The SNA Node T2.1 and TCP/IP capability can operate over a wide area network (WAN), allowing users at a remote work group location access to the services and facilities of an IBM System/370 or System/390 Host. This protocol also supports the IBM Token-Ring or Ethernet network, which allows users to access these same services and facilities over a local area network (LAN). The coax DFT attachment uses the 3274/3174 in both SNA and non-SNA mode and supports up to five sessions per IBM 3270 Connection Adapter.

The HCON Connectivity figure illustrates the connectivity capability of HCON.



HCON Connectivity

HCON Capabilities

The HCON 3270 emulation program:

- Provides IBM 3278/79 display emulation support on ASCII terminals, including the IBM 3151, IBM 3161, IBM 3162, IBM 3163, IBM 3164, DEC VT100, DEC VT220, WYSE WY-50, WYSE WY-60 and WYSE WY-370.
- Supports multiple host sessions within a single AIX terminal using AIXwindow support.
- Provides features using the AIX window interface, including menu bar support and light-pen simulation using a mouse. These features require the (X11R5) with Motif version 1.2.
- Supports the 3278/79 Models 2, 3, 4, and 5. Models 3, 4, and 5 are only available on aixterm sessions, Xstations, or xhcon run in AIXwindows. Model 5 is also available on the IBM 3151 with Expansion Cartridge.
- Supports the IBM 3286/87 printer emulation.

- Supports DFT connection through the 3270 Connection Adapter. The mainframe system console attachment using DFT is also supported. Each model can support up to four adapters, and each adapter can have up to five active sessions for the following interfaces:
  - 3174 or 3274 Control unit
  - 4361 Workstation adapter
  - 9370 Workstation subsystem controller
- Supports up to 16 sessions by connecting to the IBM 5088 Graphics Channel Controller or 6098 Channel Control Unit through the System/370 Host Interface Adapter.
- Permits more than one active session per user up to a maximum of 26 per user. (The total number of user sessions cannot exceed the number of sessions available through the hardware interface connections.)
- Provides extended data stream support for seven colors plus either reverse video, underlining, or blink. The actual attribute displayed depends on the capabilities of the display.
- Grants file transfer:
  - Support for queued or immediate file transfer requests
  - Support for C and FORTRAN programming interface to file transfer
- Supports industry-standard HLLAPI support using C, FORTRAN, and COBOL languages:
  - Workstation-application control of emulation session in an operatorless environment
  - Workstation-application control of keystrokes in an operatorless environment
- Provides utility session support where the frequently used utilities are centralized. HCON allows:
  - Color redefinition
  - Keyboard redefinition
  - Session logon and logoff automatically with generation of session logon/logoff scripts
  - File transfer support implicitly or explicitly
- Enables a user to interact with HCON on either a local or remote X server, or remotely by using TCP/IP, Telnet, or remote login. When running remotely, the user must be aware that host connection functions are executed on the “connected-to” system. The display emulation functions are viewed where the user’s terminal is running, but other host connection functions can run and affect files (by file transfer) and facilities (such as printers) on the “connected-to” system rather than the local system.
- Provides support for the SNA Logical Unit (LU) pooling to improve LU resource management and administration by:
  - Monitoring a specific LU pool during peak hours to help ensure fair distribution
  - Aiding to identify congested pools and low-usage pools
  - Displaying the status of each LU for session management and host problem determination

HCON’s features and connectivity capabilities are detailed in Chapter 2 “Using Host Connection Program”on page 2-1.

National Language Support

This program includes National Language Support (NLS) for both single-byte character set (SBCS) and double-byte character set (DBCS). Actual SBCS character presentation on ASCII display terminals may be limited by a particular display terminal’s capability, and the use of international names can be restricted in the customization of color and keyboard mapping.

NLS overall characteristics include:

- International Language Support (ILS) for all SBCS countries currently supported by AIX Japanese, Korean and Traditional Chinese language support using DBCS.
- Multiple sessions in different national languages are concurrently supported with some restrictions.
- Message handling is supported by these programs by providing messages, panels, and prompts that can be translated. The translatable material is separated from the program executable code.

The Japanese Language Support program characteristics includes support for the:

- IBM 3270 KANJI display emulation support on the Xstation. Multiple host sessions are supported within a single AIX terminal or across multiple virtual terminals on the high-function terminal (HFT). KANJI display sessions only can operate on an aixterm within the AIXwindows environment, supporting KANJI input and output operations, or the PS/55 with DEC VT100 interface using an ASCII terminal. The PS/55 requires both of the following:
  - Nihongo DOS Version K3.3 and up
  - Nihongo Procomm 4500-JCK or 5605-JCK.
- 3278/79 Models 2, 3, 4, and 5.
  - IBM 3270 KANJI printer emulation on printers with the capability to handle DBCS and field outlining.
- IBM 3270 KANJI stream.
- DBCS-Asia Query Reply and the Character Sets Query Reply Character set IDs and code page IDs for Japanese Language Support, including the following:
  - Japanese Katakana-SBCS (CS-CP: 332-290)
  - DBCS (370-300)
  - Japanese English-SBCS (101-037)
  - DBCS (370-300)
  - Operator-controlled single- or double-byte editing using Shift-in Shift-out (SI/SO) through a special key sequence.
- Expanded extended data stream for field outlining capability.
- Alternate Viewing Mode allowing users to switch the displaying character set between Japanese Katakana and Japanese English by a local key operation.
  - KANJI character input by using the DBCS Input Method and Kana-Kanji Conversion (KKC) function provided by the AIX Version 3.
- File transfer with additional file transfer command option flags for Japanese host file transfer program support. These option flags are not supported for C and FORTRAN programming interfaces.

The High-Level Language Application Program Interface (HLLAPI) does have DBCS language support.

Machine Requirements

The following are fixed-disk storage requirements for the AIX 3270 Host Connection Program licensed program:

3270 Host Connection Program
4.10 MB

Messages/Help Text
0.30 MB (per language)

Memory and fixed-disk requirements for other licensed programs, user applications, and data are not included in the above. Carefully review all system, memory, and fixed-disk requirements with your marketing representative.

HCON also runs on the following ASCII terminals using 3278/79 Model 2 emulation or Model 5 on IBM 3151 using the expansion cartridge (these terminals cannot be used for DBCS language support):

- IBM 3151
- IBM 3161
- IBM 3162
- IBM 3163
- IBM 3164
- DEC VT100
- DEC VT200
- WYSE WY-50
- WYSE WY-60
- WYSE WY-370

HCON provides National Language Support for 3151 and 3164 terminals using ISO8859–1.2 code set. The support can be provided using the appropriate NLS cartridge.

HCON supports IBM 3286/87 printer emulation with printers that use PC-ASCII data stream. HCON also supports IBM 3270 DBCS printer emulation for the following printers with the capability to handle DBCS character and field outlining:

- IBM 5572-B02
- IBM 5575-B02/F02/H02
- IBM 5577-B02/F02/G02/H02
- IBM 5579-H02
- IBM 5587-G01/H01
- IBM 5327-011
- IBM 4208-502
- IBM 4216-510
- IBM 4019

Note: The enhanced functions of the IBM 5587 printer are not supported.

Connection Requirements

Interfaces for connection to a System/390 can be one or more of the following network communication adapters:

- For coaxial attachment, the IBM 3270 Connection Adapter (#2990) (22F0189) with appropriate cables for attachment to:
  - an IBM 3174/3274 Control Unit
  - an IBM 4361 Workstation Adapter
  - an IBM 9370 Workstation Subsystem Controller configured for distributed function terminal mode.
- For coaxial attachment, the IBM System/370 Host Interface Adapter with appropriate cables for attachment to an IBM 5088/6098 Graphics Control Unit.

  Both SNA and non-SNA are supported.
- For SNA Node T2.1 attachment, display and printer LU types 1, 2, and 3 are supported. (AIX SNA Services is a prerequisite.)
  - 4-Port Multiprotocol Communications Controller (30F8813) for attachment to a WAN. Physical interface type is RS232D/V.24, V.35, and X.21.
  - Single-port Multiprotocol Adapter/2.
  - X.25 Interface Co-Processor/2 Adapter providing support for attachment to X.25 packet-switched data network. The supported physical interfaces are X.21 and X.21 bis (V.24, V.35).
  - Token-Ring High-Performance Network Adapter.
  - Ethernet High Performance LAN Adapter.

- For TCP/IP attachment using the Telnet 3270 function, the following are supported:
  - Token-Ring High-Performance Network Adapter
  - Ethernet High-Performance LAN Adapter
  - X.25 Interface Co-Processor/2
  - Fiber Distributed Data Interface (FDDI) Connectivity
  - Block Multiplexer Channel Connectivity
  - ESCON Channel Connectivity
  - Serial Optical Channel Converter Adapter

Users at a remote location may access the services and facilities of a System/390 host. Depending on the network topology and controller requirements, the connection to the System/390 host may be as follows:

- SNA T2.1 for LU types 1, 2, and 3 with the following prerequisite for the SNA Services licensed program:
  - LAN (Token-Ring or Ethernet) and WAN (X.25 and SDLC) access using 37X5 or 3174 communication controllers.
- DFT coaxial connection when attaching to a 3X74 or the equivalent:
  - For SNA mode, display session (LU type 2) is supported.
  - For non-SNA mode, both display and host-addressable printer sessions are supported.
- TCP/IP connection for display session using the Telnet 3270 option:
  - LAN (Token-Ring, IEEE802.3, Ethernet, and IBM Fiber Distributed Data Interface (FDDI) Connectivity) access using the appropriate 8232 or 3172 Interconnect Controller
  - WAN (X.25) access using the 37X5 controller
  - Direct attachment using the Block Multiplexer Channel Connectivity or the ESCON Channel Connectivity
  - Serial Optical Channel Converter attaching to an NSC DX router hyperchannel attachment to a System/370 processor

Programming Requirements

HCON requires AIX (5756-030) and runs on the POWERstations. HCON requires one of the following System/390 operating system environments:

- VM/SP CMS
- VM/XA CMS
- MVS/SP TSO/E
- MVS/XA TSO/E
- CICS/VSE
- CICS/MVS
- VSE/SP Version 4
- VSE/ESA Version 1.3

For SNA T2.1 connection to the host, VTAM Version 3.2 or above is recommended.

HCON requires one of the following programs be installed on the System/370 or System/390 host to support file transfer:

- System/370 or System/390 Host-Support File Transfer Program (IND$FILE) for Virtual Machine/Conversational Monitor System (VM/CMS) (5664-281).
- CICS/VS 3270 PC File Transfer Program (5798-DQH) is required for CICS/VSE, CICS/MVS, CICS/ESA and CICS/MVS/ESA. For VSE/SP and VSE/ESA, no prerequisite programs are needed. All required programs are part of the base VSE operating system support.
- Host-Support File Transfer Program (IND$FILE) for Multiple Virtual Systems/Time Sharing Option (MVS/TSO (5665-311).

At least one of the following programs must be installed on the System/370 or System/390 host to support file transfer for files that consist of SBCS or DBCS text:

- VM/CMS File Transfer Program Version 1.1 (5799-BWK)
- VM/CMS File Transfer Program Version 2.1 (5799-PGX) MVS/TSO File Transfer Program Version 1.1 (5799-BWJ)
- MVS/TSO File Transfer Program Version 2.1 (5799-PGY)
- CICS (MVS/VSE) File Transfer Program Version 1.1 (5799-BWL)
- CICS (MVS/VSE) File Transfer Program Version 2.1 (5799-PGZ)

Limitations

HCON does not support the following 3270 functions:

- Security keylock
- Magnetic reader control and accessories
- Monocase switch
- Video output
- APL/text character set
- Programmed symbols
- Alternate cursor
- Cursor blink
- Explicit partitions
- Numeric lock
- Response time monitor for an IBM 3174 or 3274 Control Unit
- Control Unit printing support for 3287-attached printers by using the PRINT key

Chapter 2. Using Host Connection Program

The Host Connection Program (HCON) emulates a 3278/79 display or a 3286/87 printer attached to a System/370 mainframe host. This chapter provides information on using HCON, especially for new users, on connectivity, and on machine requirements.

HCON operates in *sessions*, periods of interaction with a host computer. A *printer session* emulates a 3286/87 printer. A *display session* emulates a 3278/79 terminal display. A printer session prints files from the host computer on a local printer or stores printable files on the local system. At the beginning of a display session, the emulator acts as if you had just started the 3278/79 terminal. After logging on to the mainframe host, you can:

- Run commands or start applications running on the S/390.
- Run programs that communicate with the mainframe host using High-Level Language Application Programming Interface (HLLAPI).

  Note: This interface is compatible with the (3270 PC) HLLAPI Version 3.00. For more information, see the “High-Level Language Application Programming Interface”on page 4-1.

- Use the **fxfer** command to upload and download files to and from the host.

HCON is only accessible to registered users. Registration requires root authority and involves entering a user login ID. Once registered, you or a user with root authority must create at least one *session profile* before running HCON. The session profile specifies the following parameters for emulator sessions:

- Type of host
- Type of emulation, display, or printer
- Type of connection with the host
- Local printer name for printer emulation
- Type of protocol with the host, such as TCP/IP, SNA, or DFT

A session profile enables a connection session from the workstation to a S/390 host, using similar or differing parameters. Session characteristics are defined in the session profile. Each session requires a predefined session profile. This includes characteristics such as:

- Language or code page
- Color and keyboard definition tables
- Host field and character attributes
- Terminal key locations and key sequence
- Session profile tables
- Display screen size
- Miscellaneous session-related information

The HCON High-Level Language Application Programming Interface (HLLAPI) allows communication with a mainframe host in different environments. Applications can be created to simulate an interface requiring no user intervention for program-to-program communication and data translation.

S/390 Host Double-Byte Character Set Emulation

HCON allows emulation for a double-byte character set (DBCS) (Japanese, Korean, and Traditional Chinese) display or a printer attached to a S/390 mainframe host. DBCS operation provides one- and two-byte character set support.

A DBCS emulation session operates in a window environment that supports DBCS data input and output operations. Printer sessions need a printer with capability to handle double-byte characters and field outlining.

A DBCS environment:

- Allows input of double-byte characters from the keyboard. The DBCS input method for Japan, Korea, and Traditional Chinese are provided by the operating system.
- Enables both display and printer sessions.
- Enables shift out (SO) or shift in (SI) mode with indicators on the screen.
- Allows selection of files for the **genxlt** command. The **genxlt** command generates custom translation tables for input/output and file transfer operations.
- Enables up- and downloading of files, including double-byte text, to and from the host using the **fxfer** command. The **fxfer** command provides the **–l** and **–s** flag options to support the two host code pages and to handle SO/SI. The **fxfer** command also provides the **–b**, **–e**, **–k**, **–M**, **–c**, **–C**, **–J**, and **–N** flags to support the host options of the APVUFILE file transfer program.

Note: HLLAPI supports the DBCS environment.

With Japanese Language Support, a DBCS environment:

- Allows selection of the host code page for Japanese Language Support, either Japanese-English or Japanese Katakana.
- Uses Alternate Viewing mode to switch the displayed character set, by a local key operation, between Japanese-English and Japanese Katakana.

Note: The Keyboard mode and Shift indicators, such as Alphanumeric and Japanese code page indicators, such as Katakana or Hirangana, are not displayed in the Operator Information Area (OIA). These indicators are displayed in the Status Area of an AIXTerm (the top right area of the window border).

HCON Sessions and Session Profiles

A display session begins with a logon to a mainframe host and ends when the connection is closed. The **e789**, **xhcon, e789pr**, and **fxfer** commands, and the High-Level Application Programming Interface (HLLAPI) establish display and printer sessions. Session profiles establish display and printer session defaults. The session can be started using the following commands with the session identifier that contain a set of predefined session information.

e789 Starts a display session from an ASCII display, AIXTerm, or the HFT session.

xhcon Starts a display session using the AIXwindow interface.

e789pr Starts a printer session.

Display Sessions

Display sessions emulate a 3278/79 display terminal connected to a mainframe host. HCON supports four types of display sessions. The sessions are device-specific and include:

DFT display session
Uses the 3270 Connection Adapter in Distributed Function Terminal (DFT) mode.

Note: SNA Services software is *not* required for a DFT session.

SNA standalone session
Uses a 4-Port Multiprotocol Communications Controller, Single Port Multiprotocol Adapter/2, X.25 Interface Co-Processor/2, or Token-Ring High-Performance Network Adapter or Ethernet High-Performance LAN Adapter along with the SNA Services software.

Note: SNA Services software is required.

HIA display session
Uses the Host Interface Adapter (HIA).

TCP/IP display session
Uses a Token-Ring High-Performance Network Adapter, Ethernet High-Performance LAN Adapter, X.25 Interface Co-Processor/2, Block Multiplexer Channel Adapter, FDDI Adapter, or the ESCON Adapter.

Printer Sessions

A printer session emulates a 3286/87 printer. A printer session prints files from the host computer on a local printer or stores printable files on the local system. The printer session process executes in the background. There is no keyboard or display screen associated with the session. Using the System Management Interface Tool (SMIT) control option, you can activate or deactivate session.

Two types of printer sessions are supported:

Non-SNA DFT session
Uses the 3270 Connection Adapter in Distributed Function Terminal (DFT) mode.

SNA standalone session
Uses any appropriate adapter as a prerequisite for the SNA Services software.

Session Profiles

Session profiles define the characteristics of either a printer or a display session. Define session profiles using:

SMIT dialogs Provides online help and selectable session characteristics. Each characteristic, other than session type, has an associated field in the SMIT session-profile dialogs. SMIT also provides options to add, change, remove, or list session profiles. SMIT-created shells can define multiple profiles. To start SMIT for use with HCON, enter the **smit hcon** fast path command.

HCON commands

Requires an associated flag for each profile characteristic. Use these HCON commands to work with session profiles from the command line:

mkhcons	Creates a session profile.
chhcons	Changes an existing profile.
rmhcons	Removes a session profile.
lshconp	Lists a user's session profiles.
lshcons	Lists the characteristics of a session.
clhcons	Specifies the session type of an existing profile.

Note: Specifying a printer characteristic when defining a display session or specifying a display characteristic when defining a printer session causes an error. SMIT dialogs show only the characteristics appropriate to the type of session in use.

HCON Profile Fields and Associated Command Flags

HCON session characteristics are specific to the session type.

Display Sessions

This table shows valid SMIT dialog fields and flags for the **mkhcons** and **chhcons** commands for display sessions.

Valid Profile Fields and Associated Command Flags for Display Sessions

Session Characteristic		**Session Type**		
SMIT Dialog Field	**Flag**	**DFT Display**	**SNA Standalone Display**	**TCP/IP Display**
Autolog Node ID	**–a**	Yes	Yes	Yes
Max Buffer Size	**–b**	Yes	Yes	Yes
Color Table	**–c**	Yes	Yes	Yes
Fxfer Direction	**–d**	Yes	Yes	Yes
Fxfer Program	**–f**	Yes	Yes	Yes
Keyboard Table	**–k**	Yes	Yes	Yes
Language	**–l**	Yes	Yes	Yes
Model Number	**–m**	Yes	No	Yes
Session Name	**–n**	Yes	Yes	Yes
Device Name	**–p**	Yes	No	No
Fxfer Wait	**–q**	Yes	Yes	Yes
Replace File Name	**–r**	Yes	Yes	Yes
Save File Name	**–s**	Yes	Yes	Yes
Session Type	**–t**	Yes*	Yes*	Yes*
Session Use	**–u**	Yes	Yes	Yes
Print File	**–v**	No	No	No
SNA Logical Connection Profile	**–w**	No	Yes	No
Host Logon Name	**–x**	Yes	Yes	Yes
Port Address	**–C**	No	No	No
Host Type	**–H**	Yes	Yes	Yes
Logon Name	**–N**	Yes	Yes	Yes
Local Printer Name	**–P**	Yes	Yes	Yes
Fxfer Recover Time	**–R**	Yes	Yes	Yes
Enable Autolog Trace	**–T**	Yes	Yes	Yes
Autolog Timeout	**–W**	Yes	Yes	Yes
Host Name	**–I**	No	No	Yes

*Valid only when creating a new session profile.

Printer Sessions

This table shows valid SMIT dialog fields and flags for the **mkhcons** and **chhcons** commands for printer sessions.

Valid Profile Fields and Associated Command Flags for Printer Sessions			
Session Characteristic		**Session Type**	
		Non-SNA	**SNA**
SMIT Dialog Field	**Flag**	**DFT Printer**	**Standalone Printer**
Autolog Node ID	**–a**	No	No
Max Buffer Size	**–b**	No	No
Color Table	**–c**	Yes	Yes
Fxfer Direction	**–d**	No	No
Fxfer Program	**–f**	No	No
Keyboard Table	**–k**	Yes	Yes
Language	**–l**	Yes	Yes
Model Number	**–m**	No	No
Session Name	**–n**	Yes	Yes
Device Name	**–p**	Yes	No
Fxfer Wait	**–q**	No	No
Replace File Name	**–r**	No	No
Save File Name	**–s**	No	No
Session Type	**–t**	Yes*	Yes*
Session Use	**–u**	Yes	Yes
Print File	**–v**	Yes	Yes
SNA Logical Connection Profile	**–w**	No	Yes
Host Logon Name	**–x**	No	No
Port Address	**–C**	Yes	No
Host Type	**–H**	No	No
Logon Name	**–N**	Yes	Yes
Local Printer Name	**–P**	Yes	Yes
Fxfer Recover Time	**–R**	No	No
Enable Autolog Trace	**–T**	No	No
Autolog Timeout	**–W**	No	No
Host Name	**–I**	No	No

*Valid only when creating a new session profile.

Xwindow 3270 Emulator (xhcon)

The **xhcon** command is the Motif version of the **e789** command. It has all of the functionalities of the **e789** command. However, some new features are supported:

- Mouse function
  - cursor movement and control
  - light-pen support
- Access 3270 function keys via push buttons
- Dynamic window size for multiple sessions

The following software is required to use the **xhcon** command:

- X Window System Version 11 Release 5
- OSF/Motif Version 1.2

Customizing the xhcon Command

The **xhcon** command uses the **hconutil** utility to customize the color and keyboard configuration so that the **e789** and **xhcon** commands can run interchangeably. The **xhcon** command also requires the Motif default resources from the **/usr/lib/X11/app–defaults/XHcon** file. These default resources are:

- Bindings for the virtual key events `defaultVirtualBindings`:

```
osfMenuBar: Ctrl<Key>F10 \
osfRight: <Key>Right \
osfDown: <Key>Down \
osfUp: <Key>Up \
osfCancel: <Key>Escape \
osfLeft: <Key>Left
```

- Background color if it is not already defined by the **hconutil** utility:

```
*background:            SteelBlue
```

- Foreground color if it is not already defined by the **hconutil** utility:

```
*foreground:            White
```

- Color of the scroll bar slider trough:

```
*troughColor:           White
```

- Color of the highlighted rectangle:

```
*highlightColor:        Red
```

- Font to draw the text:

```
*fontSet : -ibm--medium-r-medium--20-14-100-100-c-90-*
```

- Color to draw the field outline box:

```
*fieldOutlineColor:     White
```

- Cursor style, block/full cursor, or underscore:

```
*fullCursor:            True
```

Note: Do not change the `defaultVirtualBindings` resource because the `osfMenuBar` binding will disable the 3270 F10 function key. Use the Ctrl-F10 key combination to activate the menu bar.

For international language support, the double-byte character set (DBCS) countries have their own application default resource file located in **/usr/lib/X11/<LANG>/app–defaults/XHcon**. For example, for DBCS countries, the default resource files are:

```
Japanese: /usr/lib/X11/Ja_JP/app-defaults/XHcon

Korean: /usr/lib/X11/ko_KR/app-defaults/XHcon

Traditional Chinese: /usr/lib/X11/zh_TW/app-defaults/XHcon
```

To display text correctly, the following `fontSet` resources are recommended for each country:

```
Japanese: –ibm_aix-gothic–medium–r–normal––19–120–100–100–m–*–*–*

Traditional Chinese:
          –ibm_aix–sung–medium–r–normal––27–170–100–100–m–*–*–*

Korean:   –ibm_aix–myungjo–medium–r–normal––*–*–*–*–*–*–*–*

ISO–8859: –ibm––medium–r–medium––20–14–100–100–c–90–*
```

These default resources can be overriden by the standard **.Xdefaults** file in your local home directory.

Mouse Function

In an X Window System environment, the mouse is the ideal mechanism to emulate the light-pen. With a mouse, you can activate a light-pen selectable field or trigger field, or move the cursor to a new location by clicking on a mouse button.

The following list shows the action taken when a mouse button is clicked:

Button	**Action**
1	Move cursor to new location.
2	Activate a light-pen selectable filed or trigger field.
3	Not used.

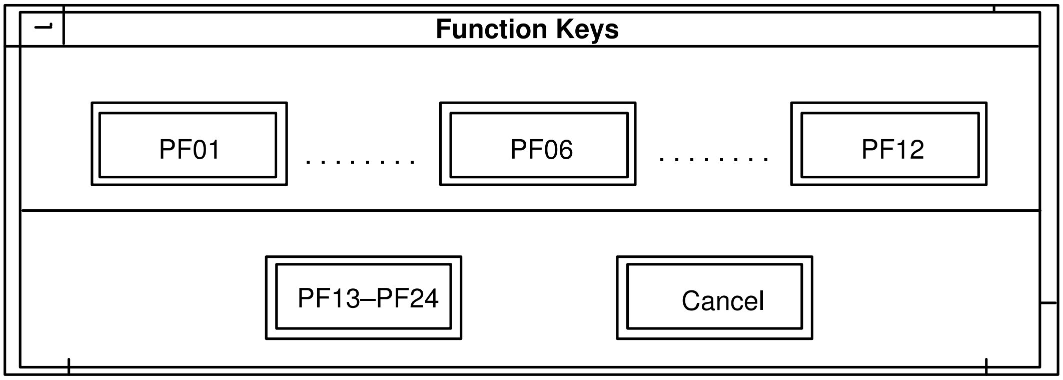
Button 2 provides the same function as the CURSEL (cursor select) key.

Note: Cut and Paste function is not supported.

Access Function Keys through Push Buttons

This feature allows you to select and run function keys by using push buttons. A pop-up window containing the push buttons for each of the function keys is displayed when you select Function Keys from the menu-bar option list. Once the Function Keys button box is displayed and the buttons are placed on the screen, you can move them to any location on the screen. The initial window displays the first 12 function keys and you can select the next set of 12 function keys by clicking a push button. The **hconutil** command can be used to configure the action of each button.

The Function Key Window screen shows the layout of the Function Key window when it is first activated.



Function Key Window

When your session is iconified, the Function Key window will also be iconified.

Dynamic Window Size for Multiple Sessions

The user interface can run multiple sessions in one window, the window is resized to fit each sessions geometry configuration. The window size is part of the session definition using SMIT. For the DFT and TCP/IP sessions, the window size remains constant as specified in the session configuration profile. However, the SNA T2.1 session window size will change in accordance to the BIND parameters specifications.

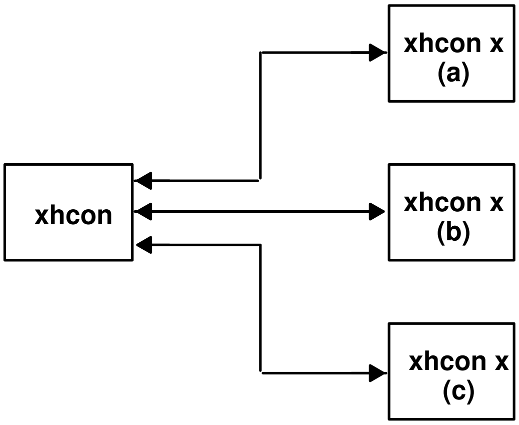
xhcon Process

Like the **e789** process, the **xhcon** command invokes the **xhcon** process which starts the **xhconx** process for each session. For example:

```
xhcon abc [ options ]
```

starts one instance of the **xhcon** process and three instances of the **xhconx** process for session a, b, and c.

The process hierarchy can be represented as follows:



Process Hierarchy

XDesktop Startup

xhcon may be started from the AIXwindows Desktop using its Application Manager. Use the following steps:

1. Log on to AIXwindows Desktop.
2. Open an Application Manager window. Make sure you are at the top level if the current level is not the top level.
3. Double-click on the xhconstart icon to bring up an xhconstart window.
4. Select sessions and options for HCON:
   - Select options:
     - Disable Typeahead

       When this option is selected, all keyboard inputs, including AID keys, are discarded during input-inhibited condition except the SysReq, Attn, and Control keys.
     - Other Options

       This field is reserved for future options.
   - Select sessions:
     - All Configured

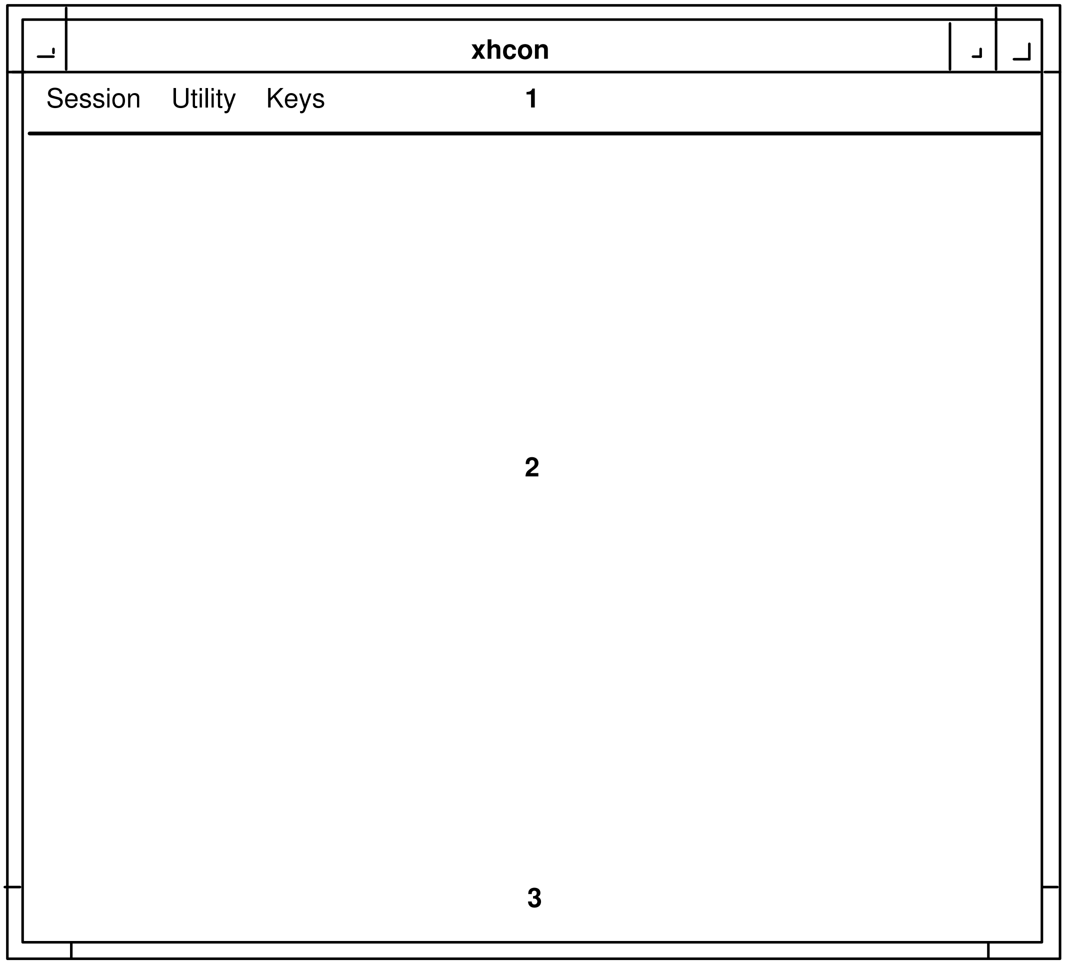
       Start all sessions that have previously been defined.
     - Individual sessions

       Start one or more individual sessions that have previously been defined.
5. Select the Start button to start the **xhcon** window.

Note: Alternatively, the Cancel button closes the xhconstart window.

Window Characteristics

Once the window is displayed, the window consists of the following components, as depicted in the Window Characteristics figure on page 2-11.



Window Characteristics

Menu Bar: The user can select **Sessions**, **Utility**, and **Keys** from the session menu bar.

Sessions: The session option is used for session navigation and termination. Choose from the following buttons from this menu:

Button **Description**

Next Makes the next session the active session. Same as the next session key. This button is active if **xhcon** is started with more than one session.

Specific Session
Selects the next active session from a list of sessions. This button is active if the **xhcon** command is started with more than two sessions.

Close This Session
Ends the current active session. If the **xhcon** command is started with more than one session, the next session in the list is active. Otherwise, **xhcon** is stopped.

Close All Sessions
Ends the **xhcon** process.

Utility: This option is a productivity session for various personal configurations. The following button may be selected from this menu:

Button	Description
Hconutil	Activates the **hconutil** utility in an AIX window. Once this window is displayed, you can move to any location on the screen or iconify it. For each active session, only one **hconutil** process can be activated. If you make any configuration changes, the changes will not take effect until you end the **hconutil** command. When you terminate the **xhcon** process, the **hconutil** command also terminates.

Keys: This option is a fast path for activating PF keys using the mouse. The following button can be selected from this menu.

Button	Description
Function Keys	Selects and runs function keys. Refer to "Access Function Keys through Push Buttons" on page 2-8 for more information concerning function keys.

Presentation Space Area:
The Presentation Space (PS) area is used to display the data received from the host. The PS window size is depended on the font size and the number of rows and columns. During its startup procedure, the **xhcon** command sets the maximum and minimum window size for the current active session. Consequently, you cannot enlarge the PS window beyond the maximum size or shrink the window below the minimum size. If you make the window smaller, you can use the scroll bar to scroll the window.

Operator Information Area:
The Operator Information Area (OIA) is used to display status information such as keyboard lock and session activity. The OIA window size is a constant value based on the maximum height of the character fonts and you cannot shrink the window. In DBCS mode, a status window, reporting the input or keyboard status of the input method to the users, is attached to the bottom of this window.

3270 Emulator

The **e789** command emulates a 3278/79 display attached to a System/390 computer. The **e789pr** command emulates a 3286/87 printer attached to a System/390 host.

The **e789** and **xhcon** commands emulate a 3278/79 display attached to a System/390 computer. The **e789pr** command emulates a 3286/87 printer attached to a System/390 host.

The **e789** and **xhcon** commands are available for 3270 display emulation, depending on the terminal type and user-interface preference. The selection can be:

e789 Works with an ASCII display or an AIX terminal.

xhcon Works in an X Windows environment with Motif user-interface requiring an high-function terminal (HFT) or Xstation.

The emulator functions as a 3278/79 terminal and is in session with the S/390 if the connection is properly configured. Use the session to:

- Run commands and applications interactively.
- Initiate a host-addressable printer session.
- Upload and download files to and from the host.
- Change the format of the data in the files as you transfer them.

A printer session runs in the background. In a printer session, you can:

- Send host files to a local printer as if the local printer were attached directly to the host.
- Save files from the host in printable form in a local file.
- Control a printer session with the SMIT control menu.

For specific aspects of the **e789**, xhcon, and **e789pr** commands, see:

- 3270 Keyboard (on page 2-14)
- Operator Information Area (OIA) (on page 2-19)
- Using Default 3270 Keyboards (on page 2-26)

Note: An HCON double-byte character set (DBCS) emulator session operates only in an aixterm or xhcon session within the windows environment.

3270 Keyboard

The Host Connection Program's **e789** and **xhcon** commands provide special characteristics for using the 3270 keyboard.

Keyboard Locking and Unlocking Criteria

The 3270 keyboard is locked under conditions indicated in the Operator Information Area (OIA):

Indicator	Condition
`X ( )`	The host is updating the display screen.
`X SYSTEM`	The local system is sending data to the host system.
`X < 0 >`	No session activity exists and the user is entering data into a protected field. If this condition exists, the keyboard can be unlocked with the RESET key or an Attention key.

The Presentation Space (PS) emulator screen contains fields and field attributes. When an attribute is reached while typing data into a field, the cursor automatically moves to the next unprotected field location instead of locking the keyboard and leaving the cursor on the attribute. Cursor movement keys unlock the keyboard in addition to performing their standard functions. Usually, a keyboard locks because of an attempt to enter data in an incorrect place.

Use the following cursor movement keys to unlock the keyboard:

Key Name	Function
LEFT	Cursor left
RIGHT	Cursor right
DOWN	Cursor down
UP	Cursor up
HOME	Cursor home
ENDF	End field
LENDF	Left end field
TAB	Forward tab
BTAB	Backward tab
NEWLINE	New line
ERASE	Erase input
RESET	Reset
BACKSPACE	Backspace
FTABW	Forward word tab
BTABW	Backward word tab

If, as the result of trying to insert characters into a full field, the keyboard locks and `X 0 >` (uppercase X, zero, greater-than symbol) displays in the OIA, the INSERT, DELETE, or DELWORD key unlocks the keyboard. If the keyboard locks and `X -f` (uppercase X, minus f) displays in the OIA, any Attention key unlocks the keyboard (as well as performing its standard function).

Special Keys

The special keys include functions that appear on the 3278/79 keyboards, such as PF1 and ENTER, and special emulator keys, such as DELWORD and FTABW, that move the cursor, add and delete text, and switch active emulator screens.

Each special emulator key has a default key sequence. By using the keyboard definition utility, different key sequences can be assigned to a specific key function.

Attention Keys

Includes the CLEAR, ENTER, PF1 to PF24, PA1 to PA3, CURSEL (cursor select), SYSREQ, and ATTN keys.

Note: The SYSREQ and ATTN keys are only used for SNA connections. The ATTN key is always supported by TCP/IP.

BACKSPACE and **BACKF Keys**
Deletes the character under the cursor and moves the remaining characters in the field to the left. If a field contains several lines, characters move from one line to another.

The functional difference between the BACKSPACE and BACKF keys is the processing performed when an attribute byte is deleted. The BACKSPACE key moves the cursor to the left when the cursor is on a protected screen location. It does not lock the keyboard or jump fields.

In an SBCS field, when the BACKF key detects an attribute byte while backspacing, it moves the cursor to the last nonnull, nonspace character of the previous unprotected field and erases it. In a DBCS field, when the BACKF key detects an attribute byte while backspacing, it moves the cursor to the last nonnull, nonspace, nonshift-in (SI) character of the previous unprotected field and erases it.

CHGDIS Switches to an auxiliary display if one is operating. If the auxiliary display is not started or if the secondary display card has no display attached to it, the CHGDIS key appears to lock up the current physical display. This happens because the emulator is trying to use the secondary display and is not aware of its unavailability. The **xhcon** command does not support this function.

CLICK Toggles keyboard clicking on or off. The **xhcon** command does not support this function.

Cursor Movement Keys
Moves the cursor. The keys and resulting cursor movements include:

Key	**Moves Cursor:**
LEFT	One position to the left
LLEFT	Two positions to the left
RIGHT	One position to the right
RRIGHT	Two positions to the right
DOWN	Down one position
DDOWN	Down two positions
UP	Up one position
UUP	Up two positions

DELETE Deletes the character located at the cursor. The cursor does not move. All remaining characters to the right of the cursor in the same field shift one or two columns to the left, depending on whether a single-byte or double-byte character is deleted. This key also unlocks the keyboard if `X 0 >` (uppercase X, zero, greater than symbol) displays in the OIA as a result of attempts to insert too much data into a field.

DELWORD Deletes characters from the cursor to the end of the word; the words following are shifted to the left. This deletion includes punctuation and one space or null character following the word. For a partial word deletion, the trailing space or null character is not deleted. The cursor is left at its current location. For word deletion, a word or field does not wrap the screen. If the cursor is positioned at a null character or space, the null or space is deleted. If the cursor is on an attribute or protected field, input is inhibited and `X < 0 >` (uppercase X, less than symbol, zero, greater than symbol) is displayed in the OIA. This key is not supported in the DBCS environment.

DOIA Toggles between the OIA and row 24 on ASCII terminals with a screen size of 24 lines. This key performs no function when the **e789** command is executed on screen displays with more than 24 rows. The **xhcon** command does not support this function.

DUP
Informs the application program a duplicate operation is indicated for the rest of the field where it is located. When entered in an SBCS field, the DUP key displays as a blank and tabs forward to the next field. The DUP key is displayed as an `*` (asterisk) when entered in a DBCS field. If the cursor is on an attribute or protected field, input is inhibited and `X < 0 >` (uppercase X, less than symbol, zero, greater than symbol) is displayed in the OIA.

ENDF
In an SBCS field, moves the cursor to one position past the last nonnull, nonspace character in the field. In a DBCS field, ENDF moves the cursor to one position past the last nonnull, nonspace, nonSI character in the field. If a field is full, the cursor is moved to the attribute byte of the next field.

EOF
Clears the character location occupied by the cursor as well as all remaining character locations in that field, if the cursor is located in an unprotected field. If the cursor is in a DBCS field, the location from the cursor to the end of the field is set to DBCS nulls.

ERASE
Clears all unprotected character locations, sets all character attributes to their default values, and repositions the cursor to the first unprotected character location on the display.

FMARK
Informs the application program of the end of a field in an unformatted buffer or subfield of a formatted buffer. When entered in an SBCS field, the FMARK key displays as a blank. The FMARK key displays as a `;` (semicolon) when entered in a DBCS field. If the cursor is positioned at a field-attribute location or is within a protected field, input is inhibited and `X < 0 >` (uppercase X, less than symbol, zero, greater than symbol) is displayed in the OIA.

FTABW and **BTABW Keys**
Allows the cursor to move to the next or previous word with a single keystroke. A word is one or more nonnull, nonspace characters. Words are separated by nulls or spaces. This kind of tabbing places the cursor on the first character of the next or previous word or at the upper leftmost position of the display, if no text exists.

This tabbing ignores field attributes and only looks at the characters displayed on the screen. Thus, it is possible to tab through protected field locations. Normal 3270 field-tab keys are provided for moving the cursor to the next and previous unprotected fields. These word-tab keys are not supported for DBCS.

Note: The following special emulator keys, related to four-byte operations, are not supported in the DBCS environment:

- **DELWORD**
- **FTABW**
- **BTABW**

HCONUTIL Invokes the HCON utility program. While the HCON utility is executing, the host can modify the internal presentation space of the emulation session. When the utility ends, the emulation session regains use of the virtual terminal. With the **xhcon** command, the hconutil is run in a separate AIXwindow and the display session continues to be active.

HOME Positions the cursor at the first unprotected character location on the display.

INSERT Operates as it does on a 3278/79, with additional features. The INSERT key puts the terminal into insert mode. This is indicated by a ^ (caret) in the OIA. All subsequent keyed characters are inserted rather than overwritten. If the field becomes full while in insert mode and there are trailing blanks at the end of the field, those blanks are shifted out of the field. Characters can then be entered until there are no nulls or trailing blanks left in the field.

Insert mode may be terminated by pressing the RESET key. The INSERT key also acts as a toggle, so that pressing this key while in insert mode resets the terminal to replacement mode.

JOBCTRL Allows suspension of the emulator if run from a shell that supports job control. While the **e789** process is suspended, the keyboard and display are released to the parent shell. The host may modify the internal presentation space of the emulation session. The **xhcon** command does not support this function.

The **e789** process cannot be put into the background. Attempting to do this results in the **e789** process remaining suspended and displays a message. To put the **e789** process back into the foreground, enter:

```
fg <job #>
```

LENDF Moves the cursor to the first nonnull, nonspace character in a SBCS field. In a DBCS field, LENDF moves the cursor to the first nonnull, nonspace, non-shift-out character in a field. If a field is empty, the cursor is moved to the first position of the current field.

NEWLINE Moves the cursor to the next line and wraps to the top of the screen for the last line.

NEXT Makes the next session the active session. For example, if four sessions are started by entering `e789 abcd`, four sessions with session names of `a`, `b`, `c`, and `d` are established. Session `a` is the active session and is usable on the display. Pressing the NEXT key causes session `b` to become active. Pressing the NEXT key three more times activates the `c`, `d`, and `a` sessions in succession. This key performs no function if only one session is available.

POREST Emulates power-on reset. This is equivalent to turning on the power for a 3278/79 display. The ENTER key may need to be pressed before the logo is displayed again, as on the 3278/79 display, if the session is a DFT or display session.

PRINT Prints the contents of the display on the printer associated with the local system. This key does not provide the same function as the Local Copy key found on the 3278/79 display.

QUIT Terminates the emulator session, which is the same as turning off a 3278/79 display.

REFRESH Refreshes the current screen on the active display session.

REPLS Replaces the contents of the replace file specified in the session profile with the contents of the display.

RESET Unlocks the keyboard after an attempt to type data in the incorrect place on the screen (for example, in a protected screen location) or an attempt to insert too much data into a field. The RESET key also terminates insert mode. In addition to the RESET key, any of the cursor movement keys may be used to reset the keyboard.

SAVES Appends the contents of the display to the save file specified in the session profile.

SHELL Invokes a subshell specified by the **SHELL** environment variable. While the subshell is executing, the host may modify the internal presentation space of the emulation session. When the subshell is terminated, the emulation session regains use of the virtual terminal. The **xhcon** command does not support this function.

SHIFTDISP Toggles SO/SI display mode in a DBCS environment. When toggled on, SO is displayed as a < (less than symbol) and SI is displayed as a > (greater than symbol). This key is only supported in a DBCS environment.

SPACEOF Performs the same functions as the 3270 EOF key except the space character, rather than the null character, performs the erasure. If the cursor is in a DBCS field, the locations from the cursor to the end of the field are set to DBCS space.

TAB and **BTAB**

Moves the cursor to the next and previous unprotected fields. These are the normal 3270 field-tab keys.

XLATE Allows DBCS users to switch displayed character sets locally. For Japan, this switches between Japanese-English and Katakana characters. This key is only supported in a Japanese Language environment.

Unsupported Print Control Keys

The unsupported 3270 print control keys include:

- Device Cancel
- Print Ident
- PA1 and PA2

Operator Information Area (OIA)

When using the 3270 Host Connection Program, the last line on the display screen is the Operator Information Area (OIA). The OIA provides system and session status information in Operator Information Area fields. Columns 9 to 17 of the OIA fields contain the Input-Inhibited error codes for HCON.

Operator Information Area Fields

System and session status information is located in specific fields in the OIA. The fields and descriptions are:

Column	Description
1 to 3	Readiness and System Connection Information field
9 to 17	Input-Inhibited field
21 to 27	Communication-Check Reminder field
38	Insert Mode field
51 to 56	Internal-Error Indicator field
58	Session Name field
59	Colon Separator field
60 to 79	Session Use field

The following tables contain the symbols used in the fields, the column where the symbols start, and a description of its function.

Readiness and System Connection Information Field		
Column	**Symbol**	**Description**
1	4	3274 Control unit and session are ready.
1	S	3274 Control unit and session are ready.
1	I	4361 Integrated workstation adapter and session are ready.
1	N	9370 Workstation subsystem controller and session are ready.
1	2	SNA Node T2.1 attached standalone session running through SDLC/Token-Ring/X.25/Ethernet is ready.
1	T	TCP/IP session is ready.
2	A	The control unit is connected to the host using a non-SNA session.
2	B	The control unit is connected to the host using SNA.
3	”	The session is working with the host application (for SNA in LU-LU session and for non-SNA).
3	<	The session is communicating with the host system SSCP (SNA SSCP-LU session only).
3	?	The session is not owned (SNA only).

Input-Inhibited Field

Column	Symbol	Description
9	X ( )	The host system needs time to perform a function.
9	X SYSTEM	The host system locked the keyboard.
9	X MACH*nnn*	Indicates a hardware problem. The machine check number is in the range of 201 to 269, 290 to 299, or 601 to 699. Equivalent to the 3278/79 error indicators: X, backslash, box and backslash, box.
9	X – +z_*nnn*	Indicates a communication line problem. The communication number is in the range of 501 to 599 or 610. This is equivalent to the 3278/79 error indicator: X followed by the broken communication symbol.
9	X PROG*nnn*	A programming error is detected in the data from the host. The error number is in the range of 401 to 499 or 701 to 799. This is equivalent to the 3278/79 error indicator X PROG.
9	X ?+	The last input is not accepted.
9	X –f	The requested function is not available.
9	X < 0 >	The cursor must be moved. It is in a protected field and an attempt has been made to enter, insert, erase, or delete a character.
9	X 0 >	An attempt has been made to enter more data into a field than can fit into it.
9	X –S	The symbol entered is not available.

For a list of input-inhibited field error codes and suggested responses, see “Input-Inhibited Field Error Codes for the HCON OIA” on page 2-21.

Insert Mode Field

Column	Symbol	Description
38	^	Insert mode is on.

Internal Error Indicator Field

Column	Symbol	Description
51	ERR*nnn*	Indicates an internal emulator error. *nnn* is the error number. Record the error number and call the system representative.

Session Name Field

Column	Symbol	Description
58	a to z	The session name specified in the session profile from configuration.

Session Use Field

Column	Symbol	Description
60	session use	A character string describing the session. The string is specified in the session profile from configuration.

Note: For SNA standalone sessions, the SNA Logical Connection Profile name is right-justified in the session use field, if sufficient space in the field exists.

Input-Inhibited Field Error Codes for the HCON OIA

This table lists possible input-inhibited field error codes, an explanation of the problem, and suggested responses.

Note: This list of error codes represents the events most likely to occur. For a complete list of all possible 3270 errors, see the *Control Unit Reference Summary,* order number GX20-1878.

Input-Inhibited Field Error Codes

Error Code	**Explanation**	**User Response**
610	Fatal communication check	Ensure that the coaxial cable is securely connected to the 3174/3274 control unit.
670	Hardware time out	Record the information and call your system representative.
671	Device initialization error	Record the information and call your system representative.
672	HCON internal error	Record the information and call your system representative.
673	HCON internal error	Record the information and call your system representative.
674	Hardware error	Record the information and call your system representative.
675	HCON internal error	Record the information and call your system representative.
676	HCON internal error	Record the information and call your system representative.
677	Device address already enabled	Record the information and call your system representative.
678	Device address not enabled	Record the information and call your system representative.
679	HCON internal error	Record the information and call your system representative.
680	HCON internal error	Record the information and call your system representative.
681	HCON internal error	Record the information and call your system representative.
683	Selective reset issued	The host has issued a selective reset. Consult your local host administrator.
684	Power-on reset in progress	Press the RESET key to clear the error. Continue with the host session.
687	The adapter has shut down	Record the information and call your system representative.
688	HCON internal error	Record the information and call your system representative.
689	HCON internal error	Record the information and call your system representative.
690	HCON internal error	Record the information and call your system representative.

Input-Inhibited Field Error Codes

Error Code	Explanation	User Response
703	Unsupported request received	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
705	SNF field of transmission header out of sequence	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
706	Command chaining error	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
707	Bracket state violation	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
708	Data traffic not yet started	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
709	Half-duplex protocol violation	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
711	Session limit exceeded	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
713	Session already bound	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
714	Session not bound	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
715	Session not activated	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
716	BIND parameter list too short	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
717	BIND support level not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
718	BIND PLU protocol not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.

Input-Inhibited Field Error Codes		
Error Code	**Explanation**	**User Response**
719	BIND SLU protocol not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
720	BIND Common protocol not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
723	BIND LU type not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
724	BIND screen size not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
725	BIND cryptography not supported	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
726	Negative response received	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
727	Exception request received	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
728	Read command with end bracket (EB) or not in licensed internal code (LIC) + CD	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
729	Read Partition received while the device was in retry state	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
731	BIND inbound maximum RU size not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
732	BIND outbound maximum RU size not valid	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
750	Not valid 3270 command received	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
751	Not valid character set value for SFE, MF, or SA order	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.

Input-Inhibited Field Error Codes		
Error Code	**Explanation**	**User Response**
752	Address out of range for SBA, RA, or EUA order	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
753	Data follows RM, RMA, RB, or EAU command; RA has not valid character; not valid attribute value or type for SFE, MF, or SA; not valid parameter for SA (SCS)	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
755	Not valid 3270 order received or not valid DBCS character code received.	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
756	SF type not valid or unsupported	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
759	Error in SF length	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
761	Not valid PID value for SF	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
769	HCON internal error	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
771	Not valid command in SF	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
791	Not valid SHF or SVF parameter (SCS)	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
792	Not valid SLD parameter (SCS)	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
793	Spooling print job failed (SCS)	Record the information and contact the host system programmer.
797	SO/SI are not in correct pair	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.

Input-Inhibited Field Error Codes		
Error Code	**Explanation**	**User Response**
798	SO/SI are received in DBCS field or GE is received in DBCS field or DBCS subfield	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.
799 (SBCS)	HCON internal error	Record the information and call your system representative.
799 (DBCS)	Start address points at DBCS low byte, not valid character attribute value in DBCS field or DBCS subfield, or not valid stop address	Press the RESET key to clear the error. If the problem continues, record the information and contact the host system programmer.

Using Default 3270 Keyboards

The 3270 Host Connection Program is shipped with default keyboard mappings that enable you to run the **e789** commands from aixterm sessions and supported ASCII terminals. Commonly used functions are in the same position on all keyboard types. You can redefine the HCON keyboard using the **hconutil** command. The keyboards supported by HCON include:

- IBM 3151, 3161, 3162, 3163, and 3164 keyboards
- DEC VT100 keyboards
- DEC VT220 keyboards
- WYSE WY-50, WY-60, and WY-370 keyboards
- Server and Station keyboards

Note: Only special emulator function keys are defined in the keyboard tables.

Setting the Terminal Type

When installed, HCON supports all local system HFTs and these ASCII terminals:

- IBM 3151, 3161, 3162, 3163, 3164
- DEC VT100 and VT220
- WYSE WY-50, WY-60, and WY-370

The terminal type must be set before starting the session. The **TERM** enviroment variable depends on the type of terminal where the session is started. To set the **TERM** enviroment variable, issue the **TERM** command from the command prompt. The following example sets the **TERM** enviroment variable for a 3151 terminal type.

```
TERM=ibm3151-132;export TERM
```

These **TERM** enviroment variables are supported.

TERM Environment Variables

Terminal Type	TERM Variable	Descriptions
3151	ibm3151	24x80 (model 2)*
3151	ibm3151-25	25x80 (model 2)
3151	ibm3151-132	28x132 (model 5)
316X	ibm3161	24x80 (model 2)*
316X	ibm3161-c	24x80 (with NLS cartridge)*
316X	ibm3162	24x80 (model 2)*
316X	ibm3162-132	28x132 (model 5)
316X	ibm3163	24x80 (model 2)*
316X	ibm3164	24x80 (model 2)*
5081	ibm5081	All 3270 models, font-size dependent
VT100	vt100	24x80 (model 2)*
VT220	vt220	24x80 (model 2)*
WYSE	wy50	24x80 (model 2)*

TERM Environment Variables		
Terminal Type	**TERM Variable**	**Descriptions**
WYSE	wy60	24x80 (model 2)*
WYSE	wy370	24x80 (model 2)*
Note: *The OIA line is not displayed. To see the OIA line, use the CTRL-X key sequence to toggle between line 24 and the OIA line.		

To use another terminal with HCON on your system, define the new terminal's key values for HCON. "Defining a New Terminal for HCON" on page 3-54 describes the steps for defining a new terminal.

For Japanese languages, the PS/55 with DEC VT100 interface can be used to run 3270 Japanese language applications. The **TERM** enviroment variable should be set to VT100. The PS/55 requires both:

- Nihongo DOS Version K3.3 and up
- Nihongo Procomm 5600-JCK or 5605-JCK

Using Display Session on Server and Station Keyboards

This table contains the default key functions on Server and Station keyboards. The position of keys on the keyboard does not change when executing the emulator locally or remotely through a TCP/IP connection. Refer to “Special Keys” on page 2-14 for a description of these functions.

Default e789 Key Functions on Server and Station Keyboards

Function	Press	Function	Press
TAB	Tab	PF15	Shift-F3
BTAB	Shift-Tab	PF16	Shift-F4
ENTER	Ctrl/Action	PF17	Shift-F5
SYSREQ	Alt-Print Screen	PF18	Shift-F6
CLEAR	Pause	PF19	Shift-F7
BACKSPACE	Backspace	PF20	Shift-F8
CHGDIS	Ctrl-keypad 6*	PF21	Shift-F9
INSERT	Insert	PF22	Shift-F10
DELETE	Delete	PF23	Shift-F11
HOME	Home	PF24	Shift-F12
PA1	Page Up	PRINT	Print Screen
PA2	Page Down	SAVES	Shift-Scroll Lock
PA3	Ctrl-Right Arrow	REPLS	Scroll Lock
SPACEOF	End	BTABW	Ctrl-A
DOWN	Down Arrow	EOF	Ctrl-B
DDOWN	Shift-Down Arrow	SHELL	Ctrl-C *
RIGHT	Right Arrow	QUIT	Ctrl-D
RRIGHT	Shift-Right Arrow	ERASE	Ctrl-E
LEFT	Left Arrow	FTABW	Ctrl-F
LLEFT	Shift-Left Arrow	ENDF	Ctrl-G
UP	Up Arrow	BACKF	Ctrl-K
UUP	Shift-Up Arrow	LENDF	Ctrl-L
PF1	F1	NEWLINE	Ctrl-M
PF2	F2	FMARK	Ctrl-N
PF3	F3	NEXT	Ctrl-O
PF4	F4	POREST	Ctrl-P
PF5	F5	RESET	Ctrl-R
PF6	F6	REFRESH	Ctrl-T
PF7	F7	DUP	Ctrl-U
PF8	F8	HCONUTIL	Ctrl-V
PF9	F9	DELWORD	Ctrl-W
PF10	F10	DOIA	Ctrl-X*

Default e789 Key Functions on Server and Station Keyboards			
Function	**Press**	**Function**	**Press**
PF11	F11	CLICK	Ctrl-Y*
PF12	F12	JOBCTRL	Ctrl-Z*
PF13	Shift-F1	NEWLINE	Enter
PF14	Shift-F2	ATTN	Ctrl-Print Screen
		SHIFTDISP	Ctrl-F1 (DBCS only)
		XLATE	Ctrl-F3 (Japan only)
		CURSEL	Ctrl-1

Note: An * (asterisk) indicates that the function is not supported in the X-Windows Environment using the **xhcon** command.

Using Display Session on 3151, 3161, 3162, 3163, and 3164 Keyboards

For the display session to function properly, the 3151, 3161, 3162, 3163, and 3164 terminals must be configured as follows.

Terminal Configuration	
General Setup Menu	**Selected Option**
Row and Column	25x80, 28x132*
Auto LF	OFF
Line Wrap	ON
Forcing Insert	OFF

Note: *The 3151 expansion cartridge is required. The feature code is 8535.

For the Communication Setup, the setup options must match the tty characteristics using SMIT.

Communication Setup	
Communication Setup Menu	**Selected Option**
Operating mode	echo
Turnaround Character	CR

Note: All line characteristics must match the Server or Station terminal definition.

For the display session to function properly, the 3151, 3161, 3162, 3163, and 3164 keyboard must be configured as follows:

Keyboard Configuration	
Keyboard Setup Menu	**Selected Option**
Enter	SEND
Return	NEWLINE
New Line	CR
Send	PAGE
Insert Character	MODE

The Default Key Functions table contains the default HCON key functions on the 3151, 3161, 3162, 3163, and 3164 terminal keyboards. See “Special Keys” on page 2-14 for a description of these functions.

Note: This family of terminals cannot be used in a DBCS environment.

Default Key Functions on 3151, 3161/62/63/64 Keyboards			
Function	**Press**	**Function**	**Press**
TAB	Tab	PF14	Shift-F2
BTAB	Shift-Tab	PF15	Shift-F3
ENTER	Send	PF16	Shift-F4
SYSREQ	Erase EOF	PF17	Shift-F5
CLEAR	Clear	PF18	Shift-F6
BACKSPACE	Backspace	PF19	Shift-F7

Default Key Functions on 3151, 3161/62/63/64 Keyboards

Function	Press	Function	Press
CHGDIS	N/A	PF20	Shift-F8
INSERT	Insert	PF21	Shift-F9
DELETE	Delete	PF22	Shift-F10
HOME	Home	PF23	Shift-F11
PA1	PA1	PF24	Shift-F12
PA2	PA2	PRINT	Send Line
PA3	PA3	SAVES	Ctrl-Insert
SPACEOF	Ctrl-Clear	REPLS	Ctrl-Delete
DOWN	Down Arrow	BTABW	Ctrl-A
DDOWN	N/A	EOF	Ctrl-B
RIGHT	Right Arrow	SHELL	Ctrl-C
RRIGHT	N/A	QUIT	Ctrl-D
LEFT	Left Arrow	ERASE	Ctrl-E
LLEFT	N/A	FTABW	Ctrl-F
UP	Up Arrow	ENDF	Ctrl-G
UUP	N/A	BACKF	Ctrl-K
NEWLINE	Enter	LENDF	Ctrl-L
PF1	F1	NEWLINE	Ctrl-M
PF2	F2	FMARK	Ctrl-N
PF3	F3	NEXT	Ctrl-O
PF4	F4	POREST	Ctrl-P
PF5	F5	RESET	Ctrl-R
PF6	F6	REFRESH	Ctrl-T
PF7	F7	DUP	Ctrl-U
PF8	F8	HCONUTIL	Ctrl-V
PF9	F9	DELWORD	Ctrl-W
PF10	F10	DOIA	Ctrl-X
PF11	F11	CLICK	Ctrl-Y
PF12	F12	JOBCTRL	Ctrl-Z
PF13	Shift-F1	CURSEL	Ctrl-4
		ATTN	Ctrl-5

Using Display Session on DEC VT100 Keyboards

The DEC VT100 must be configured with the keypad in application mode for the **e789** command to function properly. To accomplish this, enter the following command at the VT100 terminal:

```
echo "\033\075"
```

Note: For Japanese languages, the PS/55 with DEC VT100 interface can be used to run 3270 Japanese language applications. The **TERM** variable should be set to VT100. The PS/55 requires both:

- Nihongo DOS Version K3.3 and up
- Nihongo Procomm 5600-JCK or 5605-JCK

The following table contains the default HCON key functions on the DEC VT100 terminal keyboard. See “Special Keys” on page 2-14 for a description of these functions.

Default Key Functions on DEC VT100 Keyboards

Function	Press	Function	Press
TAB	TAB	PF14	N/A
BTAB	N/A	PF15	N/A
ENTER	Keypad Enter	PF16	N/A
SYSREQ	Keypad 3	PF17	N/A
CLEAR	Keypad . (period)	PF18	N/A
BACKSPACE	BACKSPACE	PF19	N/A
CHGDIS	N/A	PF20	N/A
INSERT	Keypad 0	PF21	N/A
DELETE	DELETE	PF22	N/A
HOME	N/A	PF23	N/A
PA1	Keypad 1	PF24	N/A
PA2	Keypad 2	PRINT	N/A
PA3	N/A	SAVES	N/A
SPACEOF	N/A	REPLS	N/A
DOWN	Down Arrow	BTABW	Ctrl-A
DDOWN	N/A	EOF	Ctrl-B
RIGHT	Right Arrow	SHELL	Ctrl-C
RRIGHT	N/A	QUIT	Ctrl-D
LEFT	Left Arrow	ERASE	Ctrl-E
LLEFT	N/A	FTABW	Ctrl-F
UP	Up Arrow	ENDF	Ctrl-G
UUP	N/A	BACKF	Ctrl-K
NEWLINE	RETURN	LENDF	Ctrl-L
PF1	PF1	NEWLINE	Ctrl-M
PF2	PF2	FMARK	Ctrl-N
PF3	PF3	NEXT	Ctrl-O

Default Key Functions on DEC VT100 Keyboards			
Function	**Press**	**Function**	**Press**
PF4	PF4	POREST	Ctrl-P
PF5	Keypad 7	RESET	Ctrl-R
PF6	Keypad 8	REFRESH	Ctrl-T
PF7	Keypad 9	DUP	Ctrl-U
PF8	Keypad – (minus)	HCONUTIL	Ctrl-V
PF9	Keypad 4	DELWORD	Ctrl-W
PF10	Keypad 5	DOIA	Ctrl-X
PF11	Keypad 6	CLICK	Ctrl-Y
PF12	Keypad , (comma)	JOBCTRL	Ctrl-Z
PF13	N/A	ATTN	Ctrl-] (right bracket)
		CURSEL	Ctrl-\ (backslash)

Using Display Session on DEC VT220 Keyboards

For the **e789** command to function properly, the DEC VT220 must be configured as:

- VT220, 7-bit mode
- Keypad in application mode

The following table contains the default key functions on the DEC VT220 terminal keyboard. See “Special Keys” on page 2-14 for a description of these functions.

Note: This terminal cannot be used in a DBCS environment.

Default Key Functions on DEC VT220 Keyboards

Function	Press	Function	Press
TAB	Tab	PF14	F14
BTAB	N/A	PF15	Help
ENTER	Keypad 0	PF16	Do
SYSREQ	Keypad 1	PF17	F17
CLEAR	Keypad . (period)	PF18	F18
BACKSPACE	Backspace	PF19	F19
CHGDIS	N/A	PF20	F20
INSERT	Find	PF21	Keypad 6
DELETE	Select	PF22	Keypad 7
HOME	Insert Here	PF23	Keypad 8
PA1	Remove	PF24	Keypad 9
PA2	Next Screen	PRINT	Keypad – (minus)
PA3	N/A	SAVES	Keypad 4
SPACEOF	Prev Screen	REPLS	Keypad , (comma)
DOWN	Down Arrow	BTABW	Ctrl-A
DDOWN	N/A	EOF	Ctrl-B
RIGHT	Right Arrow	SHELL	Ctrl-C
RRIGHT	N/A	QUIT	Ctrl-D
LEFT	Left Arrow	ERASE	Ctrl-E
LLEFT	N/A	FTABW	Ctrl-F
UP	Up Arrow	ENDF	Ctrl-G
UUP	N/A	BACKF	Ctrl-K
NEWLINE	Return	LENDF	Ctrl-L
PF1	PF1	NEWLINE	Ctrl-M
PF2	PF2	FMARK	Ctrl-N
PF3	PF3	NEXT	Ctrl-O
PF4	PF4	POREST	Ctrl-P
PF5	Keypad 5	RESET	Ctrl-R
PF6	F6	REFRESH	Ctrl-T
PF7	F7	DUP	Ctrl-U

Default Key Functions on DEC VT220 Keyboards			
Function	**Press**	**Function**	**Press**
PF8	F8	HCONUTIL	Ctrl-V
PF9	F9	DELWORD	Ctrl-W
PF10	F10	DOIA	Ctrl-X
PF11	F11	CLICK	Ctrl-Y
PF12	F12	JOBCTRL	Ctrl-Z
PF13	F13	ATTN	Ctrl-] (right bracket)
		CURSEL	Ctrl-\ (backslash)

Using Display Session on WYSE Keyboards

For the **e789** command to function properly, the WYSE WY-50 must be configured in WY-50 Compatible mode, the WYSE WY-60 in WY-60 Compatible mode, and the WYSE WY-370 in WY-370 Compatible mode.

Note: The WYSE WY-50, WYSE WY-60, and WYSE WY-370 keyboards do not support the BACKF and LENDF emulator keys.

The following table contains the default key functions for the WYSE WY-50 and WYSE WY-60 terminal keyboards. See “Special Keys” on page 2-14 for a description of these functions.

Note: These terminals cannot be used in a DBCS environment.

Default Key Functions on WYSE WY-50 and WYSE WY-60 Keyboards			
Function	**Press**	**Function**	**Press**
TAB	Tab	PF13	F13
BTAB	Shift-Tab	PF14	F14
ENTER	Send	PF15	F15
SYSREQ	CLR Screen	PF16	F16
CLEAR	CLR Line	PF17	N/A
BACKSPACE	Del	PF18	N/A
CHGDIS	N/A	PF19	N/A
INSERT	INS Char	PF20	N/A
DELETE	DEL Char	PF21	N/A
HOME	Home	PF22	N/A
PA1	PAGE Next	PF23	N/A
PA2	Prev PAGE	PF24	N/A
PA3	INS Line	PRINT	Print
SPACEOF	DEL Line	SAVES	Ins
DOWN	Down Arrow	REPLS	Repl
DDOWN	N/A		
RIGHT	Right Arrow	EOF	Ctrl-B
RRIGHT	N/A	SHELL	Ctrl-C
LEFT	Left Arrow	QUIT	Ctrl-D
LLEFT	N/A	ERASE	Ctrl-E
UP	Up Arrow	FTABW	Ctrl-F
UUP	N/A	ENDF	Ctrl-G
NEWLINE	Return	NEWLINE	Ctrl-M
PF1	F1	FMARK	Ctrl-N
PF2	F2	NEXT	Ctrl-O
PF3	F3	POREST	Ctrl-P
PF4	F4	RESET	Ctrl-R
PF5	F5	REFRESH	Ctrl-T

Default Key Functions on WYSE WY-50 and WYSE WY-60 Keyboards

Function	Press	Function	Press
PF6	F6	DUP	Ctrl-U
PF7	F7	HCONUTIL	Ctrl-V
PF8	F8	DELWORD	Ctrl-W
PF9	F9	DOIA	Ctrl-X
PF10	F10	CLICK	Ctrl-Y
PF11	F11	JOBCTRL	Ctrl-Z
PF12	F12	ATTN	Ctrl-] (right bracket)
		CURSEL	Ctrl-\ (backslash)

The following table contains the default key functions for the WYSE WY-370 terminal keyboards. See "Special Keys" on page 2-14 for a description of these functions.

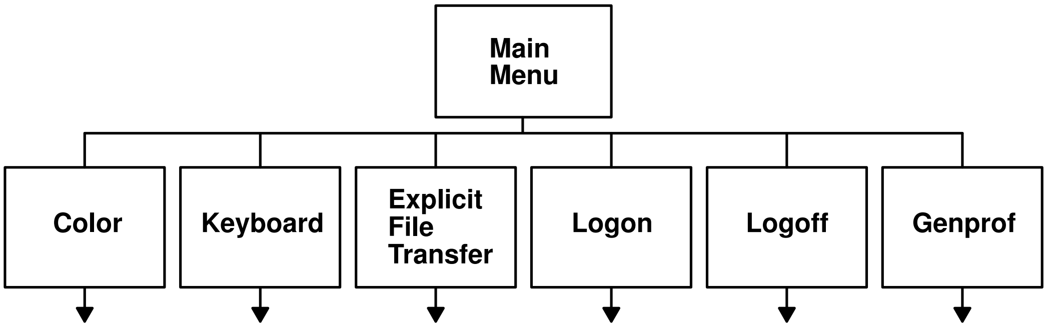
Note: During setup, under the "Display" configuration option, the "Display Function" *autowrap* parameter must be set to *on*.

Default Key Functions on WYSE WY-370 Keyboard			
Function	**Press**	**Function**	**Press**
TAB	Tab	PF13	N/A
BTAB	Shift-Tab	PF14	N/A
ENTER	Enter	PF15	N/A
SYSREQ	Ctrl-Y	PF16	N/A
CLEAR	Ctrl-K	PF17	N/A
BACKSPACE	Backspace	PF18	N/A
CHGDIS	N/A	PF19	N/A
INSERT	Insert Key	PF20	N/A
DELETE	Delete	PF21	N/A
HOME	Home	PF22	N/A
PA1	PAGE Next	PF23	N/A
PA2	Prev PAGE	PF24	N/A
PA3	Ctrl-[	PRINT	Ctrl-T
SPACEOF	N/A	SAVES	N/A
DOWN	Down Arrow	REPLS	N/A
DDOWN	N/A		
RIGHT	Right Arrow	EOF	Ctrl-B
RRIGHT	N/A	SHELL	Ctrl-C
LEFT	Left Arrow	QUIT	Ctrl-D
LLEFT	N/A	ERASE	Ctrl-E
UP	Up Arrow	FTABW	Ctrl-F
UUP	N/A	ENDF	Ctrl-G
NEWLINE	Ctrl-N		
PF1	F1	FMARK	N/A
PF2	F2	NEXT	Ctrl-O
PF3	F3	POREST	Ctrl-P
PF4	F4	RESET	Ctrl-R
PF5	F5	REFRESH	Ctrl-T
PF6	F6	DUP	Ctrl-U
PF7	F7	HCONUTIL	Ctrl-V
PF8	F8	DELWORD	Ctrl-W
PF9	F9	DOIA	Ctrl-X
PF10	F10	CLICK	N/A
PF11	F11	JOBCTRL	Ctrl-Z

Default Key Functions on WYSE WY-370 Keyboard			
Function	**Press**	**Function**	**Press**
PF12	F12	ATTN	Ctrl-A
		CURSEL	Ctrl-L

HCON Utility Program Overview

The utility program is a menu-driven interface for customizing portions of HCON and running needed HCON programs. The utility program uses several types of keys and fields to perform its functions. The Main Menus figure shows the HCON utility program menu options for customization, file transfers, and logging on and off.



Main Menus

The utility program is started from the command line with the **hconutil** command, from within the display using the HCONUTIL key, or from the menu bar option. The utility program uses the messages interface to display in the user's default national language.

Customizing HCON with the Utility Program

The utility program color and keyboard customization enables system management personnel to define the keyboard and color tables for the entire system. With the utility program you can tailor these tables.

You can create customized tables to override system defaults, name the tables with any valid file name, and store the tables in any directory. The color and keyboard tables to be used for a particular session are determined by the profile for that session. If the customization is done from within the emulator using the HCONUTIL key, the display attributes can be accessed without ending the session.

Note: To convert tables from Version 1.1 of HCON to the new format, see "Customizing HCON for System Management" on page 3-56.

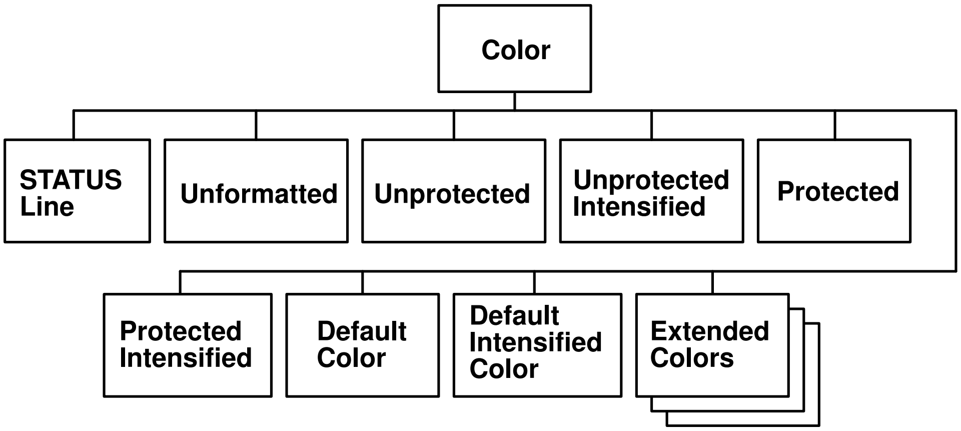
The utility customization menus include:

Color redefinition

Specifies the attributes to display for each 3270 field on the screen. The color is based on the value of the host color and highlighting. For each field, a foreground and background color, and display attribute value must be selected. Using color customization you can:

- Change the background and foreground colors of the status line (of a color terminal).
- Set 3270 unprotected normal fields to blink (if blink is supported on your terminal). For more information on 3270 highlighting and blink attributes, see "Displayable 3270 Attributes" on page 2-48.

The Color Redefinition Menus figure shows the color definition options.



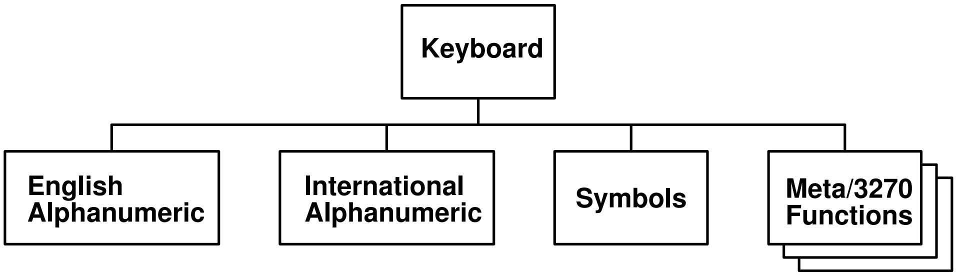
Color Redefinition Menus

Keyboard redefinition

Specifies the keyboard mappings to be used when running a display session. These keyboard mappings are independent of the type of keyboard in use on the local system. Keyboard redefinition assigns a function/key value to every supported key selectable on any supported keyboard. The defined keys not supported on a particular keyboard are ignored for that keyboard. Using keyboard redefinition you can set keys or a key sequence to:

- Delete words when editing a host file.
- Perform no function on the host.
- Produce a superscript or subscript on the host.
- Produce a character such as a ç (c cedilla) or ¨ (umlaut) on the host.

The Keyboard Redefinition Menus figure shows the keyboard definition options.



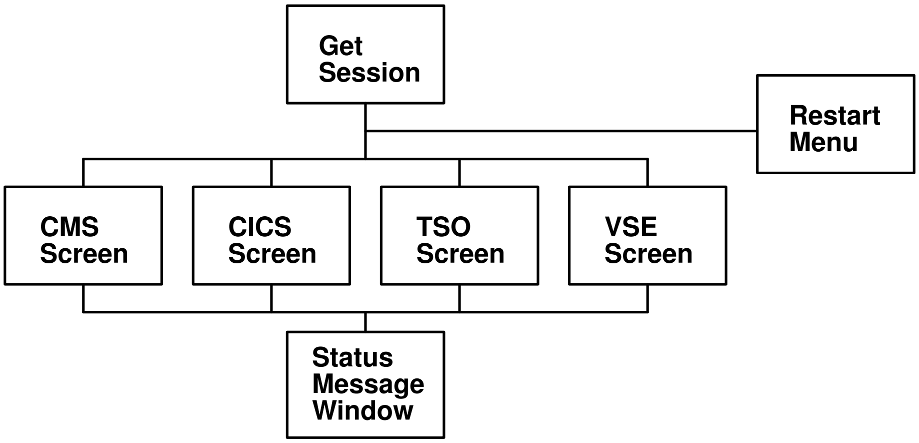
Keyboard Redefinition Menus

For more information about customization, see:

- Customizing HCON Color and Highlight Values with the Utility Program (on page 2-47).
- Customizing HCON Key Definitions with the Utility Program (on page 2-52).

File Transfers with the Utility Program

File transfers with the utility program are explicit file transfer requests from a menu-driven interface. Upload or download files to either a VM/CMS, MVS/TSO, CICS/VS, or VSE/ESA host. Enter the required file transfer information from the transfer menu screen. The Explicit File Transfer Menus figure shows the explicit file transfer options.



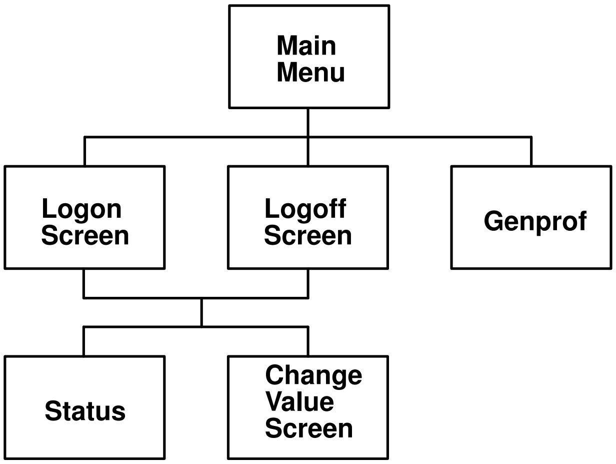
Explicit File Transfer Menus

For more information about file transfers, see:

- HCON File Transfers (on page 2-55).
- HCON Utility Program File Transfer Facility (on page 2-58).

Logging On and Logging Off Support Using a Predefined Script

Using the AUTOLOG facility, the utility program logs on to and off of currently running HCON sessions. The Logon/Logoff and Genprof Menus figure shows the logon and logoff options.



Logon/Logoff and Genprof Menus

The AUTOLOG scripts portion of the utility runs the **genprof** command to add, modify, or display AUTOLOG scripts.

For more information about logging on to and off of a display session, see:

- HCON Host Logon Procedures (on page 2-67)
- Using the HCON Utility Program Logon and Logoff Facility (on page 2-73)

HCON Utility Program Keys and Fields

The utility program uses several types of keys and fields to perform its functions.

Utility Program Keys

The utility program uses these types of keys:

- Function
- Up Arrow and Down Arrow
- Tab
- Left Arrow and Right Arrow
- Enter

Function Keys

Functions are listed at the bottom of every menu and are started by pressing the appropriate function key. Functions differ on every menu. This table lists these functions.

Function Keys for the Utility Program

Key	Function	Definition
F1	Help	Displays a pop-up window containing help information about the field the cursor is in.
F2	Refresh	Refreshes the screen.
F3	Exit	Exits the program without saving any updated color or keyboard table information.
F4	Change	Allows users to override the default values in the session profile for the logon/logoff portion of the utility program. This key is only available on the logon/logoff screens.
F5	File	Saves the current color and keyboard definitions (on the color or keyboard redefinition menu) into the designated output files. If the utility was started with the **hconutil** command, the color and keyboard definitions are saved either in the files specified by the **–C** and **–K** flags or in the **$HOME/e789_ctbl** and **$HOME/e789_ktbl** files, respectively. If the utility was started from within the emulator using the HCONUTIL key, the information is saved in the color and keyboard tables specified in the session profile for the session from which the utility was entered.
F7	Up	Scrolls the screen up one page. If the screen is at the first page, it wraps to the last page.
F8	Down	Scrolls the screen down one page. If the screen is at the last page, it wraps to the first page.
F10	Actions	Selects the key (on the keyboard redefinition menu) that the user wants remapped and moves the cursor up to the button bar at the top of the menu. If the cursor is on the button bar, pressing F10 takes the cursor back to the line item. The F10 key is available only on the keyboard redefinition menus.
F12	Return	Returns to the previous menu from any submenu, or closes the current pop-up or pull-down window.

Note: On a DEC VT100 keyboard, the F4 through F12 function keys are each represented by an escape sequence:

Function Key	Key Sequence
F4	Esc-4
F5	Esc-5
F7	Esc-7
F8	Esc-8

F10	Esc-0
F12	Esc-2

Up Arrow and Down Arrow Keys

The Up Arrow and Down Arrow keys move the cursor up and down through the different fields on the screens. If the cursor is at the last field on the bottom of the screen, the Down Arrow key moves the cursor to the first field at the top of the current column. If the cursor is at the top field, the Up Arrow key moves the cursor to the last field of the current column.

Note: In the keyboard redefinition pull-down menus, the arrow keys do not wrap on the screen. Instead they scroll through the values for that particular pull-down menu.

Tab Keys

The Tab and Backtab keys move the cursor right and left, respectively, through the fields on the current line. If the cursor is at the end of a line, it wraps around the screen. For example, if the cursor is at the last field on the left, the Tab key moves the cursor to the first field on the right of the current line.

Left Arrow and Right Arrow Keys

The Left Arrow and Right Arrow keys toggle through the values of the fields. The Right Arrow key toggles forward through the list of values while the Left Arrow key toggles backwards through the list of values. The values wrap if the end or the beginning of the list is encountered. For example, when the Left Arrow key is pressed and the current value is the last one listed, then the first value is displayed. The Left and Right Arrow keys are valid only on the color redefinition submenus and the file transfer submenus.

The Left and Right Arrow keys also scroll text to the left and right in edit fields containing long file name strings with limited visual display.

Enter Key

Depending on the screen in use, the Enter key has the following function:

- From any menu screen, press the Enter key to select which submenu to display next.
- From the keyboard redefinition button bar, move the cursor to the desired button bar field using the Tab and Backtab keys. Press the Enter key to display the pull-down window for that button bar option.
- Within the keyboard redefinition button bar pull-down window, press the Enter key to select the value to be mapped to the selected key.
- For file transfer, press the Enter key to issue a file transfer request when all of the information has been specified on the file transfer panels.
- In the Logon/Logoff screens, press the Enter key to initiate the logon/logoff process after all of the information has been entered. From the change values windows in the logon/logoff screens, press the Enter key to enable the entered data to override the session profile data.
- From the Read File/Save File pop-up windows, press the Enter key to select the name of the file to be read or saved.

Utility Program Fields

The utility program displays data in several types of fields. It also uses a message field and a heading field to display information about the screens and menus.

Data Fields

The utility program uses three types of fields to display user data choices:

`edit` Requires the user to input data.

`toggle` Has limited choices and allows the user to toggle through those choices.

`display` Indicates the current value of the field. A display field can usually be changed by a selection process or from another menu.

The **hconutil** command supports edit fields containing file name strings of up to 1024 characters with limited visual display. The strings display as:

[text] The entire string displays.

[text> There is more text to the right. Use the Right Arrow key to scroll the text to the right.

<text] There is more text to the left. Use the Left Arrow key to scroll the text to the left.

<text> There is more text to the right and left. Use the Right and Left Arrow keys to scroll the text.

Message Field

The message field is a one-line field at the bottom of the screen. The field displays messages such as warnings and work completed, including:

`You have pressed a key that is not valid.`
Disappears when either a valid key or the Refresh key is pressed or when a different menu is displayed.

`WARNING: Foreground and background colors are the same.`
Displays on the color redefinition menu when the foreground and the background colors for a certain line are set to the same value. The message goes away when the foreground or background color is changed, the cursor is moved to a different line, or to a different menu.

`The color definition table is saved successfully.`
Displays when the program successfully saves the color definition table. To save the color definition table, press the F5 key while in the color redefinition submenus.

`The keyboard definition table is saved successfully.`
Displays when the program successfully saves the keyboard definition table. To save the keyboard definition table, press the F5 key while in the keyboard redefinition submenus.

`Log attempt to session ’a’ is in progress.`
Displays for each logon and logoff attempt. Indicates which log attempt is currently running.

`All log attempts completed. Please check status.`
Displays after all requested log attempts have completed.

`Explicit File Transfer request being attempted.`
Displays after the Enter key is pressed on the file transfer screens.

`The color definition table was not read in successfully.`
Displays during access to the color submenus if the color table was not read in successfully. Enter a color table file name into the read file name window.

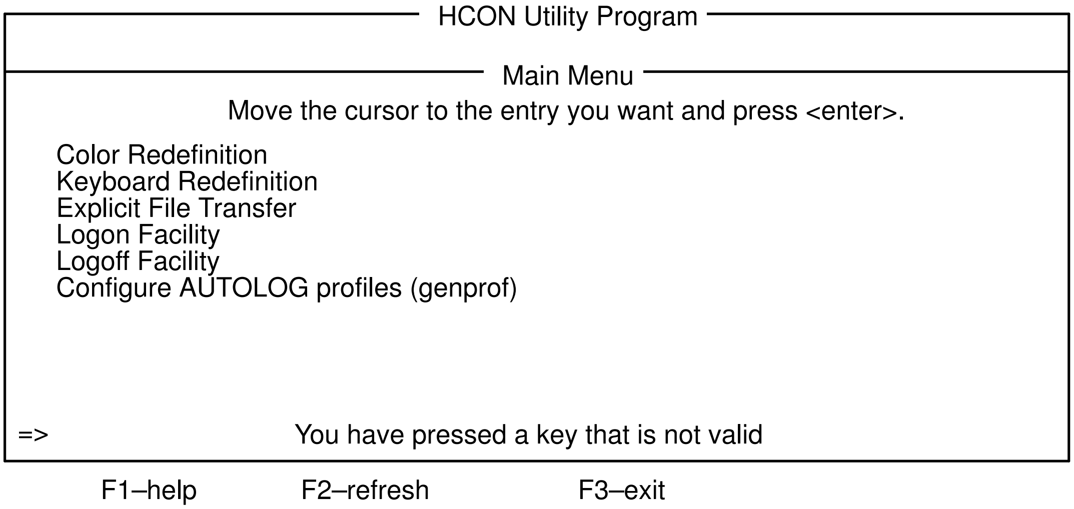
`The keyboard table was not read in successfully.`
Displays when accessing the keyboard submenus if the keyboard table was not read in successfully. Enter a color table file name into the read file name window.

Heading Field

The heading field is a one-line field below the submenu title providing column headings for the information on the screen or instructions such as:

```
Move the cursor to the entry you want and press <enter>.
```

The Heading and Message Fields figure shows the HCON utility program Main Menu with a heading and message field in bold face type.



```
                         HCON Utility Program

                              Main Menu
          Move the cursor to the entry you want and press <enter>.

   Color Redefinition
   Keyboard Redefinition
   Explicit File Transfer
   Logon Facility
   Logoff Facility
   Configure AUTOLOG profiles (genprof)




=>                  You have pressed a key that is not valid

      F1–help        F2–refresh          F3–exit
```

Heading and Message Fields

Customizing HCON Color and Highlight Values with the Utility Program

Color and highlight values are redefined for each 3270 field displayed on the screen using the HCON utility color redefinition menus.

3270 Fields

There are three categories of 3270 fields. Customize the color and highlight values for each:

`Status Line field`
Displays at the bottom of the emulator screen. Color and highlight values assigned to this field affect the entire line.

`3270 Data Stream Screen Format fields`
Define areas on the display screen based on certain associated field attributes. The field attributes are:

- `Unformatted`
- `Unprotected`
- `Unprotected Intensified`
- `Protected`
- `Protected Intensified`

`Extended 3270 Data Stream Color fields`
Define areas on the display screen based on the color associated with each field. The colors are:

- `Unformatted`
- `BLUE`
- `RED`
- `PINK`
- `GREEN`
- `TURQUOISE`
- `YELLOW`
- `WHITE`

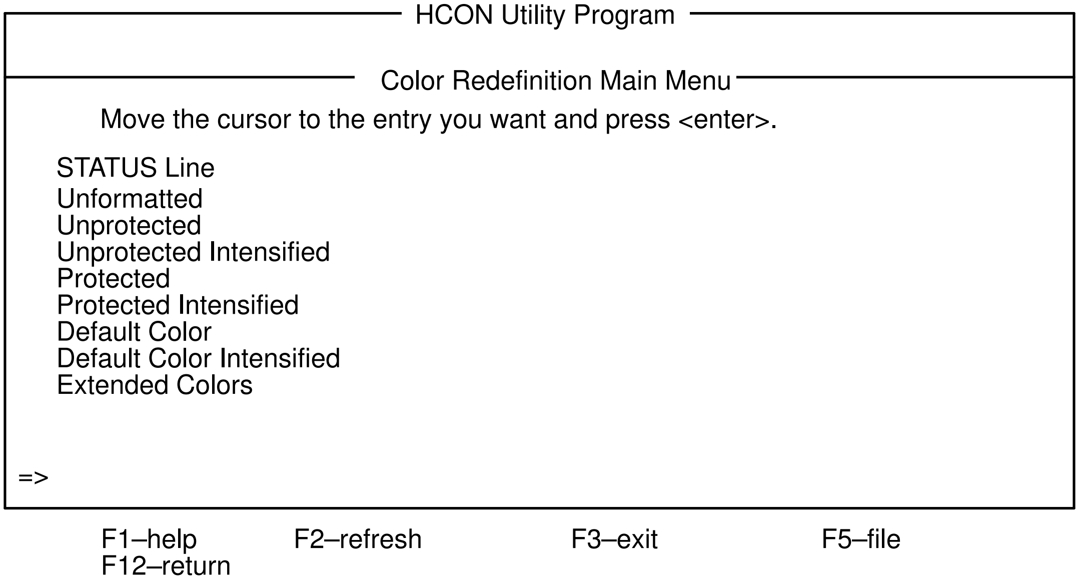
This group of fields also includes the `Default` and `Default Intensified` fields.

Four possible highlight attributes are associated with every 3270 field:

`NONE`	No highlighting
`UNDERLINE`	Underline field
`BLINK`	Blink field
`REVERSE`	Reverse video

Note: These attributes do not apply to the `Unformatted` field.

Each 3270 field displays by category as illustrated on the Color Redefinition Main Menu screen. Press the Enter key to select the appropriate category submenu.



```
                           HCON Utility Program

                      Color Redefinition Main Menu
     Move the cursor to the entry you want and press <enter>.

   STATUS Line
   Unformatted
   Unprotected
   Unprotected Intensified
   Protected
   Protected Intensified
   Default Color
   Default Color Intensified
   Extended Colors


=>

     F1–help      F2–refresh          F3–exit          F5–file
     F12–return
```

Color Redefinition Main Menu

Displayable 3270 Attributes

Each type of terminal used for 3270 display emulation has slightly different display attributes, such as highlighting, blink, reverse video, and underscore. This table lists the displayable attributes for each display type.

Displayable 3270 Attributes				
Display Type	**Highlighting**	**Blink**	**Reverse Video**	**Underscore**
x-window	no	no	yes	yes
aixterm	white	no	yes*	yes
3151	intensified	yes	yes*	yes
3161, 62, 63	intensified	yes	yes**	yes
3164 (color)	white	yes	yes***	yes
VT100-220	intensified	low to dark	yes*	yes
WYSE WY50	no	low intensity	low intensity	low intensity
WYSE WY60	no	low intensity	low intensity	low intensity
WYSE WY370 (color)	yes	yes	yes	yes

Notes: *All colors are displayed in reverse video.
**All colors are displayed in the same color as monitor.
***Only green is supported, other colors not supported.

Changing Color and Highlight Values

In each 3270 field, three areas (foreground, background, and highlight) contain color and highlighting values. Choices for these values include:

- **Foreground and Background Field Values**
  - `BLACK`
  - `RED`
  - `GREEN`
  - `YELLOW`

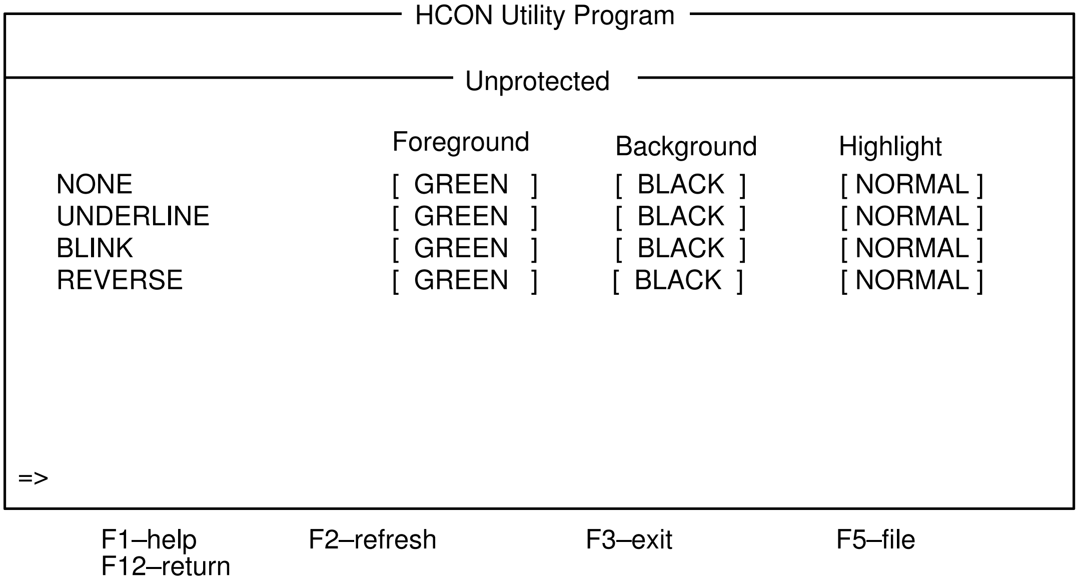
- BLUE
- MAGENTA
- CYAN
- WHITE

- **Highlight Values**
  - NORMAL
  - UNDERLINE
  - BLINK
  - REVERSE
  - BRIGHT

Define foreground color, background color, and highlight fields using the HCON utility color redefinition submenus. Make selections for each 3270 field category in the Color Redefinition Main Menu from a list of values displayed for each field:

Tab	Moves the cursor forward through the fields.
Backtab	Moves the cursor backward through the fields.
Right Arrow	Toggles forward through the field values.
Left Arrow	Toggles backward through the field values.

The 3270 Field Screen Attribute menu screen shows the `Unprotected` field and associated customized fields:



```
                         HCON Utility Program

                             Unprotected

                        Foreground      Background      Highlight
   NONE                 [ GREEN  ]      [ BLACK ]       [ NORMAL ]
   UNDERLINE            [ GREEN  ]      [ BLACK ]       [ NORMAL ]
   BLINK                [ GREEN  ]      [ BLACK ]       [ NORMAL ]
   REVERSE              [ GREEN  ]      [ BLACK ]       [ NORMAL ]





=>

      F1–help       F2–refresh        F3–exit          F5–file
      F12–return
```

3270 Field Screen Attribute Menu

All changes to color and highlight values are saved either in the default files, or in an output file specified by the user.

Note: If the utility is invoked from an emulator session using the HCONUTIL key, and the output file is not renamed, changes to color and highlight values are updated immediately upon exiting the utility. If the output file is renamed, the original file remains in effect for the duration of the session.

Customizing the HCON Color Definition Table

This procedure explains how to customize the Color Definition Table for HCON.

Prerequisites

1. The program and messages must be installed.
2. You must be registered as an HCON user to use the customized table.
3. To customize the table for the entire system, you must have write access to the **/usr/lib/hcon** directory and the **/usr/lib/hcon/e789_ctbl** file.

Note: You can install, configure, and customize HCON either before or after installing and configuring the devices.

Procedure

A default color definition table is included in the software. This table can be customized for the entire system or a new table can be created for an individual user.

Customize the Color Definition Table for the Entire System

1. Save a copy of the original default color definition table by copying the **/usr/lib/hcon/e789_ctbl** file to the **/usr/lib/hcon/e789_ctbl.orig** file.
2. Create the new color definition table using the **hconutil** command. Use the **–C** flag to name the new table. Name the table **/usr/lib/hcon/e789_ctbl**. It will become the default color definition table for the entire system. Specify **/usr/lib/hcon/e789_ctbl** as the input file by using the **–c** flag. For example, enter:

   ```
   hconutil –c /usr/lib/hcon/e789_ctbl –C /usr/lib/hcon/e789_ctbl
   ```

3. Use the color modification screens in the HCON utility program to make the new color and highlight settings. Save the color definition file using the F5 key.
4. The modified table becomes the default table for the system.

Customize the Color Definition Table for an Individual User

1. Start the HCON utility program by issuing the **hconutil** command.
2. Use the color modification screens in the utility program to make the new color and highlight settings.
3. Save the new color definitions using the F5 key. Unless you rename it, the new file is called **$HOME/e789_ctbl**.

To use the customized table, specify the name of the new table as the color definition table in your HCON session profile.

Customizing the HCON Keyboard Definition Table

This procedure explains how to customize the Keyboard Definition Table for HCON.

Prerequisites

1. The HCON program and messages must be installed.
2. You must be registered as an HCON user to use the customized table.
3. To customize the table for the entire system, you must have write access to the **/usr/lib/hcon** directory and the **/usr/lib/hcon/e789_ktbl** file.

   Note: You can install, configure, or customize HCON either before or after installing and configuring the devices.

Procedure

A default keyboard definition table is included with the HCON program. This table can be customized for the entire system or a new table can be created for an individual user.

Customize the Keyboard Definition Table for the Entire System

1. Save a copy of the original default keyboard definition table by copying the **/usr/lib/hcon/e789_ktbl** file to the **/usr/lib/hcon/e789_ktbl.orig** file.
2. Create the new keyboard definition table using the **hconutil** command. Use the **–K** flag with the command to name the new table. Name the new table **/usr/lib/hcon/e789_ktbl**. It will become the default keyboard definition table for the entire system. Specify **/usr/lib/hcon/e789_ktbl** as the input file by using the **–k** flag. For example, enter:

   ```
   hconutil -k /usr/lib/hcon/e789_ktbl -K /usr/lib/hcon/e789_ktbl
   ```

3. Use the keyboard modification screens in the HCON utility program to specify the new keyboard settings. Save the keyboard definition file using the F5 key.
4. The modified table becomes the default table for the system.

Customize the Keyboard Definition Table for an Individual User

1. Start the HCON utility program by issuing the **hconutil** command.
2. Use the keyboard modification screens in the utility program to specify the new keyboard settings.
3. Save your new keyboard definitions using the F5 key. Unless you rename it, your new file is called **$HOME/e789_ktbl**.

To use the customized table, specify the name of the new table as the keyboard definition table in your HCON session profile.

Customizing HCON Key Definitions with the Utility Program

Customize the keyboard functions using the utility program keyboard redefinition menus. Changes to key definitions are saved in the default files or in a specified output file.

Note: If the utility is started using the HCONUTIL key and the output file is not renamed, changes to key definitions are updated upon exiting the utility. If the output file is renamed, the original file remains in effect for the duration of that session.

Key Definition Fields

A key definition line exists for each physical key and contains two kinds of display-only fields:

`Physical key` Contains the name of the physical key on the keyboard to be remapped.

`Key map` Contains the value to which the physical key is mapped.

Changing Key Definitions

Use the Keyboard Redefinition Main Menu to change key definitions. The main menu accesses the following physical keys:

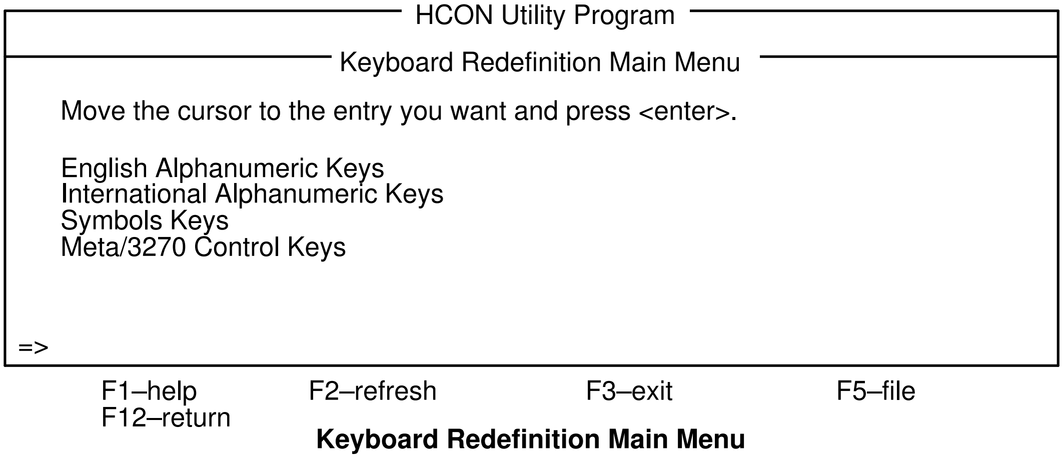
English Alphanumeric
Contains standard English alphanumeric keys.

International Alphanumeric
Contains standard international alphanumeric keys.

Symbols Contains special graphics symbols, including box characters and superscript and subscript numbers.

Meta/3270 Control
Contains meta keys (Control keys) and 3270 Control keys (including key_enter, key_command, and key_repls) that map to 3270 functions. 3270 function keys are changed by the emulator, depending on the type of terminal used, and remapped using the **terminfo** file format. (See the "HCON and terminfo Key Names" on page 3-54.)

The Keyboard Redefinition Main Menu figure shows the physical keys for keyboard redefinition.



```
                         HCON Utility Program
                   Keyboard Redefinition Main Menu

   Move the cursor to the entry you want and press <enter>.

   English Alphanumeric Keys
   International Alphanumeric Keys
   Symbols Keys
   Meta/3270 Control Keys



=>

      F1–help        F2–refresh          F3–exit          F5–file
      F12–return
```

Keyboard Redefinition Main Menu

Press the Enter key to select a physical key submenu. Select the physical key to be remapped by highlighting the physical key choice and pressing the F10 key. Process the changes to key map fields on the physical key submenu using the keyboard redefinition button bar and button pull-down windows.

Note: The ENTER, RESET, and QUIT key map values must be assigned to at least one physical key.

Redefining Keyboard Values

The keyboard redefinition button bar enables redefining of key values by accessing groups of functions to which a physical key can be mapped. The button bar is located at the top of each physical key submenu screen. Fields on the button bar correlate to groups of keys to which a physical key can be mapped.

`Alphanumeric`
Key and symbols including:

`English Alphanumeric`
Contains standard English alphanumeric keys.

`International Alphanumeric`
Contains international alphanumeric keys.

`Symbols` Contains special graphics symbols, including box characters, superscript and subscript numbers, and square root.

`3270` Contains 3270 keys, including PF keys, ENTER, NEWLINE, DUP, and FMARK.

`Emulator` Contains emulator keys, including SHELL, POR, QUIT, DOIA, and CHGDIS.

`User Defined`
Contains an edit field allowing any type of character string, up to 150 characters.

Use the Tab and Backtab keys to move through the button bar fields. Press the Enter key to select the group.

Changing the Key Map Fields

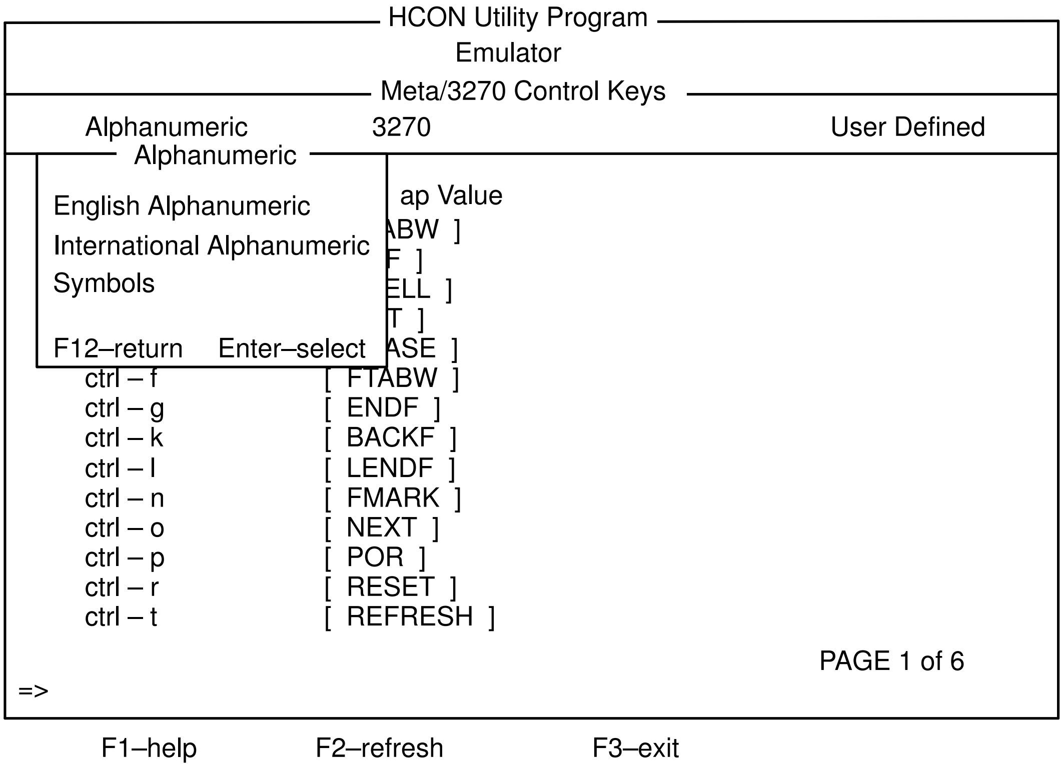
Pull-down windows enable changes to key map fields when using the keyboard redefinition button bar. The type of pull-down window depends on the button bar field selected. The three types of pull-down windows include:

Pull-Down Menu
Lists choices from which a selection can be made using the Enter key. When a selection is made, another pull-down menu that displays further options pops up.

Scroll and Select Window
Displays a list of choices for a selected key mapping group. The English Alphanumeric, International Alphanumeric, Symbols, 3270, and Emulator keys groups use this type of pull-down window. The window can be scrolled, using the Up Arrow and Down Arrow keys, to view all choices. The Enter key is used to select the value.

User Input Window
Displays an input field into which a 150 character user-defined string can be entered.

In the Physical Key Submenu screen, the alphanumeric field on the button bar has been selected. A pull-down menu is displayed listing English Alphanumeric, International Alphanumeric, and Symbols choices. If a selection is made using the Enter key, a pull-down menu listing further choices displays.



```
                         HCON Utility Program
                               Emulator
                        Meta/3270 Control Keys
    Alphanumeric             3270                              User Defined
  ┌────── Alphanumeric ──────┐
  │                          │ ap Value
  │ English Alphanumeric     │ABW  ]
  │ International Alphanumeric F  ]
  │ Symbols                  │ELL  ]
  │                          │T  ]
  │ F12–return   Enter–select│ASE  ]
  └──────────────────────────┘
    ctrl – f               [  FTABW  ]
    ctrl – g               [  ENDF  ]
    ctrl – k               [  BACKF  ]
    ctrl – l               [  LENDF  ]
    ctrl – n               [  FMARK  ]
    ctrl – o               [  NEXT  ]
    ctrl – p               [  POR  ]
    ctrl – r               [  RESET  ]
    ctrl – t               [  REFRESH  ]

                                                            PAGE 1 of 6
=>

     F1–help          F2–refresh              F3–exit
```

Physical Key Submenu

HCON File Transfers

The HCON file transfer facility transfers files from a local system to a System/370 host over a display session. Transfers between a local system and the host take place over an active session. Start a transfer using the HCON Utility Program File Transfer Facility, the **fxfer** command, a program using the HCON file transfer programming interface, an HCON API program with the **g32_fxfer** function, or the High-Level Language Application Programming Interface (HLLAPI).

Explicit and Implicit File Transfers

HCON file transfers are either *explicit* or *implicit*. An explicit file transfer occurs when a user establishes the display session manually with the **e789** or **xhcon** command, logs on to the host either manually or automatically, and starts a file transfer from an emulator subshell or another shell. In the explicit transfer, no input from the user is needed other than the file transfer option parameters. An implicit file transfer is a user-invoked transfer from a shell when the destination session is not currently running.

When the user invokes the transfer, the file transfer program checks if the emulator session is already running.

- If the session exists, the file transfer program attaches to that session and starts an explicit file transfer.
- If the needed session is not running, the file transfer program attempts to start the session, using an automatic logon to the host system, an implicit file transfer.

An implicit transfer requires an AUTOLOG script suitable for the user's logon procedure. The user is prompted for the logon ID string. The ID string contains the logon ID, the script name, and the optional AUTOLOG parameters for AUTOLOG. The user is not prompted for the logon ID string if the necessary information is specified within the session profile, entered into the Utility File Transfer screen, or specified by the **fxfer** command **–x** option.

When an implicit file transfer is started, additional file transfer requests can be sent to the current file transfer processes without logging on again to the host. The additional transfer requests are sent as long as the file transfer process stays logged on to the host, waiting for additional requests. The transfer process remains logged on for the time period specified by the File Transfer Wait Period characteristic in the session profile. The program then logs off from the host.

Note: File transfers made with the utility program should be explicit; otherwise, an error occurs indicating implicit file transfers cannot be attempted with the utility program. File transfers made with the **fxfer** command can be either explicit or implicit.

Synchronous and Asynchronous File Transfers

File transfers can be either *synchronous* or *asynchronous*.

A synchronous file transfer occurs in the foreground. No other activity can run on that emulator session until the current file transfer completes.

An asynchronous file transfer runs in the background, enabling you to initiate other processes in the shell. Additional asynchronous file transfers can be initiated without waiting for the previous transfer to complete. Each request is placed in a queue. The file transfers are executed sequentially until all are complete.

Session Profiles for File Transfers

For a file transfer, the session profile can define:

- Communication path to the host
- Host type
- Host logon name
- Up or down default file transfer direction
- Recovery time
- File transfer wait period

For an implicit file transfer, the profile can define:

- Host Logon ID
- AUTOLOG node ID

and detect:

- AUTOLOG trace
- AUTOLOG timeout

When making a transfer with the **fxfer** command, provide or override some of these settings by using the appropriate flags at the command line.

Interrupted and Restarted File Transfers

A file transfer can be interrupted by any unrecoverable communication error. When the file transfer is interrupted, it saves the state of the transfer in a RESTART file. An interrupted file transfer can be restarted from the beginning without loss of data.

If the host communication is lost or disconnected during an implicit file transfer, the file transfer attempts to recover by reconnecting and logging back on to the host. Automatic recovery is possible only with implicit transfers and is dependent on the length of recovery time defined by the File Transfer Recovery characteristic in the session profile.

In an automatic recovery, the file transfer process uses the logon script, the user logon ID, and the password to log on to the host and execute the file transfer. The file transfer occurs only if the link to the host is recovered within the time specified by the file transfer recovery time in the session profile. Once the host connection is established again, the file transfer resumes from the start. If communication cannot be established again, the file transfer program generates a RESTART file.

When the host connection is lost during a manual logon, log back on to the host before attempting to restart the file transfer.

If, when you begin a new file transfer, a transfer RESTART file exists in the **$HOME** directory, a message displays. The message states the RESTART file has been created and gives the choice of restarting the interrupted file transfer, deleting the RESTART file, or continuing with the current file transfer. If you elect to continue the present file transfer, the RESTART file for the previous transfer can be deleted or saved.

Warning: Even if you save the existing RESTART file, it will be lost if the new file transfer is interrupted, because the new RESTART file will overwrite the existing RESTART file.

How file transfers are restarted depends on whether the new file transfer is implicit or explicit:

- Explicit transfers restart both implicit and explicit restart files. The explicit restart file requests are transferred to the currently logged-on session. The implicit restart file requests are transferred using the session and logon ID saved in the RESTART file. The user is prompted for the password.
- Implicit transfer can only restart the implicit restart file because the logon IDs of the explicit transfer requests are not known.

HCON Utility Program File Transfer Facility

Use the HCON utility program to issue explicit file transfer requests from a menu-driven interface. Upload or download files to either a VM/CMS, MVS/TSO, CICS/VS, VSE/ESA, or VSE/SP host. Enter the information needed for the file transfer on the File Transfer menu screen.

Before entering the file transfer facility, you must have started an HCON session with the **e789** or **xhcon** command, and you must be logged on to the host from either the command line or by using the utility program logon facility.

Note: To issue an implicit file transfer, use the **fxfer** command.

The file transfer facility uses seven screens and menus:

- Session profile prompt screen
- Restart menu
- CMS menu
- TSO menu
- CICS menu for CICS/VS and VSE menu for VSE/ESA
- File transfer message window

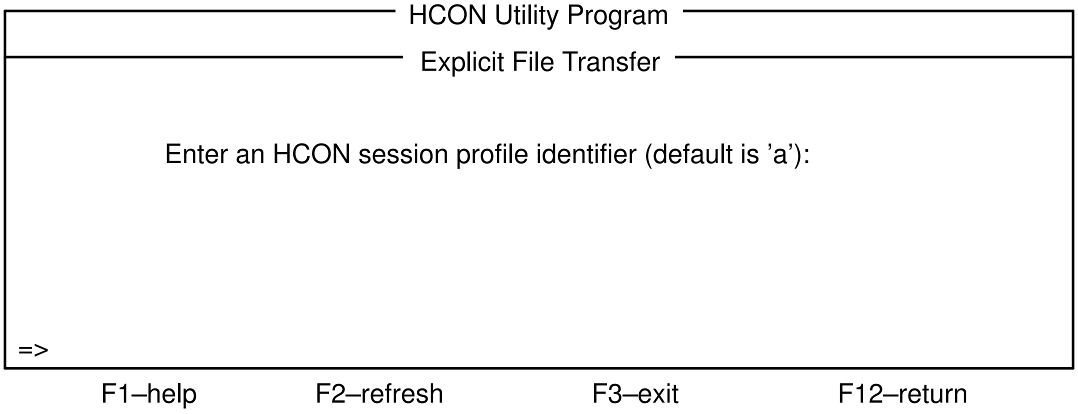
Many of the file transfer menus contain fields for choosing transfer options. These fields are described in “Transfer Fields for the CICS, CMS, VSE, and TSO Menus” on page 2-63. For more information about file transfers, refer to:

- *IBM VSE/ESA Messages and Codes.*
- *IBM VSE/ESA Programming and Workstation Guide.*
- *CICS/VS 3270-PC File Transfer Program*.

Session Profile Prompt Screen

The Session Profile Prompt screen requests an HCON session profile name from the session configuration used to read in the default information for the file transfer. The session name defaults to the value of the **$SNAME** environment variable. If the **$SNAME** environment variable is not set, the letter *a* is the default session name. The name entered must specify a valid profile owned by the current user. If the session profile does not exist, another session profile name is requested through an error message.

The Session Profile Prompt screen for the File Tansfer Facility figure shows an example profile screen.



```
                         HCON Utility Program
                        Explicit File Transfer

        Enter an HCON session profile identifier (default is ’a’):




=>
     F1–help        F2–refresh         F3–exit          F12–return
```

Session Profile Prompt Screen for the File Transfer Facility

Restart Menu

The Restart menu displays when you enter the Utility Program File Transfer facility while a RESTART file is in the **$HOME** directory. The Restart menu displays the choices for the

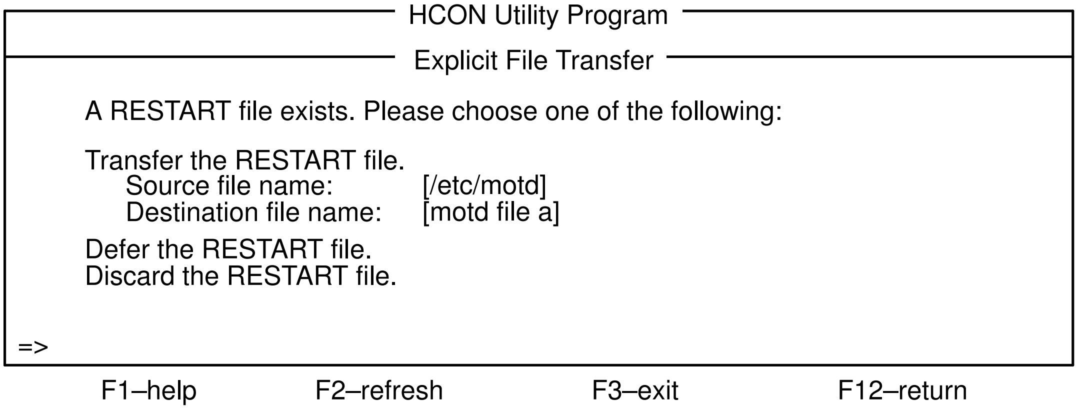
RESTART file. Highlight a choice and press the Enter key to accept the choice. The Restart menu displays the following options:

Transfer the RESTART file
The current restart information becomes the default and displays on the transfer screens. The RESTART file is deleted after the information it contains is processed.

Defer the RESTART file
The RESTART file is ignored. The session profile information is used as the default information on the transfer screens.

Discard the RESTART file
The RESTART file is deleted. The information from the session profile is used as the default information on the transfer screens.

The Restart Menu for the File Transfer Facility figure shows an example of restart menu.

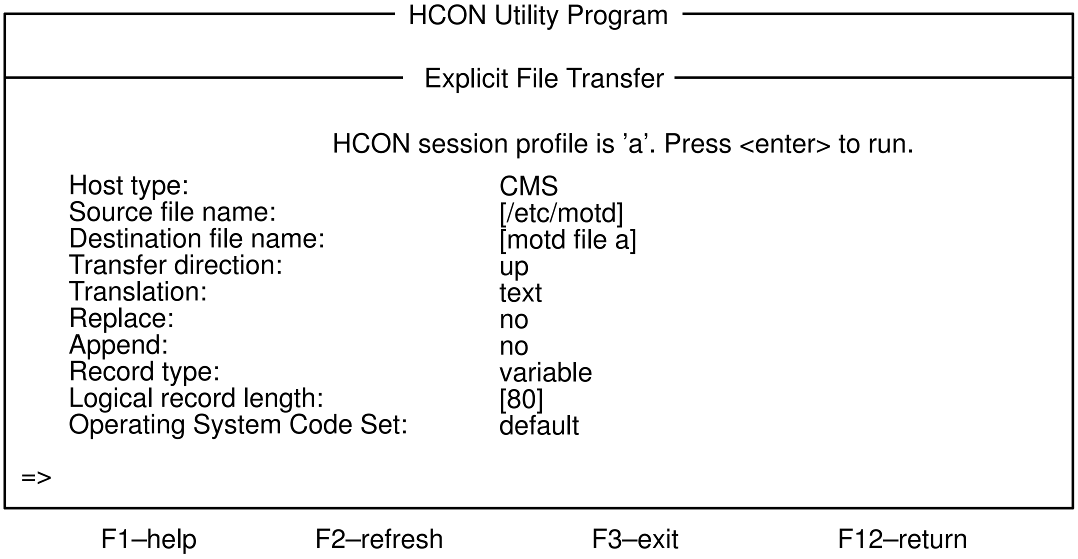


```
                         HCON Utility Program
                        Explicit File Transfer

    A RESTART file exists. Please choose one of the following:

    Transfer the RESTART file.
       Source file name:         [/etc/motd]
       Destination file name:    [motd file a]
    Defer the RESTART file.
    Discard the RESTART file.

=>
       F1–help        F2–refresh          F3–exit          F12–return
```

Restart Menu for the File Transfer Facility

CMS Menu

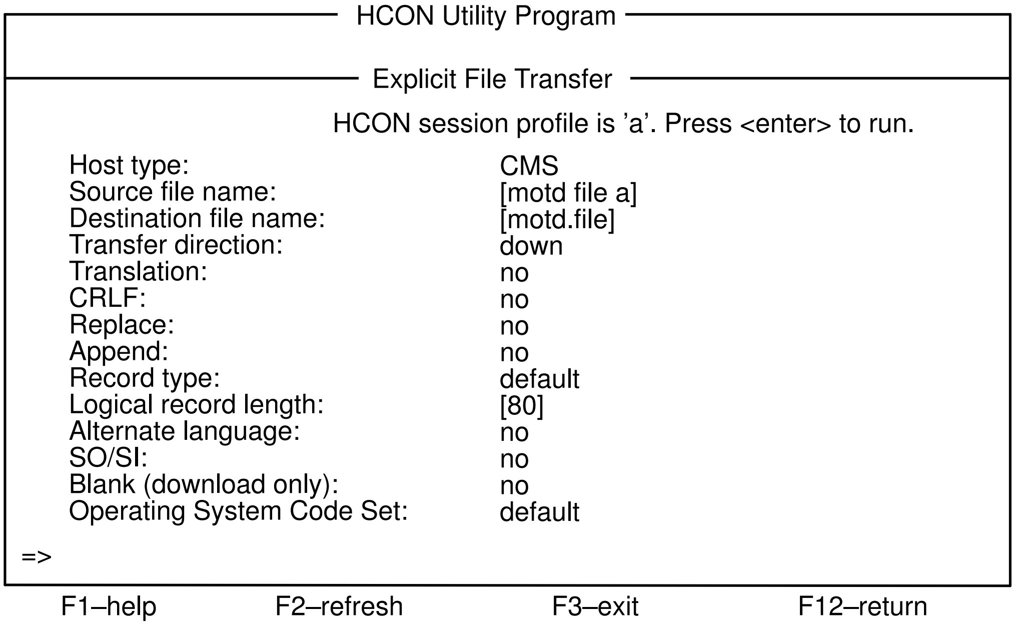
The CMS menu allows the input of parameters to use for a file transfer. To execute the file transfer, press the Enter key. The Transfer Fields section on page 2-63 discusses the fields in this menu. The CMS Menu for the File Transfer Facility in an SBCS Environment figure shows an example menu for file transfers to and from a CMS host.



```
                         HCON Utility Program

                        Explicit File Transfer

                  HCON session profile is 'a'. Press <enter> to run.

   Host type:                          CMS
   Source file name:                   [/etc/motd]
   Destination file name:              [motd file a]
   Transfer direction:                 up
   Translation:                        text
   Replace:                            no
   Append:                             no
   Record type:                        variable
   Logical record length:              [80]
   Operating System Code Set:          default

=>
       F1–help        F2–refresh          F3–exit          F12–return
```

CMS Menu for the File Transfer Facility in an SBCS Environment

The CMS Menu for the File Transfer Facility in a DBCS Environment figure shows an example menu for file transfers to and from a CMS host.

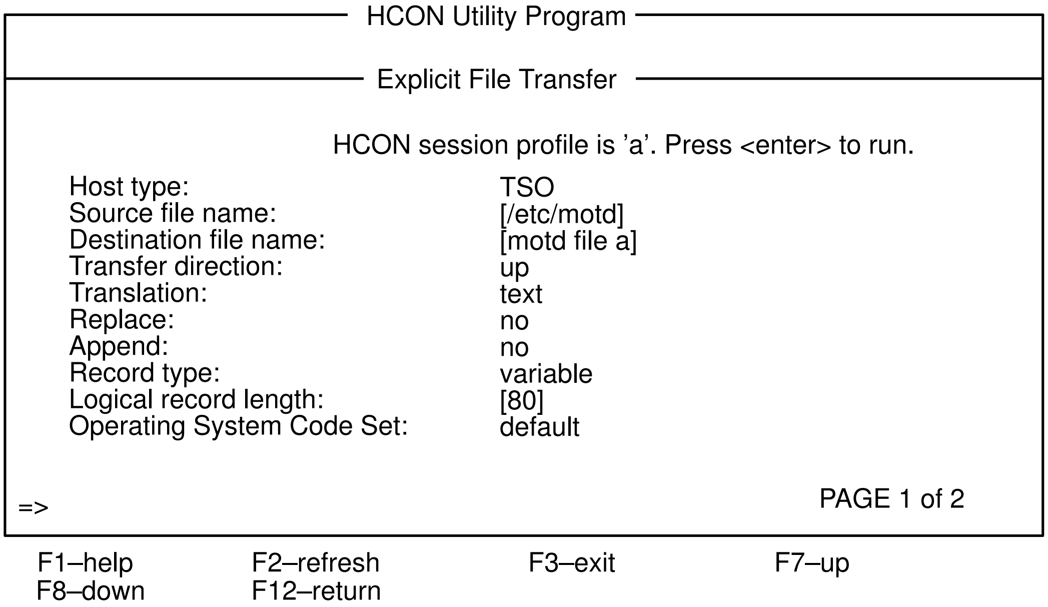


```
                           HCON Utility Program

                            Explicit File Transfer
                       HCON session profile is 'a'. Press <enter> to run.
   Host type:                        CMS
   Source file name:                 [motd file a]
   Destination file name:            [motd.file]
   Transfer direction:               down
   Translation:                      no
   CRLF:                             no
   Replace:                          no
   Append:                           no
   Record type:                      default
   Logical record length:            [80]
   Alternate language:               no
   SO/SI:                            no
   Blank (download only):            no
   Operating System Code Set:        default

=>
  F1–help         F2–refresh          F3–exit          F12–return
```

CMS Menu for the File Transfer Facility in a DBCS Environment

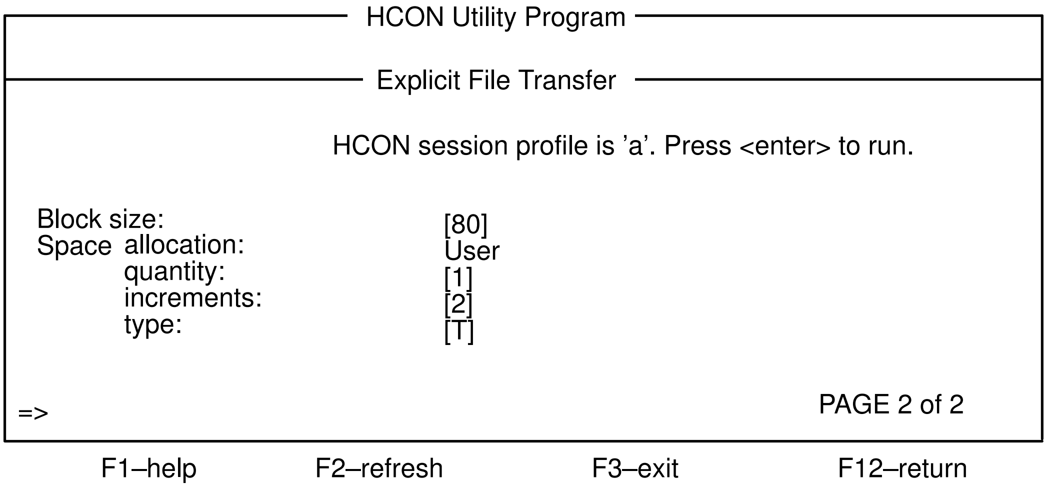
TSO Menu

The TSO menu is similar to the CMS file transfer menu, but has five additional fields. Use these additional fields to specify information unique to the TSO system. The TSO Menu for the HCON File Transfer Facility in an SBCS Environment figures show example menus for file transfers to a TSO host.



```
                           HCON Utility Program

                            Explicit File Transfer

                       HCON session profile is 'a'. Press <enter> to run.
   Host type:                        TSO
   Source file name:                 [/etc/motd]
   Destination file name:            [motd file a]
   Transfer direction:               up
   Translation:                      text
   Replace:                          no
   Append:                           no
   Record type:                      variable
   Logical record length:            [80]
   Operating System Code Set:        default

                                                              PAGE 1 of 2
=>
 F1–help         F2–refresh          F3–exit          F7–up
 F8–down         F12–return
```

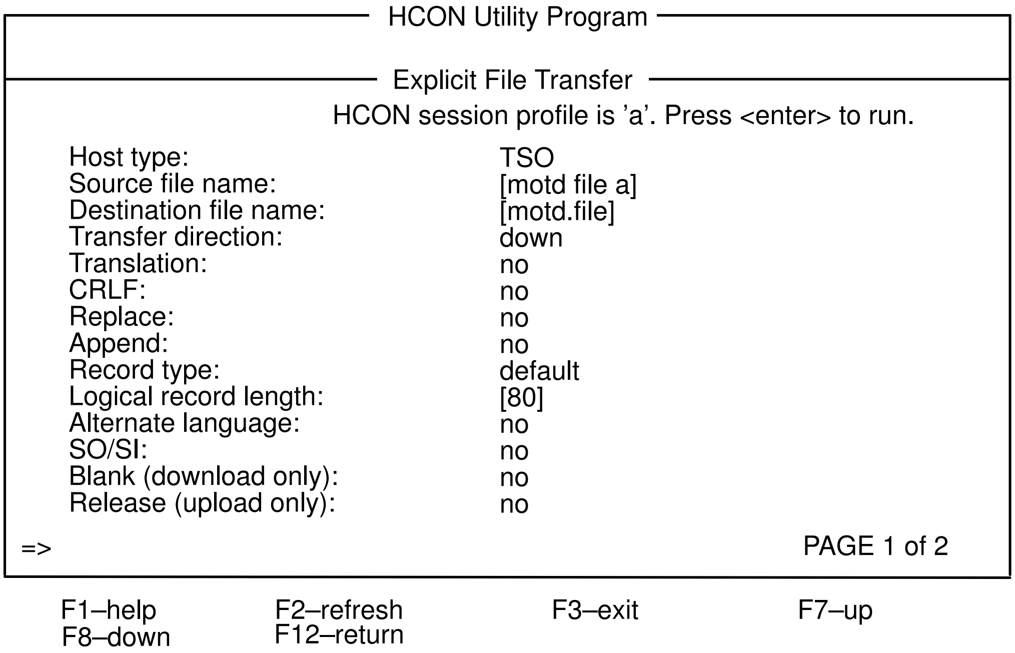
TSO Menu for the File Transfer Facility in an SBCS Environment



```
HCON Utility Program
Explicit File Transfer
                    HCON session profile is 'a'. Press <enter> to run.

Block size:                  [80]
Space  allocation:           User
       quantity:             [1]
       increments:           [2]
       type:                 [T]

=>                                                  PAGE 2 of 2

   F1–help        F2–refresh        F3–exit        F12–return
```

TSO Menu for the File Transfer Facility in an SBCS Environment

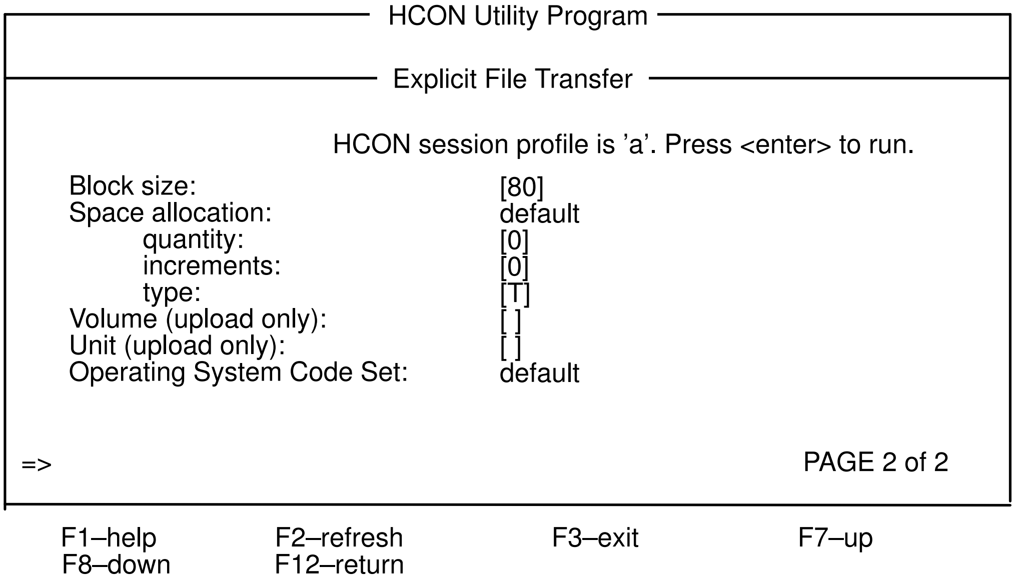
The TSO menu for the File Transfer Facility in a DBCS Environment figures show example menus for a file transfer to a TSO host. The first TSO/DBCS figure shows page 1 of 2 of the TSO menu in a DBCS environment, containing the options **Host type** through **Release**.



```
HCON Utility Program
Explicit File Transfer
                    HCON session profile is 'a'. Press <enter> to run.
   Host type:                    TSO
   Source file name:             [motd file a]
   Destination file name:        [motd.file]
   Transfer direction:           down
   Translation:                  no
   CRLF:                         no
   Replace:                      no
   Append:                       no
   Record type:                  default
   Logical record length:        [80]
   Alternate language:           no
   SO/SI:                        no
   Blank (download only):        no
   Release (upload only):        no
=>                                                  PAGE 1 of 2

   F1–help        F2–refresh        F3–exit        F7–up
   F8–down        F12–return
```

TSO Menu for the File Transfer Facility in a DBCS Environment

The second TSO/DBCS figure shows page 2 of 2 of the TSO menu in a DBCS environment, containing the options **Block size** through **Operating System Code Set**.

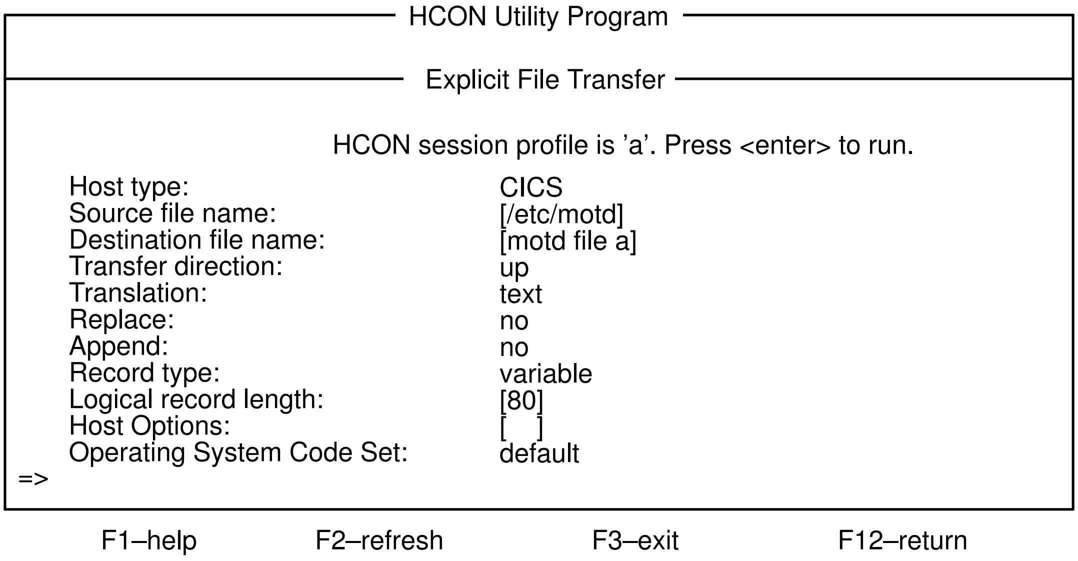


```
                         HCON Utility Program
                         Explicit File Transfer

                    HCON session profile is 'a'. Press <enter> to run.
  Block size:                         [80]
  Space allocation:                   default
       quantity:                      [0]
       increments:                    [0]
       type:                          [T]
  Volume (upload only):               [ ]
  Unit (upload only):                 [ ]
  Operating System Code Set:          default


=>                                                         PAGE 2 of 2

  F1–help        F2–refresh        F3–exit        F7–up
  F8–down        F12–return
```

TSO Menu for the File Transfer Facility in a DBCS Environment

CICS Menu for CICS/VS and VSE Menu for VSE/ESA

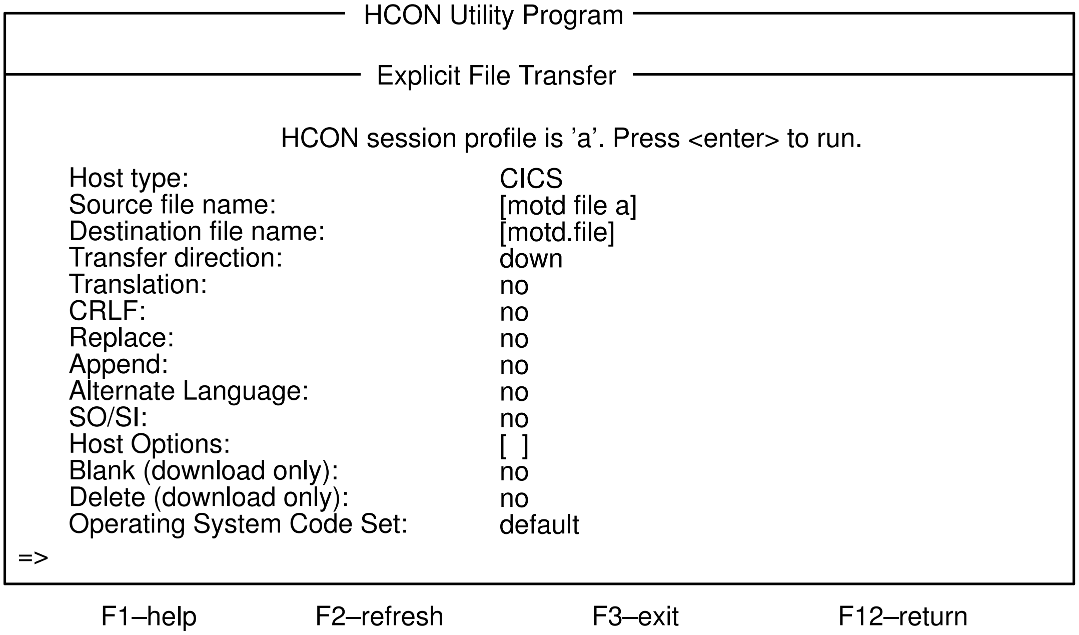
The CICS and VSE file transfer menus are the same as the CMS file transfer menu, except for the Transfer Fields for the CICS, CMS, VSE, and TSO menus. The CICS file transfer can be used for CICS/MVS and CICS/VSE. The VSE option can be used for VSE/ESA or CICS/VSE. The CICS menu for the File Transfer Facility in an SBCS Environment figure shows an example menu for a file transfer to a CICS host.



```
                         HCON Utility Program
                         Explicit File Transfer

                    HCON session profile is 'a'. Press <enter> to run.
  Host type:                          CICS
  Source file name:                   [/etc/motd]
  Destination file name:              [motd file a]
  Transfer direction:                 up
  Translation:                        text
  Replace:                            no
  Append:                             no
  Record type:                        variable
  Logical record length:              [80]
  Host Options:                       [    ]
  Operating System Code Set:          default
=>

    F1–help        F2–refresh        F3–exit        F12–return
```

CICS Menu for the File Transfer Facility in an SBCS Environment

The CICS Menu for the File Transfer Facility in a DBCS Environment figure shows an example menu for a file transfer from a CICS/VS host.

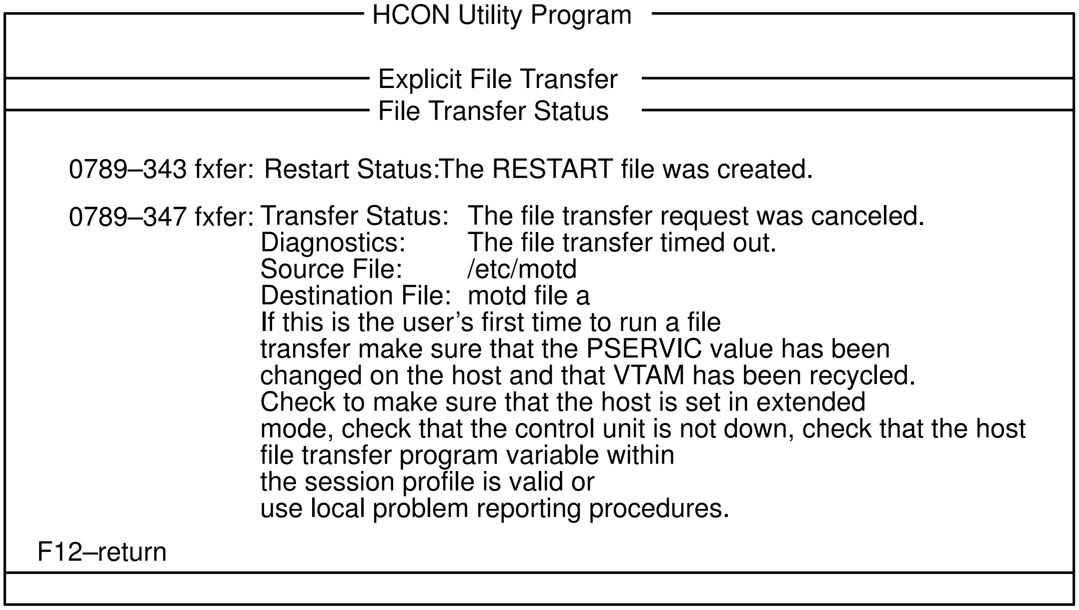


```
                         HCON Utility Program
                        Explicit File Transfer

                HCON session profile is 'a'. Press <enter> to run.
   Host type:                         CICS
   Source file name:                  [motd file a]
   Destination file name:             [motd.file]
   Transfer direction:                down
   Translation:                       no
   CRLF:                              no
   Replace:                           no
   Append:                            no
   Alternate Language:                no
   SO/SI:                             no
   Host Options:                      [ ]
   Blank (download only):             no
   Delete (download only):            no
   Operating System Code Set:         default
=>

     F1–help        F2–refresh        F3–exit        F12–return
```

CICS Menu for the File Transfer Facility in a DBCS Environment

File Transfer Message Window

The file transfer pop-up window displays the status of a file transfer request. This pop-up window displays after the file transfer completes. The message contains the status of the file transfer request along with any appropriate error messages. The File Transfer Message Window for the File Transfer Facility figure shows an example of the window.



```
                         HCON Utility Program

                        Explicit File Transfer
                        File Transfer Status

   0789–343 fxfer: Restart Status:The RESTART file was created.

   0789–347 fxfer: Transfer Status:  The file transfer request was canceled.
                   Diagnostics:      The file transfer timed out.
                   Source File:      /etc/motd
                   Destination File: motd file a
                   If this is the user's first time to run a file
                   transfer make sure that the PSERVIC value has been
                   changed on the host and that VTAM has been recycled.
                   Check to make sure that the host is set in extended
                   mode, check that the control unit is not down, check that the host
                   file transfer program variable within
                   the session profile is valid or
                   use local problem reporting procedures.
 F12–return
```

File Transfer Message Window for the File Transfer Facility

For VSE/ESA, the host error message displays at the host screen. For more information about host error messages, see the *IBM VSE/ESA Messages and Codes*.

Transfer Fields for the CICS, CMS, VSE, and TSO Menus

Each file transfer menu contains toggle and edit fields for choosing file transfer options.

Toggle Fields

The toggle fields have a limited number of values. Use the Left Arrow and Right Arrow keys to move between the values within the menu. The toggle fields are:

Host type Specifies the type of host the data transfers to or from. The type of host also determines which fields appear on the transfer screen. The default is the value of the Host Type characteristic in the session profile.

Transfer direction
Specifies whether the transfer sends a file from the local system to the host (`up`) or from the host to the local system (`down`). The default is the value of the File Transfer Direction characteristic in the session profile.

Translation Specifies the type of translation the file transfer should perform on the file. In an SBCS environment, there are three choices: `no` (the default), `text`, and `DOS`. In a DBCS environment, there are two choices: `no` (the default) and `yes`.

CRLF The CRLF field is only valid in a DBCS environment. `CRLF` specifies the CR (carriage return) and LF (line-feed) characters handling methodology. The following three choices are available:

> **no** No CRLF handling. `No` is the default.
>
> **AIX** For an AIX file type in an uploading file transfer, `CRLF` appends LF characters to the CR character sequence. In a downloading file transfer, `CRLF` removes the LF characters from the CRLF character sequence.
>
> **DOS** For a DOS file type in an uploading file transfer, `CRLF` removes the EOF designator. In a downloading file transfer, `CRLF` adds an EOF code (0x1A) as an end-of-file designator.

Replace Specifies whether to replace the destination file with the new file if the destination file exists. The default is `no`.

Append Specifies whether to append the transferred file to the destination file if the destination file exists. The default is `no`.

Record type Specifies the type of host file format to use for the transferred file. On a VSE/CICS/CMS screen, the choices are `default`, `variable`, and `fixed`. On a TSO menu, one additional choice exists: `undefined`. The default is `default`. This field is valid only on upload file transfers. It is ignored on download file transfers, with the exception of `fixed` on a VSE screen, where trailing blanks are downloaded.

Space allocation
Defines the amount of space to allocate for the host file. This field is valid only on upload file transfers. It is ignored on all download file transfers. The valid values are `host default` (the default) and `user input`.

This field is only available on TSO file transfer requests. For the `user input` value, the user must also fill in the edit fields for `Quantity`, `Increments`, and `Type`.

Alternate language
Specifies an alternate host code page for JISCII-EBCDIC translation. If the field is `no`, the language used for translation is defined by the Language characteristic in the session profile. If the field is `yes`, the language used for translation is the alternate Japanese language.

For example, if the Language characteristic in the session profile is JPK (Japanese Katakana), a `yes` will use Japanese-English to translate the file.

Specify this option when the `Translation` field is `text` or `DOS`. This field is only available in a Japanese language environment.

SO/SI
Specifies SO/SI option usage. When you select the SO/SI option, the following fields are provided:

Upload
SO/SI characters are not inserted in DBCS fields.

Download
Replaces SO/SI characters with control characters (0x1E/0x1F) in DBCS fields. This field is only available on file transfer requests in a DBCS environment.

Blank
Specifies that blanks are not deleted at the end of each record when this option is specified. This option can be specified when the `Translation` field is `yes`. This field is only available in a DBCS environment.

Delete
Deletes the temporary storage queue at the completion of the file transfer. This field is only available on CICS file transfer requests and is only available in a DBCS environment.

Release
Releases unused records in the data set at the completion of the file transfer. This field is only available on TSO file transfer requests and is only available in a DBCS environment.

Operating System Code Set
Specifies an alternate code set to use for ASCII-EBCDIC translation. The default code set is specified by the system locale that can vary from shell to shell. Each shell can have an individually set locale permitting the use of several code pages. The following code sets are supported:

Default
Uses current local system ASCII code page.

IBM-850
Uses IBM code page 850 for translation in an SBCS environment.

IBM-932
Uses IBM code page 932 for translation in a DBCS environment.

ISO8859-1
Uses ISO 8859-1 Latin alphabet number 1 code page.

ISO8859-7
Uses ISO 8859-7 Greek alphabet.

ISO8859-9
Uses ISO 8859-9 Turkish alphabet.

IBM-eucJP
Uses IBM Extended UNIX Code for translation in the Japanese language environment.

IBM-eucKR
Uses IBM Extended UNIX Code for translation in the Korean language environment.

IBM-eucTW
Uses IBM Extended UNIX Code for translation in the Traditional Chinese language environment.

Edit Fields

Enter the information to answer the prompt in the following edit fields of each menu:

Source file name
Names the file to be transferred. If the transfer direction is `down`, this is the name of a host file. If the transfer direction is `up`, then this is the full path name of a file. The maximum size of this field is 1024 characters. This is a required field; the default value is blank.

Destination file name
Names the file to be created, replaced, or appended. If the transfer

direction is `up`, this is the name of a host file. If the transfer direction is `down`, this is the full path name of a file. The maximum size of this field is 1024 characters. This is a required field; the default value is blank.

Logical record length
Gives the logical record length of the host file. This option is valid only on upload file transfers and is ignored on download file transfers. The maximum size of this field is five characters. The default value is `80`.

Block size Gives the host block size. This field is valid only on upload file transfers and is ignored on download file transfers. This field is only available on TSO file transfer requests. The default value is `80`.

Quantity Specifies the number of units of space to be added initially. Only a positive integer can be specified. This field is only available on TSO file transfer requests and need not be filled in unless the value of the `Space allocation` field is `user input`. The default value is `0`.

Increments Specifies the number of units of space to be added to the data set each time the previously allocated space is filled. This field is only available on TSO file transfer requests and need not be filled in unless the value of the `Space allocation` field is `user input`. The default value is `0`.

Type Defines the unit used for space allocation and may be `T` for tracks, `C` for cylinders, or a number specifying the average block size (in bytes) of the records to be written to the data set. This field is only available on TSO file transfer requests and need not be filled in unless the value of the `Space allocation` field is `user input`. The default value is `T`.

Host Options Lists the file transfer options passed to the host without error checking by the local system. The maximum size of this field is 64 characters.

Volume Specifies the volume serial number of the host disk for data set allocation. This field is only available on TSO file transfer requests and is only available in a DBCS environment.

Unit Specifies the unit of the host disk for data set allocation. This field is only available on TSO file transfer requests and is only available in a DBCS environment.

HCON Host Logon Procedures

Before information can be exchanged between a local system and a host system, you must log on to the host system with a valid host user ID and password. For more information about using the logon and logoff utility, see “Using the HCON Utility Program Logon and Logoff Facility” on page 2-73.

There are two ways to log on to a host system:

manual logon Starts a display session and logs on to the host system.

automatic logon
Starts a session, then runs a user-written HLLAPI program to perform the logon steps. Starts a file transfer or a program that starts an emulator session. Starts a session, a file transfer, or an API program starting an emulator session.

Then the program reads a user defined AUTOLOG script, which determines how to log on to the system. The AUTOLOG procedure may ask for a host user ID and any other host logon parameters that are not specified in the session profile or in the API program.

Automatic logons can be performed by file transfer procedures, by API programs, or by running an AUTOLOG script either from an emulator subshell, using the **tlog** command, or from the HCON utility program.

Automatic Logon (AUTOLOG)

AUTOLOG enables you to create a menu-driven logon procedure without writing a program. Use the **genprof** command or the HCON utility program to create an AUTOLOG script containing all the information necessary to perform logon and logoff operations. HCON provides example AUTOLOG scripts containing the appropriate information for the AUTOLOG procedure.

AUTOLOG Parameters

For an AUTOLOG procedure to succeed, the following parameters must either be set in the HCON session profile or entered during logon:

Host Logon ID Gives the host logon ID.

AUTOLOG Node ID
Names the AUTOLOG procedure to be used.

AUTOLOG Trace
Controls output to help test the AUTOLOG script.

AUTOLOG Timeout
Specifies the amount of time, in seconds, to wait for a particular pattern to be received from the host. The default value is 0.

Note: Always enter the host password when logging on.

If the host logon ID parameter is not set in the session profile, you are prompted for a host logon string containing the parameters and password. If the *Host Logon ID* parameter is set in the session profile, you are only prompted for the password. The rest of the parameters are retrieved from the profile.

Set or override the AUTOLOG parameters at logon time by entering a logon string at the host system prompt. Use the utility program logon facility and enter data into the Change Values screen, or set the user ID and password parameters for the **g32_open** or **g32_openx** calls in API programs.

If you enter the logon string at the prompt, the first value in the logon ID string must be the Host Logon ID. The second value is the AUTOLOG script name (node ID). After the node

ID, the string can contain the optional *AUTOLOG Trace* and *AUTOLOG Timeout* parameter values. Each parameter value must be separated by commas. For example:

```
Enter logon id string:
  mike,vm1,trace,time=10
Enter password:
  mypassword
```

If certain parameters are missing from the host logon string but are in the profile, they are still retrieved. For example, if you set the *Node ID*, *Trace*, and *Timeout* parameters in the session profile, only enter the Host Logon ID when prompted. However, your response to a prompt always overrides a profile parameter. For example, if you set the *AUTOLOG Timeout* parameter in the session profile but enter a different value on the prompt line or the Utility Change Values screen, the latter value is used.

Creating and Testing an HCON AUTOLOG Script

This procedure explains how to create and verify and HCON AUTOLOG script.

Prerequisites

1. The appropriate adapters for HCON must be installed.
2. The HCON program and messages must be installed.
3. You must be an HCON user and have at least one session profile defined.
4. You must have a user ID on the host.

Procedure

1. Run the **e789** or **xhcon** command. Provide a specific session profile. To start a session profile `z`, enter:

   `e789 z` or `xhcon z`

2. Log on to the host, then log off. Record all the events on an AUTOLOG **logform** file (located in the /**usr**/**lib**/**hcon** directory) until the final logon/logoff prompt.

3. Generate the log script by running the **genprof** or **hconutil** command. Access the menus for creating, displaying, or changing an AUTOLOG script. The log information is stored in the user's **$HOME** directory and resides in the log script under the name **SYS***NodeID*. For example, in:

   ```
   SYSdanvm1
   ```

   the suffix `danvm1` is equivalent to the *NodeID* variable.

   Note: The /**usr**/**lib**/**hcon** directory provides three sample AUTOLOG scripts: **SYSvm1**, **SYSvm2**, and **SYStso**. The directory also contains the **logform** file, which shows the format of the **genprof** command menu.

4. Use the **tlog** program to test the AUTOLOG script. An emulator must be running to use the **tlog** program. To test the script, enter:

   ```
   tlog z
   ```

   If the host logon ID is not specified in the session profile, the **tlog** command prompts for the logon ID string and password. Otherwise, the program only prompts for the password. Enter the logon ID string in the following format:

   UserID,*NodeID*,**trace,time=***Value*

   For example:

   ```
   grace,danvm1,trace,time=5
   ```

   where:

   UserID Specifies the Host Logon ID.

   NodeID Specifies the node ID. The node ID is the name of the AUTOLOG script (excluding the **SYS** prefix).

   trace Specifies optional trace information output to the screen.

   time=*Value* Specifies the optional time parameter, enabling a change to the default time to wait for the reception of a particular pattern from a host. The *Value* variable specifies the time, in seconds, for the AUTOLOG procedure to wait.

If the AUTOLOG procedure cannot find the AUTOLOG script in the **$HOME** directory, the procedure checks the /**usr**/**lib**/**hcon** directory. If the AUTOLOG script is not found there, the AUTOLOG procedure displays an error message.

Example AUTOLOG Script

The following example shows an AUTOLOG script that logs on to a CMS system while passing through multiple host systems. The AUTOLOG script can be generated using either the **genprof** or **hconutil** commands.

In `EVENT 1`, the system searches for `TEST MVS Test ESA` on the host screen. If the system finds the `PROMPT`, then `testvm` is input to the host system and entered. Control is then passed to `EVENT 2`. All events are processed until the AUTOLOG procedure is complete.

```
NODE ID : HOSTSYSB
LOGON STARTS  :  1_   LOGOFF STARTS : 11
EVENT      PROMPT            INPUT        KEY       NEXT EVENTS
1  TEST MVS Test ESA_  testvm________  ENT(1)  2_ __ __ __ __ __
2  HOSTSYSC__________  ______________  NEW(2)  3_ __ __ __ __ __
3  HOSTSYSC__________  d  pvm________  ENT(1)  4_ __ __ __ __ __
4  PASS-THROUGH______  HOSTSYSB______  ENT(1)  5_ __ __ __ __ __
5  HOSTSYSB__________  &id___________  ______  6_ __ __ __ __ __
6  HOSTSYSB__________  &pw___________  ENT(1)  7_ __ __ __ __ __
7  VM READ___________  ______________  ENT(1)  8_ 9_ __ __ __ __
8  HOLDING___________  ______________  CLE     0_ __ __ __ __ __
9  CP READ___________  logoff________  ENT(1)  4_ __ __ __ __ __
10 __________________  ______________  ______  __ __ __ __ __ __
11 Press one of the__  logoff________  ENT(1)  12 __ __ __ __ __
12 PASS-THROUGH______  ______________  PA1___  13 __ __ __ __ __
13 PRESS ENTER KEY___  ______________  ENT(1)  14 __ __ __ __ __
14 USERID____________  ______________  NEW(2)  15 __ __ __ __ __
15 COMMAND___________  VMEXIT________  ENT(1)  0_ __ __ __ __ __
```

Using an HCON AUTOLOG Script

This procedure explains how to use an HCON AUTOLOG script.

Prerequisite

An AUTOLOG script must be stored in your **$HOME** directory.

Note: The /**usr**/**lib**/**hcon** directory provides three sample AUTOLOG scripts: **SYSvm1**, **SYSvm2**, and **SYStso**. The directory also contains the **logform** file, which shows the format of the **genprof** command menu.

Using an AUTOLOG Script with the File Transfer Command

To use an AUTOLOG script with the **fxfer** command, run the command implicitly without initiating the corresponding **e789** emulation session. Then, specify the **–n***SessionName* flag.

Using an AUTOLOG Script with an API Program

To use an AUTOLOG script with an API program:

1. Compile the API program by entering:

   - For C programs:

     ```
     cc apiprog.c –o apiprog –l g3270
     ```

   - For FORTRAN programs:

     ```
     xlf apiprog.f –o apiprog –lc –l g3270f –lg3270
     ```

   - For Pascal programs:

     ```
     xlp apiprog.pas –o apiprog –lc –lg3270p –lg3270
     ```

2. Execute the API program:

   - To start the API program implicitly, execute the program without initiating an emulator session. If the Host Logon ID is not in the session profile, the API program prompts for a logon ID and password. Otherwise, the program only prompts for the password.

   - To start the API program explicitly, start an emulator session using the **e789** command. Before compiling the application, set the flag parameter in the **g32_open** or **g32_openx** call to `1`. Then execute the API program.

Debugging an HCON AUTOLOG Script

This procedure explains how to debug an HCON AUTOLOG script.

Prerequisite

An AUTOLOG script must be stored in your **$HOME** directory.

Note: The /**usr**/**lib**/**hcon** directory provides sample AUTOLOG scripts: **SYSvm1**, **SYSvm2**, and **SYStso**. The directory also contains the **logform** file, which shows the format of the **genprof** command menu.

Procedure

The tracing facility assists in debugging the AUTOLOG script by enabling you to view the result of the AUTOLOG script execution. To use the tracing facility, you must:

1. Enable the AUTOLOG script execution tracing facility either by setting the AUTOLOG trace option to `yes` in the session profile, or by including `trace` as an option in the Host Logon ID string. For example, if `Alex` is the user name and `vm6` is the AUTOLOG node ID:

   ```
   Enter logon id:
   Alex,vm6,trace
   ```

2. Use the time-out facility to specify the maximum amount of time, in seconds, to wait for a successful event. Set the AUTOLOG *Timeout* parameter in the session profile or, if the logon ID is prompted, enter a `,` (comma) and `time=`*Seconds* following the word `trace`. For example:

   ```
   Enter logon id:
   Alex,vm6,trace,time=10
   ```

   where the *Seconds* variable (`time = 10`) indicates the number of seconds to wait for host activity.

3. Start an emulator with the **e789** or 0**xhcon** command.
4. Enter an emulator subshell.
5. Use the **tlog** program to execute the AUTOLOG script.

As the AUTOLOG script attempts to automatically log on to the host, the tracing facility monitors the script execution. The facility prints the results of each string pattern search and the key strokes sent to the host. This enables you to monitor the results and modify the script, if necessary.

Using the HCON Utility Program Logon and Logoff Facility

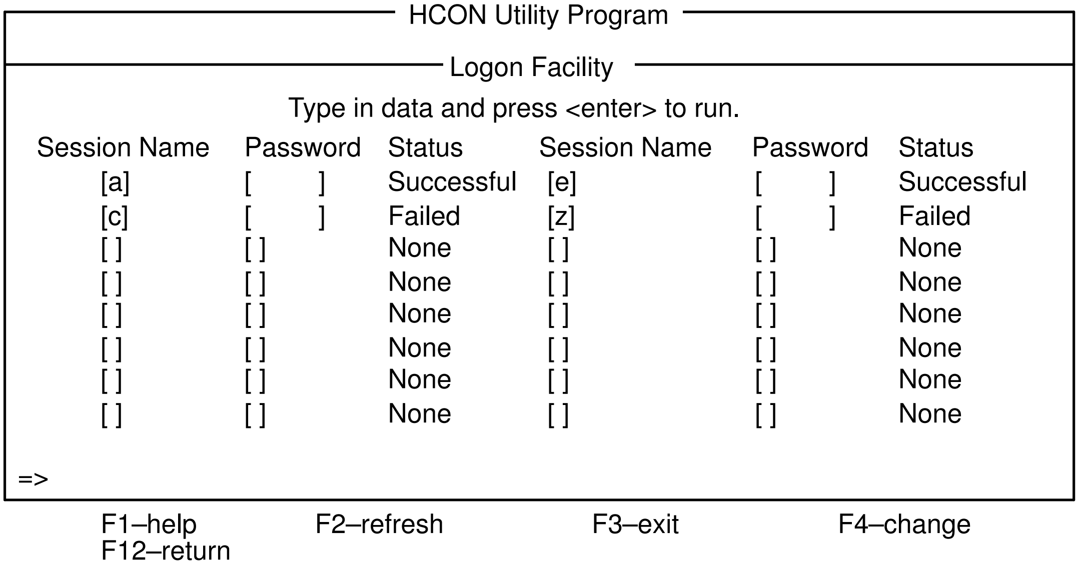
The utility program logon and logoff facility enables automatic logons and logoffs for display sessions, using an AUTOLOG procedure. More than one session can be logged on to or logged off of in one operation.

The logon facility asks for session names and host passwords, reads the sessions profiles for information about AUTOLOG procedures, and attempts to log on to the host using the designated AUTOLOG procedure. The logoff facility asks for session names, then logs those sessions off the host system.

Logon and Logoff Screens

Two screens and two pop-up windows are associated with the logon/logoff portions of the utility program. The screens are the Logon and Logoff screens. The pop-up windows are the Change Values Window and the Logon/Logoff Status Window.

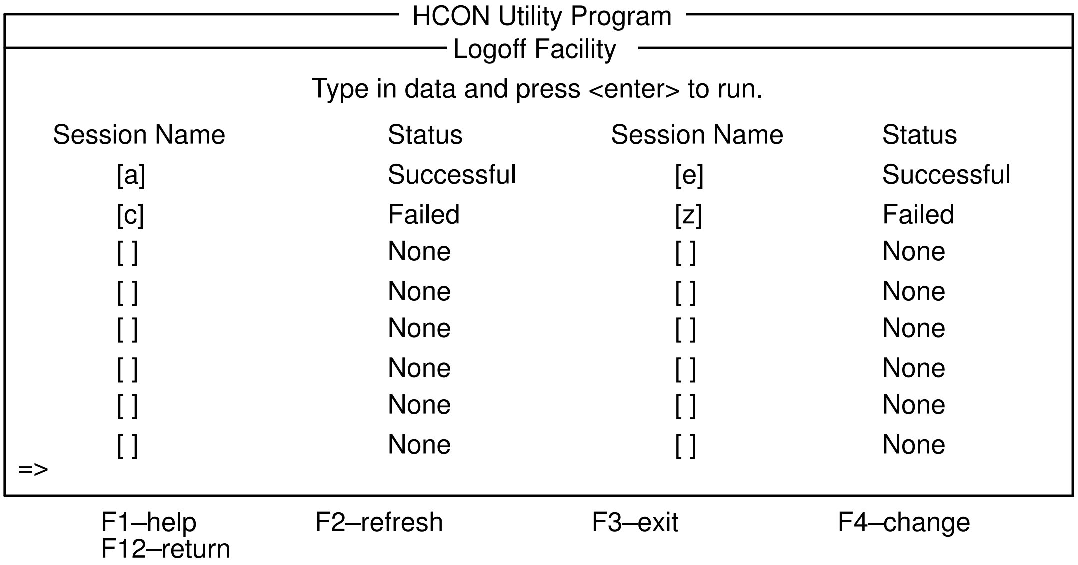
Logon Screen Contains three types of fields: `Session Name`, `Password` and `Status`. The Logon Screen figure shows an example logon screen.



```
                                  HCON Utility Program
                                    Logon Facility
                        Type in data and press <enter> to run.
 Session Name    Password   Status       Session Name    Password   Status
      [a]        [      ]   Successful    [e]            [      ]   Successful
      [c]        [      ]   Failed        [z]            [      ]   Failed
      [ ]        [ ]        None          [ ]            [ ]        None
      [ ]        [ ]        None          [ ]            [ ]        None
      [ ]        [ ]        None          [ ]            [ ]        None
      [ ]        [ ]        None          [ ]            [ ]        None
      [ ]        [ ]        None          [ ]            [ ]        None
      [ ]        [ ]        None          [ ]            [ ]        None

=>
       F1–help          F2–refresh             F3–exit              F4–change
       F12–return
```

Logon Screen

Logoff Screen Contains two types of fields: `Session Name` and `Status`. The Logoff Screen figure shows an example of the logoff screen.



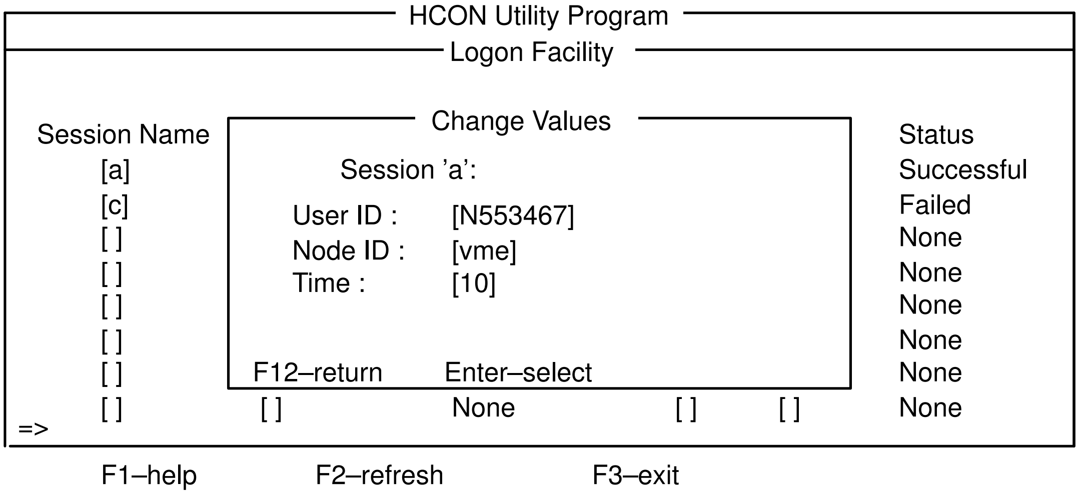
```
                          HCON Utility Program
                             Logoff Facility
                  Type in data and press <enter> to run.
  Session Name          Status          Session Name        Status
      [a]               Successful           [e]            Successful
      [c]               Failed               [z]            Failed
      [ ]               None                 [ ]            None
      [ ]               None                 [ ]            None
      [ ]               None                 [ ]            None
      [ ]               None                 [ ]            None
      [ ]               None                 [ ]            None
      [ ]               None                 [ ]            None
=>

      F1–help        F2–refresh          F3–exit          F4–change
      F12–return
```

Logoff Screen

Change Values Window

Contains two or three fields, depending on whether it is initiated from a logon or logoff screen. If called from the logon screen, it contains the `User ID`, `Node ID`, and `Time` fields. If called from the logoff screen, it contains only the `Node ID` and `Time` fields.

To override the default values for `User ID`, `Node ID`, or `Time`, move the cursor to the line of the value. Press the F4 key to bring up the Change Values window. Type in the changes and press the Enter key to accept the changes. To exit without accepting the changes, press the F12 key. Both keys return the utility to the logon or logoff screen. The Change Values Window figure shows an example of this window for the logon facility.

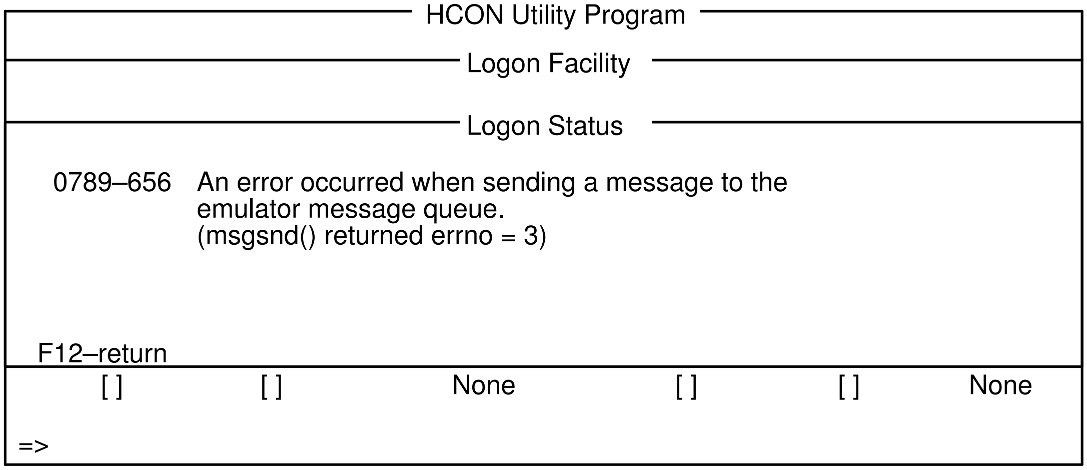


```
                          HCON Utility Program
                             Logon Facility

                           Change Values
 Session Name                                                 Status
     [a]          Session 'a':                                Successful
     [c]                                                      Failed
     [ ]       User ID :      [N553467]                       None
     [ ]       Node ID :      [vme]                           None
     [ ]       Time :         [10]                            None
     [ ]                                                      None
     [ ]                                                      None
     [ ]       F12–return     Enter–select                    None
     [ ]       [ ]            None           [ ]      [ ]     None
=>

      F1–help        F2–refresh          F3–exit
```

Change Values Window

Logon/Logoff Status Window

Displays the status of a logon or logoff request. The window displays after the logon or logoff request is complete. The message contains the status of the request along with any appropriate error messages. The Logon/Logoff Status Window figure shows an example of this window for the Logon facility.



```
                         HCON Utility Program
                            Logon Facility

                             Logon Status

  0789–656   An error occurred when sending a message to the
             emulator message queue.
             (msgsnd() returned errno = 3)



 F12–return
      [ ]          [ ]          None          [ ]          [ ]          None

=>
```

Logon/Logoff Status Window

Logon and Logoff Fields

The utility program Logon and Logoff windows contain the following fields:

`Session Name`
Names the currently defined and active HCON session. To be active, the session must have been started using the **e789** or **xhcon** command.

`Password` Specifies the host password (up to 8 characters) correlating to the user ID specified. One password must be entered for each session name on the logon screen. The `Password` field is not used on the logoff screen. To log on to a CICS host, a dummy password must be entered. The password is not displayed.

`User ID` Names the host ID to use during the logon process. This field is only on the logon screen. The default is the user ID defined in the session profile. To log onto a CICS host, a dummy host user ID must be entered.

`Node ID` Names the AUTOLOG script to use for logging on and off the host. The default is the node ID specified in the session profile.

`Time` Specifies the amount of time (in seconds) to wait for the specified prompt from the host during the AUTOLOG procedure. The default value is the AUTOLOG Time Value in the session profile.

`Status` Displays the status of the logon or logoff attempt. The value can be `successful`, `failed`, or `none`. A status of `none` means that no logon or logoff attempt has been made.

The data in the Session Name and Password fields must be entered. However, the values for User ID, Node ID, and Time are retrieved from the session profile specified by the Session Name field. The values in the session profile become the default values for these fields. However, these fields can be overridden by pressing the F4 (Change) key, opening the Change Values pop-up screen. The Status field cannot be edited.

HCON Commands

See “HCON Programming References” on page 5-11 for information about the File Transfer Program Interface, example programs, and system management files.

Emulation and File Transfers

e789 or **xhcon** Initiates one or more HCON display sessions.

e789pr Initiates an HCON printer session.

fxfer Starts file transfers.

hconutil Starts the HCON utility program, which allows the user to customize HCON color and keyboard tables, start file transfers, log on to and log off of the host system, and create, modify, and display AUTOLOG scripts.

AUTOLOG Procedures

HCON provides the following commands used for generating and testing the implicit logon procedures:

genprof Creates, modifies, and displays AUTOLOG scripts.

tlog Contains a test program for testing AUTOLOG profile scripts.

Note: The /**usr**/**lib**/**hcon** directory contains this example:

logform Specifies implicit logon input form.

The /**usr**/**lib**/**hcon** directory contains these AUTOLOG programming examples:

SYStso Contains an AUTOLOG script for the MVS/TSO host.
SYSvm1 Contains an AUTOLOG script for the VM/CMS host.
SYSvm2 Contains an AUTOLOG script for the VM/CMS host.

Configuring HCON

genprof Creates an AUTOLOG script.

hconutil Starts the HCON utility program.

mkhcons Creates a session profile.

mkhconu Registers a new users.

panel20 Diagnoses activity between and HIA and the 5080 Graphics Control Unit.

sethcons Sets administrative limit to number of HCON sessions. This command is available beginning with Version 2.1.3.

sthcondmn Starts the **hcondmn** subsystem.

tlog Tests an AUTOLOG script.

Maintaining HCON

The Maintaining category is subdivided by functionality. Commands that fall into more than one subdivision are repeated.

Working with HCON Users

mkhconu Registers users.

lshconu Lists all users.

rmhconu Removes a user.

Working with Session Profiles

chhcons Changes a session profile.

clhcons Returns the type of a session profile.

mkhcons Creates a session profile.

lshconp Lists a user's session profiles.

lshcons Lists the characteristics of a session.

rmhcons Removes a session profile.

stathcon Lists the status of all session profiles and SNA logical unit (LU) pools.

Working with HCON Sessions

e789 or **xhcon** Initiates one or more display sessions.

e789cln Stops an HCON session and its associated resources.

fxfer Transfers files between your system and the host.

Chapter 3. Managing Host Connection Program

The Host Connection Program (HCON) emulates a 3278/79 display or a 3286/87 printer attached to a System/370 mainframe host. This chapter provides information for managing HCON, including setup, connection, emulation and session information.

Managing HCON

The Host Connection Program (HCON) is a software package for communication between a local system and one or more System/370 mainframe hosts. To communicate with a mainframe host, HCON establishes a *session*, a period of interaction with the host system.

HCON establishes multiple sessions with System/370 mainframes. Each session emulates either a 3278/79 display or a 3286/87 printer. A session emulating a display is a *display session*. A session emulating a printer is a *printer session*. HCON provides file transfer capabilities within display sessions. It also includes the High-Level Language Application Programming Interface (HLLAPI) to write programs that communicate with mainframe host programs.

Each HCON user can have up to 26 sessions, allowing one or more simultaneous invocations of session to communicate with one or more hosts using different session characteristics and communication protocols. The parameters defining the session characteristics are established by a *session profile*.

To communicate with a mainframe host, HCON uses one or more of the following:

- 3270 Connection Adapter in Distributed Function Terminal (DFT) mode
- Host Interface Adapter (HIA)
- Group of adapters supported by System Network Architecture (SNA) Services/6000
- Group of adapters supported by Transmission Control Protocol/Internet Protocol (TCP/IP)

If the local system has more than one of these devices installed, users can implement different devices for different HCON sessions:

DFT session Uses the 3270 Connection Adapter. The 3270 Connection Adapter emulates a display (by establishing an SNA DFT or non-SNA DFT display session) or a printer (by establishing a non-SNA DFT printer session). The SNA Services is not required.

HIA session Uses the Host Interface Adapter (HIA). The HIA adapter emulates a display by establishing an HIA display session.

SNA standalone session
Uses SNA Node Type 2.1 over SNA Services. HCON-supported adapters supported by SNA Services establish a *S*NA standalone printer session or SNA standalone display session.

TCP/IP session
Uses TCP/IP with the appropriate adapters. HCON-supported adapters supported by TCP/IP emulate a 3270 display by establishing a TCP/IP display session.

The system can have any combination of supported adapters:

- Each 3270 Connection Adapter supports up to five sessions.
- HIA supports up to 16 sessions.
- Each SNA Node T2.1 attachment supports up to 253 logical units (LUs) per connection.
- For TCP/IP, the maximum number of sessions per connection depends upon the user's system resources.

HCON Users

Before using HCON, the user must be defined as an HCON user. An HCON user can create session profiles, then:

- Establish display or printer sessions with a mainframe host.
- Use the file transfer facility (the **fxfer** command).
- Run programs written with HCON HLLAPI.

To define a new user to HCON, you must have root authority. Add or remove an HCON user with the **smit hcon** or the **mkhconu** command by specifying a valid user logon name. When you remove a user, the name you specify must be that of a registered HCON user.

HCON uses an Object Data Manager (ODM) database to store information about users. When an HCON user is registered, an entry for that user is created in the ODM database, using the system defaults for session information. Thereafter, each time the user creates a new session, HCON changes the user's defaults in the ODM database to match the values set for the last session the user created.

Managing HCON Sessions

How HCON sessions process data depends on the type of host connections used. The session profiles are stored in object classes using the Object Data Manager (ODM).

Types of HCON Sessions

From the user's point of view, HCON supports six types of sessions:

- DFT display
- non-SNA DFT printer
- HIA display
- SNA standalone printer
- SNA standalone display
- TCP/IP display

However, there are two types of DFT display sessions, SNA and non-SNA, and two types of SNA standalone printer sessions, LU1 and LU3. These sessions process information distinctly using different protocols between the local system and the mainframe host.

DFT Display Sessions

The DFT connection requires installation of a 3270 Connection Adapter. For both types, the user must define the device name in the session profile. The 3270 device driver determines whether it is SNA- or non-SNA-attached to the host, and adjusts accordingly.

Although the user defines a display model number for the SNA DFT session, the model number may not affect how the emulator displays information. See "HCON Screen-Size Management" on page 3-46.

For a SNA DFT display session, HCON starts an **e789lus** process to handle the SNA protocol, along with the **e789x** or **xhconx** process to handle the 3270 data stream. For a non-SNA DFT display session, only the **e789x** or **xhconx** process is started. See "HCON Processes" on page 3-23.

TCP/IP Display Sessions

HCON supports a TCP/IP display session to a mainframe host configured with the Telnet 3270 protocol. To set up an HCON TCP/IP display session, install and configure one of the following adapters with TCP/IP:

- Token-Ring High-Performance Network Adapter attached to a Token-Ring LAN
- Ethernet High-Performance LAN Adapter attached to an IEEE 802.3 LAN
- FDDI adapter
- X.25 Interface Co-Processor/2 attached to an X.25 packet-switching network
- Block Multiplexer Channel Adapter
- ES Connection Architecture (ESCON) Adapter.

SMIT options are available to the user in configuring HCON for a TCP/IP display session. The **Add TCP/IP Display Session** menu option is available to define a TCP/IP display session. The user must provide the host name, which is used for routing and address resolution purposes. The number of concurrent TCP/IP display sessions is limited only by the workstation's memory resources and paging space. The **mkhcons** command can also be used to create an HCON session profile.

HCON Printer Sessions

HCON supports three types of printer sessions:

- 3270 data stream over non-SNA DFT (non-SNA DFT printer session)
- 3270 data stream over SNA LU3 standalone connections (SNA printer session)
- SNA Character String (SCS) data stream over SNA LU1 standalone connections (SNA standalone printer session)

"HCON Printer Emulation" on page 3-19 describes the differences among these sessions in more detail.

Storing HCON Session Profiles

Session profiles are stored in object classes using ODM. Associated with each HCON user are two object classes. Each object class consists of two files in the user's **$HOME** directory. The files are created when a user is defined as an HCON user. Session profiles for the user are stored in the **$HOME**/**usrprofs** and **$HOME**/**usrprofs.vc** object class files. Defaults for user session profiles are stored in the **$HOME**/**usrdflts** and **$HOME**/**usrdflts.vc** object class files. Global defaults for HCON sessions are stored in object class files in the /**usr**/**lib**/**hcon** directory, along with a list of registered HCON users.

When a session profile is created, the data specified for the profile is stored in the **usrprofs** object class. Values for options not specified are taken from the **usrdflts** object class. The new session profile is used to update the **usrdflts** object class. The values specified for the new profile become the user's defaults for future profiles of that type.

HCON Display Emulation

HCON supports the emulation of a 3270 display session in Models 2, 3, 4, and 5. The display session can communicate with System/370 host processors using the 3270 data stream architecture. Some display models might not be available in certain ASCII displays.

The connection to a mainframe host can be:

- 3 x 74 connection in DFT mode (SNA and non-SNA supported)
- TCP/IP connection
- SNA standalone connection

The 3270 data stream architecture includes:

- Attributes
- Commands
- Orders
- Outbound structured fields
- Inbound structured fields

For a detailed description of data stream architecture, see the *3270 Information Display System Data Stream Programmer's Reference*.

3270 Data Stream Attributes

The 3270 display session supports field attributes, extended field attributes, and character attributes.

Field Attributes

The bit assignments for field attributes supported by 3270 display sessions include:

EBCDIC Bit	Field Description
0,1	Value determined by contents of bits 2–7.
2	0 = Unprotected 1 = Protected
3	0 = Alphanumeric 1 = Numeric* **Note:** Bits 2 and 3 set to 1 can cause an automatic skip.
4,5	00 = Display/not cursor-select-key detectable 01 = Display/cursor-select-key detectable 10 = Intensified display/cursor-select-key detectable 11 = Nondisplay, nonprint, nondetectable
6	Reserved
7	Modified Data Tag (MDT); identifies modified fields during Read Modified command operations. 0 = Field has not been modified. 1 = Field has been modified by the operator. Can also be set by program in data stream.
*Numeric field is not enforced. It is treated as an alphanumeric field.	

Extended Field Attributes

These attribute types and attribute values are used in the Start Field Extended (SFE), Modify Field (MF), and Set Attribute (SA) orders.

Attribute Type	**Code**	**SFE, MF Orders**	**SA Orders**
Character Attribute Reset	X‘00’	–	x
Field Attribute	X‘C0’	x	–
Extended Highlighting	X‘41’	x	x
Color	X‘42’	x	x
Programmed Symbols	X‘43’	x	x
Background Transparency	X‘46’	x	x
Note: Lowercase x indicates the type code is valid when used in the order.			

Valid attribute values for each attribute type code.

Type	**Value**	**Result**
X‘00’	X‘00’	This is the only valid setting for this attribute type. All character attributes that can be specified in SA order are set to default value.
X‘C0’		The codes appearing here have the same format as that of the field attribute codes preceded by the SF order.
X‘41’	X‘00’ X‘F1’ X‘F2’ X‘F4’	Default (Normal) Blink Reverse Video Underline
X‘42’	X‘00’ X‘F1’ X‘F2’ X‘F3’ X‘F4’ X‘F5’ X‘F6’ X‘F7’	Default (Green) Blue Red Pink Green Turquoise Yellow White
X‘43’	X‘00’	Default (Base Character Set)
X‘46’	X‘FF’	Non-Transparent

3270 Data Stream Commands

The 3270 data stream commands include:

Command	**Mnemonic**	**Hex Line Code**
write	WR	F1
erase/write	EW	F5
erase/write alternate	EWA	7E
erase all unprotected	EAU	6F
read modified	RM	F6
read modified all	RMA	6E
read buffer	RB	F2
write structured field	WSF	F3

The definitions of the 3270 data stream commands are:

write (WR)
Sends orders or data to update the display screen. Data characters are stored in successive buffer locations until an order is received in the data stream that alters the buffer address, or until all data has been received.

Note: The **write** command must be followed by a Write Control Character (WCC). A WCC Reset bit with the **write** command is not effective.

erase/write (EW)
erase/write alternate (EWA)
Clears the screen before the write operation is started. The write operation starts from the buffer address 0.

Note: The **erase/write** command must be followed by a Write Control Character (WCC). If the WCC Reset bit is used, the Inbound Reply Mode is reset to Field.

erase all unprotected (EAU)
Performs the following:

- Clears all unprotected character locations and associated character attributes.
- Resets the Modified Data Tag (MDT) bit in each unprotected field.
- Unlocks the keyboard.
- Resets the Attention Identifier (AID) to X‘60’.
- Repositions the cursor to the first character space in the first unprotected field.

If the screen is unformatted or contains only the protected field, the cursor will be repositioned to buffer address 0.

read modified (RM)
Initiates one of five operations:

- Read modified
- Short read
- Cursor select
- Test request read
- Inbound retry

When issuing the **read modified** command as unsolicited, the inbound transmission will be in a complete **read modified** format with an AID of X‘60’. Issue the **read modified** command to try an inbound transmission again. If issued while the display is in a retry state, the **read modified** command causes the original inbound operation to repeat.

read modified all (RMA)
Operates like the **read modified** command except both addresses and data from all modified fields are sent to the host, regardless of the AID byte generated. The **read modified all** command is available only in the SNA environment.

read buffer (RB)
Causes all data in the display buffer to be transmitted inbound. The **read buffer** command is provided for diagnostic purposes.

write structured field (WSF)
Enables the user to send one or more structured fields.

Write Control Characters

The Write Control Character (WCC) bits have these definitions.

WCC Bit	Explanation
0	No function.
1	No function for the **WR** command. Reset function, if set to 1, for **EW** and **EWA** commands.
2, 3	Reserved.
4	Starts printer (SNA only). When set to 1, initiates a local-copy operation at the completion of the write operation.
5	Sounds alarm. When set to 1, causes the audible alarm to sound.
6	Restores keyboard. When set to 1, causes keyboard operation to be restored (by resetting system lock or WAIT indicator) and resets AID to X‘60’.
7	Resets MDT bits in field attributes (**WR** command only). When set to 1, causes MDT bits to be reset to 0 in all field attribute bytes before any orders or data characters are processed.

3270 Data Stream Orders

An HCON display session supports these 3270 data stream orders.

Order	Mnemonic	Hex Line Code
Set Buffer Address	SBA	11
Start Field	SF	1D
Start Field Extended	SFE	29
Modify Field Attribute	MF	2C
Set Attribute	SA	28
Insert Cursor	IC	13
Program Tab	PT	05
Repeat to Address	RA	3C
Erase Unprotected to Address	EUA	12

The 3270 data stream orders perform the following operations:

Set Buffer Address (SBA)

Sets the current buffer address to the value specified in bytes 1 and 2. The display session supports 12-, 14-, and 16-bit addressing. The SBA format is:

Byte	Content	Description
0	X‘11’	SBA Order Code
1–2	X‘....’	New, Current Buffer Address

Start Field (SF)

Starts a new field by placing a basic field attribute character at the current buffer address of the display. The buffer address is incremented by 1. The attribute position is displayed as a blank. The extended field attribute for this position is set to X‘00’. The SF format is:

Byte	Content	Description
0	X‘1D’	SF Order Code
1	X‘..’	Basic Field Attribute

Start Field Extended (SFE)

Enables the user to define the start of a field and to assign these attributes:

- **Basic field**
- **Extended highlighting**
- **Color**
- **Programmed symbol**
- **Background transparency**

The attribute character is stored at the current buffer address. The buffer address is incremented by 1. Any attribute type not specifically defined in the SFE order has its value set to binary zeros. If Byte 1 contains X‘00’, all attribute types are set to the default value.

Byte	Content	Description
0	X‘29’	SFE Order Code
1	X‘..’	Number of Type/Value Pairs (N)
2	X‘..’	Attribute Type
3	X‘..’	Attribute Value
...	...	
2N	X‘..’	Attribute Type
2N+1	X‘..’	Attribute Value

Modify Field Attribute (MF)

Enables the user to selectively change these attributes at the current buffer address:

- **Basic field**
- **Extended highlighting**
- **Color**

The attribute types not selected in the MF order maintain the same values. The buffer address is incremented by 1. The MF format is:

Byte	Content	Description
0	X‘2C’	MF Order Code
1	X‘..’	Number of Type/Value Pairs (N)
2	X‘..’	Attribute Type
3	X‘..’	Attribute Value
...	...	
2N	X‘..’	Attribute Type
2N+1	X‘..’	Attribute Value

Set Attribute (SA)

Enables the user to change these attributes at the current buffer address:

- **Extended highlighting**
- **Color**
- **Programmed symbol**
- **Background transparency**

The SA order also enables the user to set the same attributes to the default values. The specified attribute is associated with all subsequent data characters in the outbound data stream until another **write-type** command is transmitted or a new SA order changes the attribute. The SA format is:

Byte	Content	Description
0	X‘28’	SA Order Code
1	X‘..’	Attribute Type
2	X‘..’	Attribute Value

Insert Cursor (IC)

Sets the current cursor position to the current buffer address. The current buffer address remains unchanged. The IC format is:

Byte	Content	Description
0	X‘13’	IC Order Code

Program Tab (PT)

Advances the current buffer address to the address of the first character of the next unprotected field. If you issue the PT order when the current buffer address is the location of an attribute byte of an unprotected field, the buffer address advances to the next location within that field. If the PT order in the write data stream does not follow a command, order sequences such as WCC nulls are inserted into the buffer. The nulls are inserted from the current buffer address to the end of the field, even if the field is protected.

If issuing the PT order when the current address is the location of a protected field attribute, the current buffer address advances to the first unprotected position of the next unprotected field.

The PT order stops its search at the last character location of the screen buffer. If an unprotected field attribute with an associated unprotected character location is not found, the current buffer address is set to 0. If the unprotected field attribute found is in the last character location of the screen buffer, the current buffer address is set to 0.

If the PT order terminates at the end of the screen while inserting nulls, and a second PT order immediately follows, the new PT order continues to insert nulls from buffer location 0 to the end of the current field. The PT format is:

Byte	Content	Description
0	X‘05’	PT Order Code

Repeat to Address (RA)

Stores a specified character in all buffer locations. The specified character is stored starting at the current buffer address and ending at (but not including) the specified stop address. When the stop address is equal to the current buffer address, the character is stored in all buffer locations.

When you specify extended highlighting or color attributes for the character, the attribute values are entered into the extended character attribute buffer as each repeated character is written into the data buffer. The RA format is:

Byte	Content	Description
0	X‘3C’	RA Order Code
1-2	X‘....’	Stop Address
3	X‘..’	Character to be Repeated

Erase Unprotected to Address (EUA)

Inserts nulls in all unprotected character locations in the buffer. The nulls are inserted starting at the current buffer address and ending at (but not including) the specified stop address. The character attribute associated with each null character is set to X‘00’. The stop address then becomes the new current buffer address.

When the stop address equals the current address, all unprotected character locations are erased. The EUA format is:

Byte	Content	Description
0	X‘12’	EUA Order Code
1-2	X‘....’	Stop Address

3270 Data Stream Outbound Structured Fields

The structured field is a format used to transport data. *Outbound* structured fields are data fields that are sent from the host to the local system running HCON.

The HCON **write structured field** (WSF) command (X‘F3’) transmits the outbound structured fields to the display session. You can issue a single **write structured field** command to send one or more structured fields.

WSF Command (X‘F3’)	Structured Field 1	Structured Field 2	...	Structured Field n

The outbound structured field functions supported by an HCON display session include:

Function	**ID Code (Hex)**	
	Byte 2	**Byte 4**
Read Partition:	01	
Query		02
Query List		03
Erase/Reset	03	
Set Reply Mode	09	
Outbound 3270DS:	40	
Write		F1
Erase/Write		F5
Erase/Write Alternate		7E
Erase ALL Unprotected		6F

The outbound structured field functions perform the following operations:

Read Partition Enables a host application program to ascertain the color, highlighting, usable area, reply modes, symbol-set, and other characteristics of a terminal. The format of the read partition structured field is:

Byte	**Content**	**Description**
0–1	L	Length of this Structure
2	X‘01’	Read Partition
3	X‘FF’	Partition ID (PID)
4	TYPE	Query
	X‘02’	Query
	X‘03’	Query List
5	Bits 0–1	This byte is present only for: Query List (X‘03’)
	B‘00’	Q-code List (Bytes 6-N)
	B‘01’	Query Equivalent plus Q-code List
	B‘10’	All Query Replies
	B‘11’	(Reserved)
	Bits 2–7	
	B‘000000’	(Reserved)
6–n	Q-List	List of Query Reply Codes (Present only for Query List)

Erase/Reset Erases the screen and resets the display session to implicit partition state using the default or alternate size, as specified in the structured field. The Inbound Reply mode is reset.

If byte 3 contains any value other than X‘00’ or X‘80’, the structured field is rejected with a negative response (in SNA) or an Op-check (in non-SNA). The format of the erase/reset structured field is:

Byte	Content	Description
0–1	X‘0004’	Length of this Structure
2	X‘03’	Erase/Reset
3	Bit 0: B‘0’ B‘1’	Implicit Partition Size: Default Alternate
	Bits 1–7: B‘000000’	(Reserved)

Set Reply Mode

Specifies the reply mode required in all subsequent inbound data streams. The specified reply mode remains in effect until it is changed by:

- Another Set Reply mode structured field, specifying a different reply mode
- An **erase/reset** structured field
- An **erase/write** or **erase/write alternate** command, or a structured field with the WCC bit 1 set to 1, causing a reset function

The format of the Set Reply mode structured field is:

Byte	Content	Description
0–1	L	Length of this Structure
2	X‘09’	Set Reply Mode
3	X‘00’	PID
4	MODE X‘00’ X‘01’ X‘02’ Others	Reply Mode being requested: - Field Mode - Extended Field Mode - Character Mode - (Reserved)
5–n	A-List (present only if Mode is X‘02’)	List of Attribute Types: X‘41’ : Extended Highlighting X‘42’ : Color

Outbound 3270DS

Enables the user to direct the write commands and other structured fields to the display within a single transmission. The format of the outbound 3270DS structured field is:

Byte	Content	Description
0–1	L	Length of this Structure
2	X‘40’	Outbound 3270DS
3	X‘00’	PID
4	CMND X‘F1’ X‘F5’ X‘7E’ X‘6F’ Others	 **WR** command **EW** command **EWA** command **EAU** command (Reserved)
5	WCC	WCC Byte if Byte 4 is X‘F1’, X‘F5’, or X‘7E’
6–n	Data	Write Data if Byte 4 is X‘F1’, X‘F5’, or X‘7E’

3270 Data Stream Inbound Structured Fields

The structured field is a format used to transport data. *Inbound* structured fields are sent from the local system to the host system.

An HCON display session uses the Attention ID (AID) (X‘88’) to transmit the inbound structured fields to the host program. You can issue a single AID to send one or more structured fields.

AID (X‘88’)	Structured Field1	Structured Field 2	...	Structured Field n

The inbound structured field functions supported by an display session include:

Function	**ID Code (Hex)**	
	Byte 2	**Byte 3**
Inbound 3250DS	80	
Query Reply:	81	
Summary		80
Usable Area		81
Character Sets		85
Color		86
Highlighting		87
Reply Mode		88
Distributed Data Management		95
Auxiliary Device		99
Implicit Partition		A6
Null		FF

The format for each structured field includes:

Inbound 3270DS

Enables the user to send data from the alphanumeric presentation layer to flow together with the graphic data. The format of the inbound 3270DS structured field is:

Byte	Content	Description
0–1	L	Length of this Structure
2	X‘80’	Inbound 3270DS
3	X‘00’	Partition Identifier
4	AID	Attention Identifier
5–6	CURSOR	Alphanumeric Cursor Position
7–N	DATA	Orders and Data

Query Reply In response to the query from the host system, the display session responds with a series of structured fields, or query replies, which describe the device capabilities. The query replies include:

AID (X‘88’)	Query Reply1	Query Reply 2	...	Query Reply n

Summary Lists the supported query replies used by the query list.

Byte	Content	Description
0–1	X‘000D’	Length of this Structure
2	X‘81’	Query Reply
3	X‘80’	Summary
4–C	Q-Codes:	
	X‘80’	Summary
	X‘81’	Usable Area
	X‘84’	Alphanumeric Partitions
	X‘85’	Character Sets
	X‘86’	Color
	X‘87’	Highlighting
	X‘88’	Reply Mode
	X‘95’	DDM
	X‘99’	Auxiliary Device
	X‘A6’	Implicit Partition

Usable Area Defines the size and characteristics of the screen.

Byte	Bit	Content	Description
0–1		X‘0014’	Length of this Structure
2		X‘81’	Query Reply
3		X‘85’	Character Set
4	0–1	B‘00’	(Reserved)
	2	B‘0’	EXSF Supported
	3	B‘0’	Not a “HARD COPY” Device
	4–7	X‘3’	12/14/16-bit Addressing Allowed
5	0	B‘0’	Variable Cells Not Supported
	1	B‘0’	Matrix Character
	2	B‘0’	Value in Bytes 6-9 in Cells
	3–7	B‘00000’	(Reserved)
6–7		X‘0050’	Usable Area Width
8–9		X‘0018’	Usable Area Height
10		X‘00’	Units for Measure: Inch
11–14		X‘00020089’	Horizontal PEL Distance
15–18		X‘00020085’	Vertical PEL Distance
19		X‘09’	Default Cell Width
20		X‘0E’	Default Cell Height
21–22		X‘0780’	Character Buffer Size

Character Set Defines the character set active for this session.

Byte	Content	Description
0–1	X‘0006’	Length of this Structure
2	X‘81’	Query Reply
3	X‘81’	Usable Area
4	X‘02’	Graph Escape Not Supported
5	‘00’	(Reserved)
6–7	X‘090E’	Character Slot Width and Height
8–11	X‘00000000’	Load PS Not Supported
12	X‘07’	Length of Following Descriptor
13–14	X‘0000’	PS Characteristics
15	X‘00’	Local Character Set ID
16–17	X‘XXXX’	Global Character Set ID
18–19	X‘XXXX’	Global Character Set ID

Color Describes the color features of the display.

Byte	Content	Description
0–1	X‘0016’	Length of this Structure
2	X‘81’	Query Reply
3	X‘86’	Color

4	X‘00’	(Reserved)
5	X‘08’	Number of Color Attribute Pairs
6–21	X‘00F4’ F1F1 F2F2 F3F3 F4F4 F5F5 F6F6 F7F7	Default is Green Identification Pairs

Highlighting Identifies the type of highlighting supported by the display.

Byte	Content	Description
0–1	X‘000D’	Length of this Structure
2	X‘81’	Query Reply
3	X‘87’	Highlighting
4	X‘04’	Number of Pairs
5–21	X‘00F0’ F1F1 F2F2 F4F4’	Default is Normal Action Pairs

Reply Mode Reports the reply modes supported by the display.

Byte	Content	Description
0–1	X‘0007’	Length of this Structure
2	X‘81’	Query Reply
3	X‘88’	Reply Mode
4–6	X‘000102’	Field, Extended Field, and Character Modes supported

Distributed Data Manager

Defines the distributed data manager characteristic. This characteristic is used by the file transfer protocol.

Byte	Content	Description
0–1	X‘0000’	Length of this Structure
2	X‘81’	Query Reply
3	X‘85’	Distributed Data Manager (DDM)
4–5	X‘0000’	Reserved
6–7	X‘0000’	Inbound Buffer Size (no limit)
8–9	X‘0000’	Outbound Buffer Size (no limit)
10	X‘01’	Number of Subset Supported
11	X‘01’	DDM Subset Identification

Auxiliary Device

Defines the characteristic of the auxiliary device used by the file transfer process.

Byte	Content	Description
0–1	X‘0006’	Length of this Structure

2	X‘81’	Query Reply
3	X‘99’	Auxiliary Device
4	X‘00’	Reserved
5	X‘00’	Reserved

Implicit Partition
Defines the default and alternate implicit partition size.

Byte	Content	Description
0–1	X‘0011’	Length of this Structure
2	X‘81’	Query Reply
3	X‘A6’	Implicit Partition
4–5	‘0000’	(Reserved)
6	X‘0B’	Parameter Length
7	X‘01’	Implicit Partition Size
8	X‘00’	(Reserved)
9–10	X‘0050’	Width of Default Implicit Partition
11–12	X‘0018’	Height of Default Implicit Partition
13–14	X‘0050’	Width of Alternate Implicit Partition
15–16	X‘0018’	Height of Alternate Implicit Partition

Null Defines the transmitted inbound in reply to a query list when the display session does not support any of the query replies in the list.

Byte	Content	Description
0–1	X‘0004’	Length of this Structure
2	X‘81’	Query Reply
3	X‘FF’	Null

HCON Printer Emulation

HCON supports continuous printing of printer data streams from the host. The data streams consist of characters, highlights, and formatting commands interpreted and translated into characters and controls specific to the locally configured printer. Two data stream types are supported: SNA Character String (SCS) and 3270.

Concurrent printer sessions are supported. For example, a print server in a cross-network environment can initiate a print job from a host within a network and route the print job to a different host on the same or a different network.

HCON printer sessions are supported in these environments:

- Non-SNA coaxial connection to a DFT 3174/3274 controller or equivalent, using the 3270 data stream

  Note: Printer sessions for SNA DFT connections are not supported.

- SNA attachment in a Node T2.1 environment, which includes:
  - SCS data stream for LU type 1
  - 3270 data stream for LU type 3

Local systems emulate 3287 model 1 and 2 printers. The following print characteristics are *not* supported:

- Color
- APL language characters
- Programmed symbols
- 3287 printer operation switches (PA1, PA2, cancel operations)

Starting and Controlling a Printer Session

A printer session is defined both on System/370 hosts and on the local operating system. The host definition for display or printer sessions must match in terms of resource definition and the type of print data stream. From the local system, you can:

- Define a printer session using SMIT HCON user functions:
  - For an SNA standalone session, the HCON printer profile will link to an SNA LU profile definition for an LU 1 or LU 3 type printer.
  - For a non-SNA DFT printer session, the specific printer session is defined in SMIT functions using the 3270 communication device option.
- Start and stop a printer session, manually or automatically during every reboot of the system, using SMIT HCON control functions.
- Administer a printer session using the SMIT HCON printer session log. The session log is saved in the data set **hconprintlog.***x* (where *x* is the session short name). The log information tracks data stream usage, session starts, and session stops.

3270 Data Stream Support for Printer Sessions

Printer emulation supports two types of host-directed printer data streams: the 3270 printer data stream and SCS. These two types are capable of producing similar output, in different ways.

3270 Printer Data Stream

The 3270 printer data stream is used in non-SNA DFT configuration, as well as in the SNA Standalone LU3 environment.

The 3270 printer data stream is a buffer-oriented data stream, similar to the 3270 display data stream processed by the HCON program. This data stream is sent using the non-SNA DFT or SNA LU type 3 interface as session data. The following codes are included in a 3270 printer data stream. They are valid only when bits 2 and 3 of the Write Control Character (WCC) in the data stream are set to B'00'.

NL (New Line) Moves the print position horizontally to the left margin and vertically down to the next line.

CR (Carriage Return)
Moves the print position horizontally to the left margin.

EM (End of Message)
Terminates the print operation.

FF (Form Feed)
Moves the print position to the top and left margin of the next page.

Note: For a complete list of 3270 codes, see the *3270 Information Display System Data Stream Programmer's Reference*.

SCS Printer Data Stream

The SCS printer data stream is a sequential data stream specifically oriented toward line printers. The data stream consists of characters and commands. The characters are printed according to the attributes and formatting information specified by the control commands. How each SCS character is printed depends on the control commands that precede it. Optionally, the data stream can be transported using an SNA Function Management Header (FM Header) of type 1, supported by an LU type 1 session.

The SCS codes supported by HCON in a DBCS environment include:

Supported SCS Control Codes for DBCS

Symbol	**Hex Value**	**Command**
SA	28	Set Attribute (character set and field outlining)
SO	0E	Shift Out
SI	0F	Shift In

The SCS codes supported include:

Supported SCS Control Codes		
Symbol	**Hex Value**	**Command**
BS	16	Backspace
BEL	2F	* Bell
CR	0D	Carriage Return
FF	0C	Form Feed
HT	05	Horizontal Tab
IRS	1E	Interchange Record Separator
LF	25	Line Feed
NL	15	New Line
NUL	00	Null
PP	34	* Presentation Position
PPM	2BD2XX48	* Page Presentation Media
SA	28	Set Attribute (supports Highlight attribute of type Underline only)
SHF	2BC1	Set Horizontal Format
SLD	2BC6	Set Line Density
SPD	2BD229	Set Print Density
SVF	2BC2	Set Vertical Format
TRN	35	* Transparent
VT	0B	Vertical Tab
Notes: 1. The * (asterisk) indicates the codes ignored in a DBCS environment. 2. The program ignores all other SCS codes.		

SCS Structured Fields

The SCS structured field is a format used to transport SCS data. *Outbound* structured fields are data fields sent from the host to the local system running HCON. *Inbound* structured fields are sent from the local system to the host system.

Outbound Structured Fields

Outbound SCS data is transported as raw data or packaged in one or more SCS structured fields preceded by a type 1 FM Header. The FM Header indicator is part of the SNA Request/Response Header. The FM Header type 1 structure includes:

FM Header Type 1 for Outbound and Inbound Structured Fields

Byte	Value	Description
0	X’06’	Length of Header
1	X’01’	FM Header type 1
2	X’00’	Reserved
3	X’0B’ X’8B’	Outbound Structure Fields included with this FM Header Inbound Structure Fields included with this FM Header
4	X’60’	No compressed data
5	X’00’	Always 00

If an FM Header is specified in the BIND time (handshaking period), HCON expects the outbound SCS data in structured field format. If FM Header support is indicated in the bind and raw data follows, `PROG756` displays in the Operator Information Area (OIA) of the LU 1 printer session.

HCON supports these outbound structured fields:

- `SCS data`
- `Read Partition (Query)`

Inbound Structured Fields

The FM Header is optionally used by the printer session to transmit the inbound data. FM Header support is determined during the session bind time. For a printer session, the only inbound data is a reply to a `Read Partition (Query)` function.

The supported inbound structured field in response to a `Read Partition (Query)` function includes these substructures:

`Usable Area`
Specifies the print buffer size and location.

`Character Sets`
Identifies the supported character set.

`Colors` Identifies the supported colors.

`Highlighting`
Specifies the supported highlighting types.

`Field Outlining`
Specifies the details of field outlining for DBCS support only.

HCON Processes

HCON emulator and file transfer sessions are established, maintained, and stopped by these processes:

hcondmn	HCON daemon
e789, **xhcon**	Emulator parent process
e789x, or **xhconx**	Emulator child process for each session
e789lus	Emulator child process for SNA DFT processing
e789pr	Emulator child process for each host addressable printer session
dfxfer	File transfer child process

The **hcondmn** subsystem provides a focal point to coordinate the various HCON sessions and negotiate conflicts throughout the system. The subsystem assigns a unique identifier to each session, providing the **e789**, **xhcon, e789cln**, and **fxfer** commands, and the HCON HLLAPI programs with a label to identify that session on the local system.

When the **e789** or **xhcon** command is invoked, an **e789** or **xhconx** process is started. The **e789** process starts the **e789x** process for each session. For example:

```
e789 bdh
```

starts one instance of the **e789** process and three instances of the **e789x** process, for sessions `b`, `d`, and `h.` The **xhcon** process starts the **xhconx** process for each session. For example, enter the following to start one instance of the **xhcon** process and three instances of **xhconx** process for sessions b, d, and h:

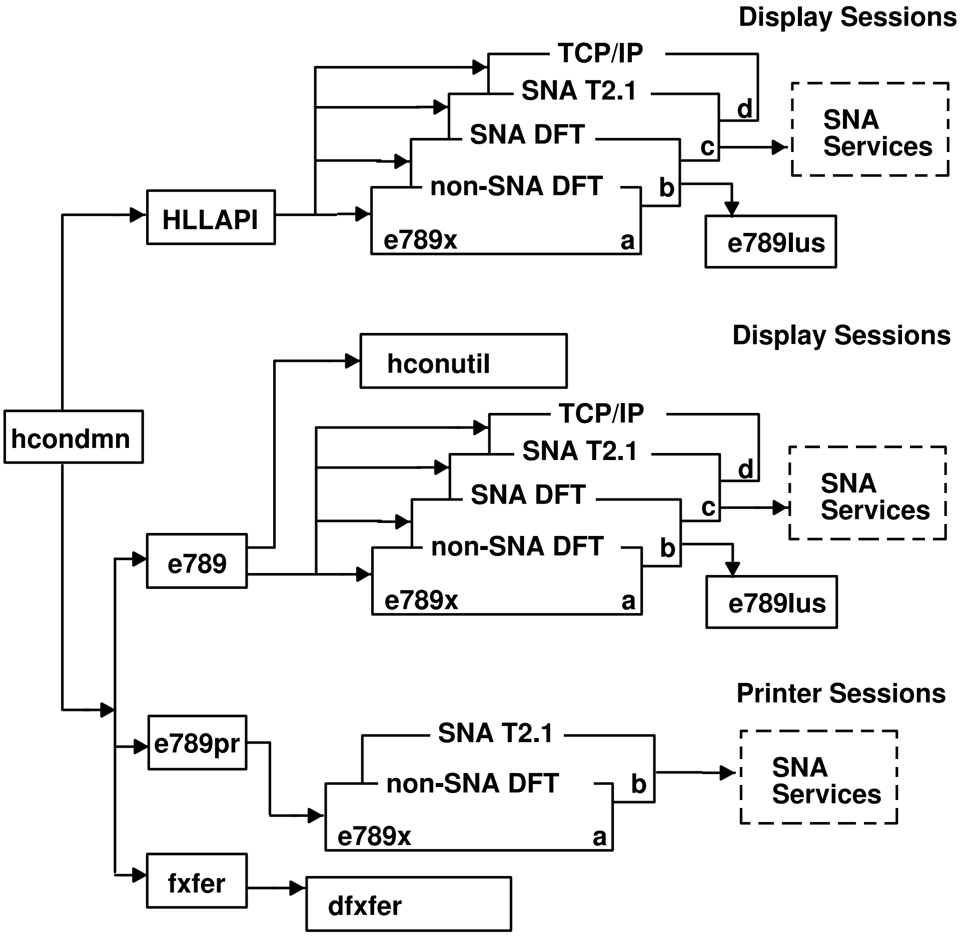
```
xhcon bdh
```

Each instance of the **e789** process manages the **e789x** processes associated with it. Each invocation of the **e789** process runs independently of the other **e789** processes invoked on the same system. For SNA DFT sessions, the **e789x** process invokes an SNA protocol process (**e789lus**) to manage the SNA protocol.

The file transfer starts a separate child process. The **dfxfer** process is invoked when a file transfer begins with:

- **fxfer** command
- **fxfer** function
- **g32_fxfer** function
- File transfer requests through the **hconutil** command

The HCON Processes figure shows the parent and child process relationship.



HCON Processes

hcondmn Subsystem

The **hcondmn** subsystem is a daemon invoked at startup on any system with the HCON program installed. During installation, instructions are placed in the **inittab** file. These instructions direct the System Resource Controller (SRC) to start the **hcondmn** subsystem each time the system is turned on. The subsystem can also be started using the **smit hcon Control** option. Use the **ps** command to determine if the **hcondmn** subsystem is running.

The subsystem remains in a wait state until requests from HCON internal components arrive. Any process establishing an HCON session communicates with the **hcondmn** subsystem to register that session.

The **hcondmn** subsystem:

- Resolves session name conflicts at session startup.
- Maintains and manages internal software structures such as queues, shared segments, and logical terminal names for each session on the system.
- Initializes interfaces to each session (requested by HCON applications) to establish internal communication.
- Removes the resources associated with each session when the session ends.

The **hcondmn** subsystem starts and stops using the following commands:

sthcondmn Starts the subsystem. Enter:

```
/usr/lib/hcon/sthcondmn
```

stopsrc Stops the subsystem. Enter:

```
/usr/bin/stopsrc -f -s hcon
```

Warning: Do not stop the **hcondmn** subsystem unless under directions from customer support, or if installing or updating HCON software. Any process establishing an HCON session communicates with the **hcondmn** subsystem to register that session. Be sure all HCON activity has ceased before stopping the **hcondmn** subsystem.

e789 Process

The **e789** process starts each time a display session is started using the **e789** command. The **e789** process contacts the **hcondmn** subsystem to establish the requested display session or sessions. The **hcondmn** subsystem allocates the appropriate storage space for each session and passes a return code to the **e789** process. The **e789** process creates an **e789x** child process for each display session.

xhcon Process

The **xhcon** process starts each time a display session is started using the **xhcon** command. The **xhcon** process contacts the **hcondmn** subsystem to establish the requested display session or sessions. The **hcondmn** subsystem allocates the appropriate storage space for each session and passes a return code to the **xhcon** process. The **xhcon** process creates an **xhconx** child process for each display session.

e789pr Process

The **e789pr** process starts each time a printer session is started using the **e789pr** command. The **e789pr** process contacts the **hcondmn** subsystem to establish the requested printer session or sessions. The **hcondmn** subsystem allocates the appropriate storage space for each printer session and passes a return code to the **e789pr** process. The **e789pr** process creates an **e789x** child process for each printer session.

e789x Process

The **e789x** child process starts for each session on the system. The **e789x** child process can be started by:

- **e789** process
- File transfer executed with an implicit logon
- HLLAPI program executed with implicit logon

The **e789x** process attaches to the storage space established for that session by the **hcondmn** subsystem. For a DFT display session that is SNA-attached, the **e789x** process invokes an **e789lus** process to manage the SNA protocol.

xhconx Process

The **xhconx** child process starts for each session on the system. The **xhconx** child process can be started by using the **xhcon** process.

The **xhconx** process attaches to the storage space established for that session by the **hcondmn** subsystem. For a DFT display session that is SNA-attached, the **xhconx** process invokes an **e789lus** process to manage the SNA protocol.

e789lus Process

The **e789lus** child process is invoked by the **e789x** process for each SNA DFT display session. The **e789lus** process manages the SNA protocol, while the **e789x** process manages the 3270 data stream.

HCON File Transfer Process

The HCON file transfer program transfers files between a local system and a mainframe host. With the corresponding version of the 3270 File Transfer Program (**IND$FILE** or its equivalent) installed, the host operating system for transfers can be:

- VM/CMS
- MVS/TSO
- CICS/VS (MVS or VSE)
- VSE/ESA

For the VSE/ESA operating systems, the file transfer program is provided as part of the VSE base. The additional host transfer program is not needed. If you want to perform a file transfer to CICS/VSE, the transfer program should be VSE/ESA.

When a file is transferring from a local system to a host, the file transfer is *uploading*. A transfer from the host to the local system is *downloading*. The HCON file transfer features support text and binary data. The file transfer program consists of two modules:

fxfer process Interprets the file transfer requests, forms file transfer request queues, and sends the requests to the appropriate **dfxfer** process. The **fxfer** process is started from the command line by the **fxfer** command. The status of the file transfer operation is reported to a terminal, a file (if invoked with the **fxfer** command), or to a program (if invoked by a program).

dfxfer process

Transfers files. The **dfxfer** process is started either by:

- **fxfer** process
- **fxfer** command
- API program issuing the **g32_fxfer** function
- HCON utility program

Each **dfxfer** process is associated with one display session. Multiple file transfer requests using the same session are queued using the same **dfxfer** process. The **dfxfer** process remains logged on to the host indefinitely, based on the file transfer wait period specified in the session profile.

File transfers are either:

asynchronous

When the user starts additional file transfers without waiting for the first one to complete. Each request goes in a queue used by the **dfxfer** process associated with the display session. Up to 580 file transfers can be queued at one time.

synchronous

When the file transfer is processed immediately. If a current file transfer has not completed, additional synchronous file transfer requests generate a host connection busy message.

File transfers are either:

explicit When the user must establish a session with the host and log on before starting the file transfer.

implicit When the **fxfer** process checks for the appropriate session. If the session exists, the **fxfer** process connects to it and starts the **dfxfer** process for the file transfer. If the session does not exist on the local system, the **fxfer** process starts the **dfxfer** process. The **dxfer** process:

- Invokes the session by starting an **e789x** process.
- Logs on to the host.

- Transfers the file.
- Logs off the host.
- Ends the session.

If a file transfer wait period is specified, the **dfxfer** process logs off the host and terminates the session only after the specified period of inactivity has elapsed.

Note: If the requested session exists, it could have been started explicitly with the **e789** command or implicitly by a previous file transfer.

A file transfer can be interrupted before it is completed. A file transfer can also be interrupted by any unrecoverable communication error. When interrupted, the state of the transfer is saved. The transfer can be restarted without loss of data. See “Recovering from Interrupted HCON File Transfers” on page 3-59.

You can create a shell procedure to specify parameters for similar file transfers that are performed frequently. See “Creating HCON File Transfer Shell Procedures” on page 3-28.

Creating HCON File Transfer Shell Procedures

The following sections describe the procedures for creating and using an HCON file transfer shell procedure.

Prerequisite

To run the file transfer shell procedure, you must be registered as an HCON user.

Shell Procedure

An HCON file transfer can be invoked in a shell procedure by entering the user interface commands into a file and running the procedure. The procedure can inspect the return code from the **fxfer** command by testing the **$?** environment variable after the command runs. A return code of 1 indicates that an error has occurred, and a return code of 0 indicates that the transfer has completed.

The following example shell procedure accepts the name of the local system file as the first command line parameter (the **$1** procedure variable) and the name of the host file as the second parameter (the **$2** procedure variable). The shell procedure instructs the **fxfer** command to:

- Perform an automatic logon if necessary (if session `a` is not already established on the local system) and log into the host as user `matthew`, using the `SYSvm6` AUTOLOG script.
- Upload the local system file to the host.
- Perform ASCII-to-EBCDIC translation. The file transfer process translates the file using the table specified by the Language characteristic in the session profile.
- Place messages from the file transfer command in the `$HOME/transfer.stat` file.

The shell procedure checks the error code environment variable (the **$?** variable) to see if the transfer is successful and echoes this information to the user.

Notes:

1. When running the shell procedure, include the appropriate quotation marks when entering the host file name.
2. The file transfer process prompts the user for the host password.

Shell Procedure Example

Following is the `fx` sample shell procedure:

```
## fx shell procedure  ##
# This procedure accepts two command line parameters:
#   $1 – local file name
#   $2 – host file name
#
# This procedure uploads the local file to the host specified
# in HCON session profile a, and translates the file from
# ASCII to EBCDIC.
#
# If necessary, the procedure logs into the host automatically.
# Status messages are placed in the $HOME/transfer.stat file.
# After the procedure runs, the file transfer prompts for
# the host password.
#
fxfer –n a –utf $HOME/transfer.stat –x matthew,vm6 ”$1” ”$2”
if test $? != 0
then
  echo ”File transfer return value indicates an error.”
  echo ”See the $HOME/transfer.stat file for information.”
```

```
else
  echo ”File transfer completed successfully.”
fi
```

Using the File Transfer Shell Procedure

To use the `fx` shell procedure to transfer the local file `/home/matthew/newinfo` to the host file `newinfo` on an MVS/TSO host, enter:

```
fx /home/matthew/newinfo ”newinfo”
```

The procedure invokes the **fxfer** command to transfer the file to the host computer and prompts for the host password.

To use the shell procedure for a transfer to a VM/CMS host, enter:

```
fx /home/matthew/newinfo ”newinfo file a”
```

In each case, the host type must be specified in the session profile.

Bypassing the Password Prompt

Redirecting Input into the File Transfer

To bypass password entry when prompted for the password, redirect input into the file transfer. For example, if user `matthew`’s host password is `u1matt`, change the file transfer code in the procedure as follows:

```
fxfer –n a –utf $HOME/transfer.stat –x matthew,vm6 ”$1” ”$2” << END
u1matt
END
```

Using this redirection allows the procedure to bypass prompting the user for the password. Instead, the file transfer process uses the password `u1matt`.

Using echo Command

Use the **echo** command to give the password to the shell procedure, as follows:

```
echo ”u1matt” | fx /home/matthew/infofile ”infofile”
```

Using the cat Command

Place the host password in a file and use the **cat** command to give the password to the shell procedure. For example, if the password is in the file `/home/matthew/logfile`, enter the following to start the file transfer:

```
cat /home/matthew/logfile | fx /home/matthew/newinfo ”newinfo”
```

Note: When using these techniques to avoid a password prompt, you may also want to specify a status file using the **–f** flag of the **fxfer** command. Otherwise, all of the file transfer status messages are put in the **$HOME/hconerrors** file.

Using the Same Shell Procedure with Different Host Logon IDs

Using a separate file for the host password also allows you to change the logon ID for the host. For example, change the file transfer code in the procedure as follows:

```
fxfer –n a –utf $HOME/transfer.stat ”$1” ”$2”
```

Then include both the host logon ID and the host password in a separate file and use the **cat** command to give the information to the file transfer procedure. For example, if the `/home/matthew/.hostinfo` file contains the following lines:

```
matt,vm6
mattpass
```

the command

```
cat /home/matthew/.hostinfo | fx /home/matthew/upfile ”newfile”
```

causes the `fx` shell procedure to invoke the **fxfer** command and log on to the specified host using the logon ID string `matt,vm6` and the host password `mattpass`.

HCON Connections and Adapters

HCON host communication is established through several types of adapters and interfaces. Managing this connectivity involves:

- HCON attachments
- Display session pooling
- Screen-size management

HCON software communicates with a host through a 3174/3274 control unit or its equivalent, such as an integrated communications adapter in 4361 and 9370 systems. All control unit attachment protocols are supported, including:

- Non-SNA (Binary Synchronous Communication (BSC) and channel)
- SNA (channel and remote)

Note: HCON does not support a direct attachment using BSC (without 3X74).

HCON supports standalone attachments, such as a Node T2.1 connection to a mainframe host. TCP/IP connection is available when communicating to a host using an 8232 or 3172 Interconnect Controller. The Telnet 3270 protocol is supported.

This table shows HCON attachments, interfaces, and capabilities.

HCON Attachment and Interface Relationships

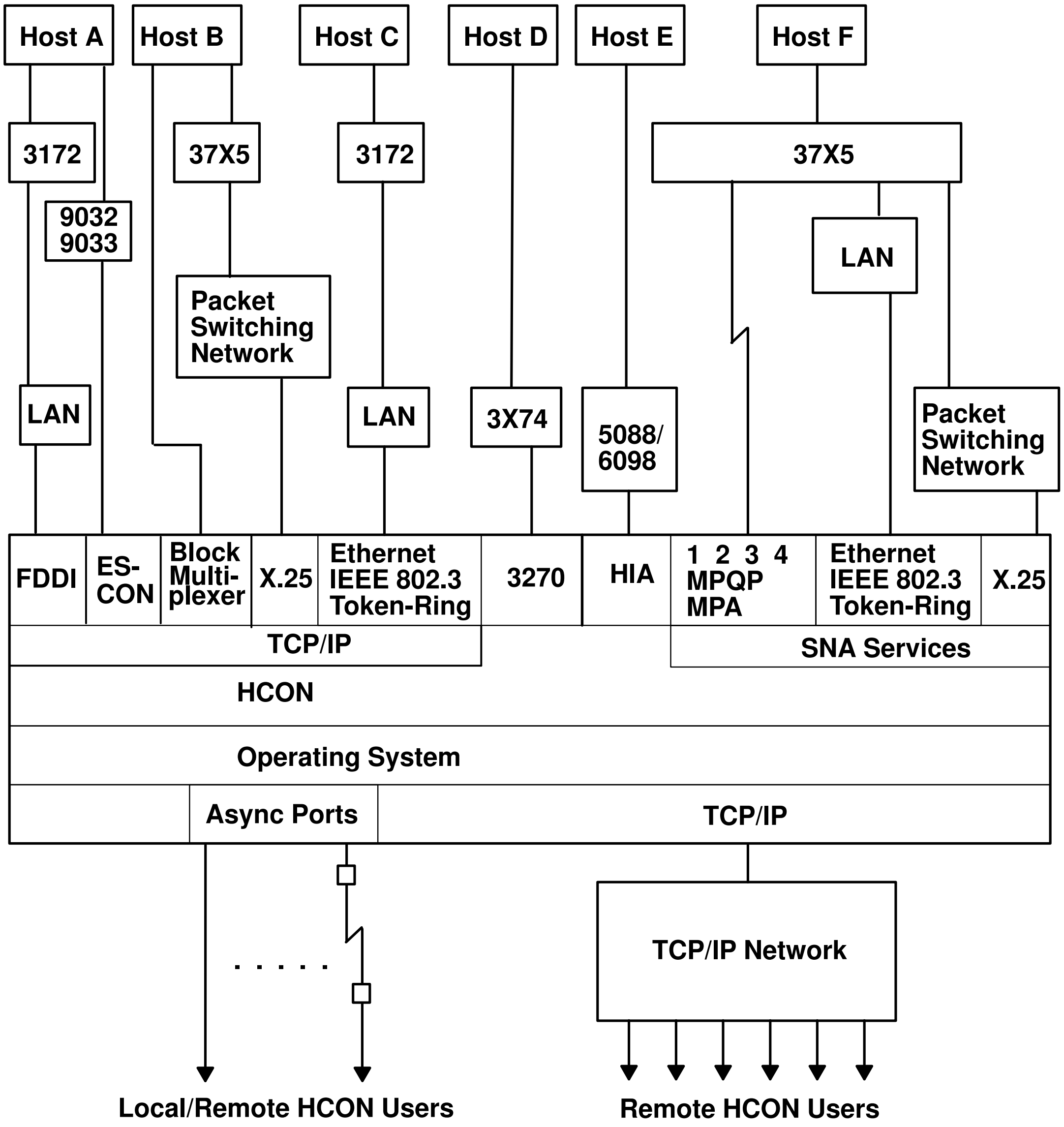
Attachment	Type	Interface	DLC	Host Printer
3174/3274	SNA	DFT mode	Coax	No
3174/3274	Non-SNA	DFT mode	Coax	Yes
Standalone	SNA	Node T2.1	SDLC, Token-Ring Ethernet X.25	Yes (LU1, LU3)
5088/6098	Non-SNA		Coax	No
3172/8232	TCP/IP	Telnet 3270	Token-Ring, Ethernet, IEEE 802.3 X.25 FDDI	No
Channel	TCP/IP	Telnet 3270	ESCON Block Multiplexer	No

With SNA connectivity and the capability to support multiple communications adapters, the limiting factor for HCON sessions is the number of expansion slots on a particular machine (usually 4 to 8). Capability is also limited by the number of cards of each type that the operating system supports.

The operating system has direct access to any customer SNA network. The choice of connectivity is dependent on the system environment and geographical location. These variables affect response time for an application:

- Model types
- Types of host applications and response time requirements
- Number of concurrent users during peak periods
- Other applications running concurrently with HCON on the local system

The HCON Connectivity figure shows the connectivity capability of the HCON 3270 emulation program.



HCON Connectivity

HCON Attachments

The HCON Adapters and Protocols figure shows the protocols and session types supported for each type of HCON connectivity. The control unit prerequisites are identified by lowercase letters *a* through *d*.

			WAN		LAN			CHANNEL
	3270 Coax	5088/ 6098 Coax	SDLC	X.25	802.3	802.5	Ether-net Vers. 2	Block Multi-plexer or ESCON
SNA	Yes D a		Yes * D, P c	Yes * D, P c	Yes * D, P d	Yes * D, P c		
Non-SNA	Yes D, P a	Yes D b						
TCP/IP				Yes D c	Yes D d	Yes D d	Yes D d	Yes D

Note: * SNA Services/6000 required
D Display Session
P Printer Session

a	**3X74**
b	**5088 or 6098**
c	**37X5**
d	**8232 or 3172**

HCON Adapters and Protocols

HCON attachments include:

- 3174/3274 or equivalent
- 5088/6098 Graphics Control Unit
- 3172/8232
- Channel attachment
- SNA standalone

The HCON SNA function is dependent on the connectivity type and the source of SNA support. SNA support can be from the SNA Services program or from within HCON. See "SNA Support" on page 3-39.

3174/3274 or Equivalent Attachment

The 3174/3274 attachment uses the 3270 Connection Adapter. The Distributed Function Terminal (DFT) protocol gives the HCON program the ability to attach to a 3174 or 3274 controller configured to operate in pass-through mode.

When the local system connects to the host, using a controller and DFT connection over a coaxial cable, the 3174 or 3274 control unit handles the remote and channel protocol. However, the LU (for SNA sessions) and 3270 (for all DFT sessions) data stream processing is done locally by the **e789lus** and **e789x** or **xhconx** emulator processes, respectively.

Each 3270 coaxial connection can support up to five sessions. The supported session types include:

Protocol	Session Type
Non-SNA	Display and host-addressable printer
SNA	Display

HCON supports these DFT capabilities:

- 8KB hardware communication buffer
- Slow device for non-SNA printing
  Note: This option is required from the controller if non-SNA printing is desired.
- Up to five logical sessions for each adapter
- Enhanced buffer-management support option

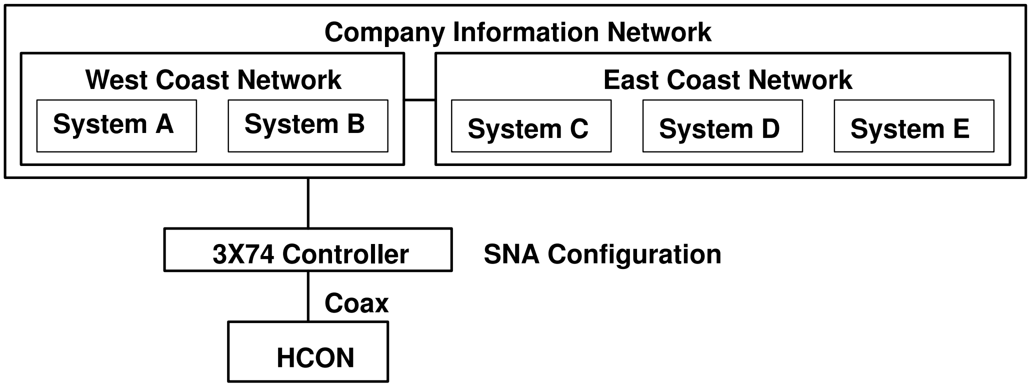
HCON does *not* support the following DFT capabilities:

- Control unit print function
- Response time monitor in SNA
- Customization of a control unit by attaching to port 0

How the 3174/3274 Connection Works

When HCON connects using the DFT protocol, it adjusts to the attachment protocol (either SNA or non-SNA) of the 3174/3274 or an equivalent controller. You do not have to specify in the configuration which protocol to use.

The SNA DFT Network figure shows an SNA information network. With this configuration, the System Service Control Point (SSCP) session allows the user to choose the data host. The 3X74 controller is attached to System B using an SNA channel.

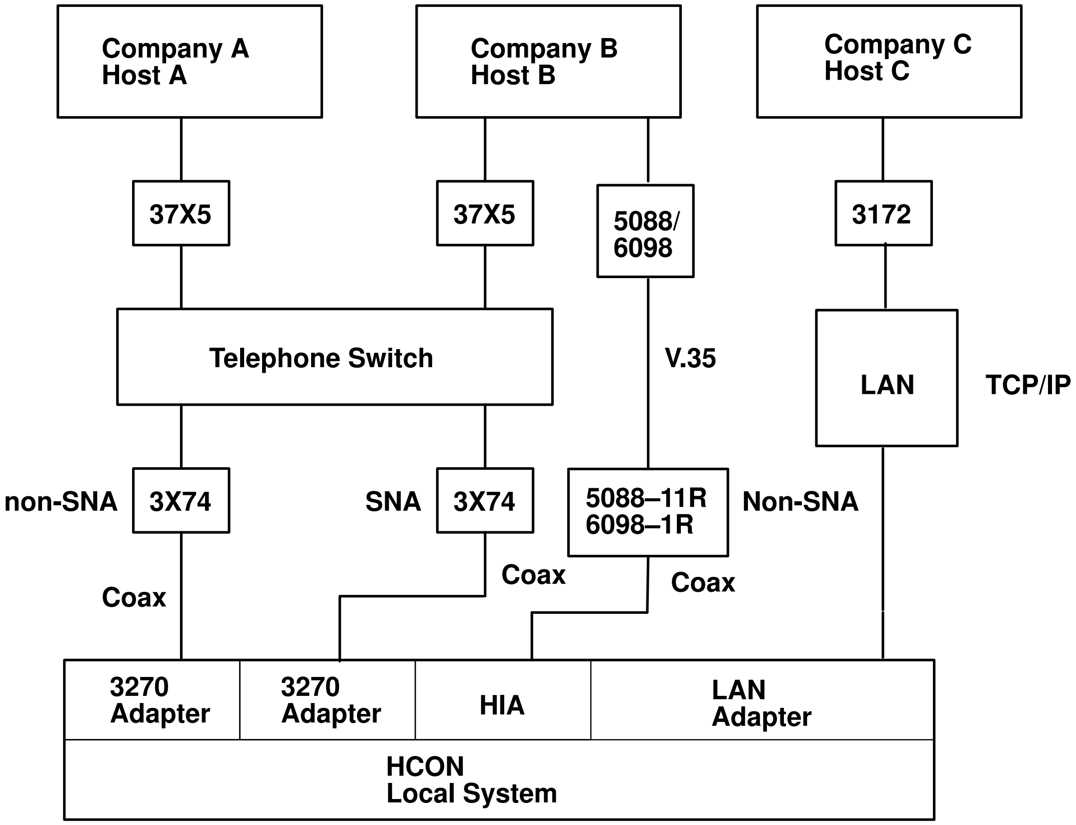


SNA DFT Network

5088/6098 Graphics Control Unit Attachment

Attachments to a 5088, 5088-11R, or 6098 Graphics Control Unit are made using a Host Interface Adapter (HIA). The graphics controller can be remote or local. The controller connects to a mainframe host in a non-SNA environment. This type of attachment allows session functional capabilities equivalent to those of other display sessions.

The DFT, HIA, and TCP/IP Connections to Separate Hosts figure shows three distinct data hosts. Each host has different 3X74 controller-protocol requirements, Host A. Host B uses a 5088 Graphics Controller Unit. Host C uses a 3172 Interconnect Controller. In that configuration, each connection requires a 3270 Connection Adapter with up to five logical sessions from each connection. The 5088 controller requires an HIA connection. The TCP/IP attachment requires at least one of the existing local system LAN adapters.



DFT, HIA, and TCP/IP Connections to Separate Hosts

3172/8232 Attachment

Attachments to a 3172 or 8232 Interconnect Controller are made using these adapters:

- Token-Ring High-Performance Adapter
- Ethernet High-Performance Adapter
  - IEEE 802.3
  - Ethernet V2.0
- X.25 Interface Co-Processor/2
- FDDI Adapter

The control unit is locally attached to the mainframe host. The LANs supported are IEEE 802.5 (Token-Ring), FDDI, and IEEE 802.3 (CSMA/CD), which includes the Ethernet V2.0. Multiple display sessions can be activated between the host and the local system.

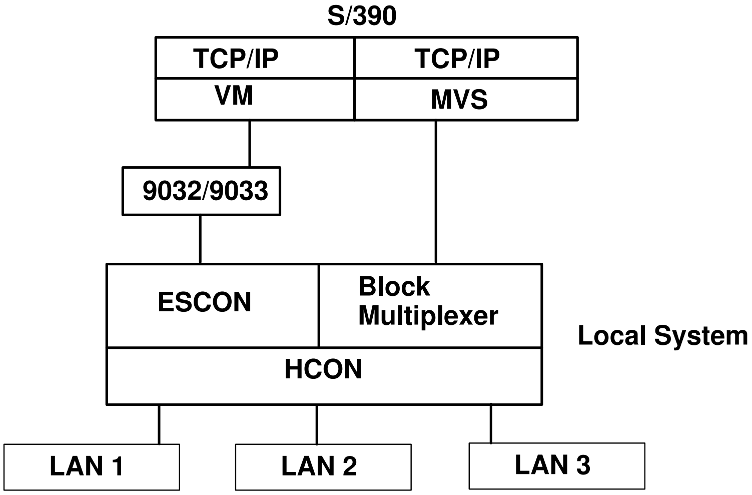
Channel Attachment

Direct attachment to S/370 or S/390 mainframe hosts can be made using:

- Block Multiplexer Channel Adapter
- ESCON Adapter

Note: TCP/IP protocol is supported for a direct attachment. TCP/IP is required on VM or MVS. HCON uses the Telnet 3270 option.

The direct channel attachment enables the local system to serve as a gateway between a LAN and a mainframe host. The Gateway Configuration between Mainframe Hosts and Multiple LANs figure shows this type of relationship between multiple LANs and mainframe hosts.



Gateway Configuration between Mainframe Hosts and Multiple LANs

SNA Standalone Attachment

HCON in the SNA standalone mode requires that SNA Services be installed on the local system. Before HCON can be invoked, SNA Services must be active and the appropriate adapter must be installed. Only logical unit (LU) types 1, 2, and 3 are supported.

The standalone SNA attachment connects to a mainframe host using these connection types and adapters:

- 4-Port Multiprotocol Communications Controller supports the following physical interface types:
  - EIA-232D
  - CCITT V.35
  - CCITT X.21
- Single Port Multiprotocol Adapter/2
  - EIA 232D
- X.25 Interface Co-Processor/2 supports the following physical interface types:
  - X.21
  - X.21 bis, including:
- V.24/EIA-232D
- V.35
- Token-Ring High-Performance Network Adapter, which is compatible with the IEEE 802.5 specifications at the following network speeds:
  - 4 Mbps
  - 16 Mbps
- Ethernet High-Performance Adapter
  - IEEE 802-3
  - Standalone Ethernet

Each SNA node from the local system, whether connecting to the same or a different host, requires a separate connection. Each connection can coexist with and operate independently of the other connections.

The local system in SNA Standalone mode emulates a SNA Type 2.1 node with dependent LUs. The system supports LU types 1, 2, and 3 concurrently, with a limitation of 253 LUs per node. However, the actual performance and response time of each LU depends on the system workload and type of application.

The implementation of SNA sessions emulates an SNA Node T2.1. The node implementation is within the local system using SNA Services. Communication takes place between network addressable units (NAUs) using the logical connection as a session. In a networked environment, the host always contains the primary LU (PLU) and the System Service Control Point (SSCP). The local system contains the secondary LU (SLU). Each SLU works independently of all the others, while working with its partner PLU or the SSCP in the host.

Once a session (SSCP to SLU or PLU to SLU) is established between NAUs, data and control information is exchanged. The SSCP to SLU session enables the SLU to request SSCP assistance to initiate PLU to SLU sessions. This enables the two applications to be in session. For example, the host application and the terminal user can communicate interactively. The standalone PLU to SLU session types are:

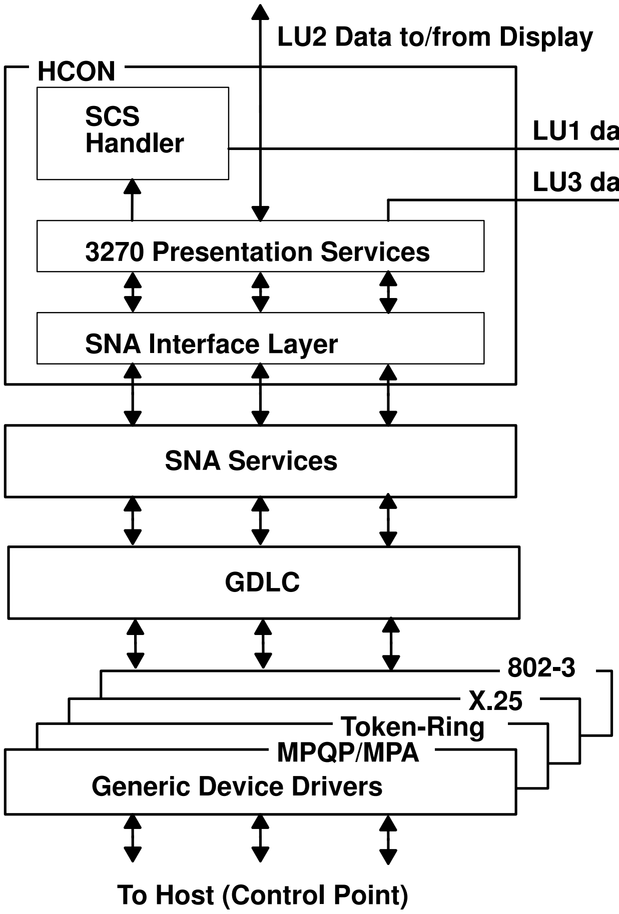
LU Type	**Use**
1	Supports data communication between an application program and printer SLU in HCON, using the SCSP printer data stream. The data can be transported with or without a Function Management Header Type 1.
2	Supports data communication between an application program and a display SLU in HCON by using the 3270 data stream as the display control.
3	Supports data communication between an application program and a printer SLU in HCON, using the 3270 data stream as the printer control.

How SNA Sessions Are Invoked within HCON

Several layers handle SNA standalone session processing:

- The Data Link Control (DLC) layer handles exchange station protocol and the exchange of network and node names.
- The SNA Services layer handles all SNA data flow control and session control protocol. Within the network protocol layer, SNA implements the path control and half-session functions, which include the transmission control and data flow control service layers.
- The 3270 session processes all the end-user services, such as updating presentation space, as well as some half-session functions.

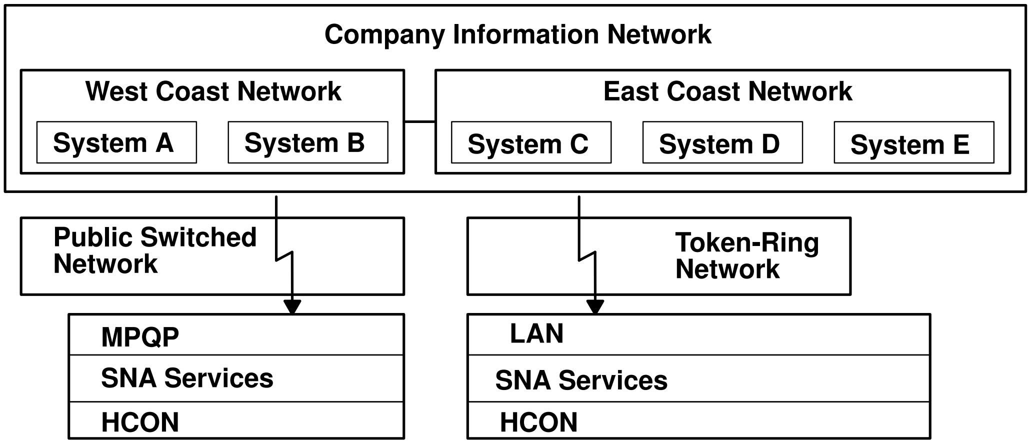
The SNA Standalone Structure figure shows the structure of layers in standalone mode.



SNA Standalone Structure

SNA Standalone Connection Example

The SNA Standalone Attachments figure shows an SNA information network. In the configuration shown, the SSCP session allows the user to select the data host. A dial-up or leased line through a telephone company is used to provide access to System B, while a Token-Ring connection is used to connect another system to System C. Both users can access all the systems within the company's information network.



SNA Standalone Attachments

SNA Support

SNA support can be from the SNA Services program or from within HCON. HCON SNA function is dependent on the connectivity type and the source of SNA support.

DFT The SLU processing logic is implemented within HCON.

Standalone The SNA support is implemented by SNA Services. The portion of SNA required is the **sna.sna.obj** file. The SNA program performs all the node and SLU functions by emulating the capabilities of a 3X74 controller. Only LU types 1, 2, and 3 are supported using HCON.

This table lists the SNA commands supported by a local system under SNA DFT or standalone mode.

SNA Commands Supported

		SSCP	Node	SSCP	SLU	PLU	SLU
Name	**Type**	**——>**	**<——**	**——>**	**<——**	**——>**	**<——**
ACTPU	SC	1,2					
DACTPU	SC	1,2					
ACTLU	SC			1,2,3			
DACTLU	SC			1,2,3			
BIND	SC					2,3	
UNBIND	SC					2,3	1,2
SDT	SC					2	
CLEAR	SC					2,3	
CANCEL	DFC					2,3	
BID	DFC					2,3	
CHASE	DFC					2,3	
SIGNAL	DFC					2,3	
SHUTD	DFC					2,3	
RSHUTD	DFC						2,3
SHUTC	DFC						2,3
LUSTAT	DFC						2,3
RTR	DFC						3
Data	FMD			3	3	3	3
Notify	FMD				1,2		
REQMS	FMD	1					
RECFMS	FMD		1				
NMVT (Alert)	FMD		1				
NMVT (RTM)	FMD	1	1				
NVMT (RSID)	FMD	1	1				

Notes: 1 = Processed/generated by 3X74 controller.
2 = Processed/generated by SNA Services
3 = Processed/generated by HCON SNA.

System Tuning Considerations for HCON in SNA Standalone Mode

If you run a large number of HCON sessions concurrently, your system can require tuning to avoid processor or memory utilization difficulties. For each invocation of the **e789x** command, 400KB of system paging space is required. Sufficient disk paging space can be configured on your system to support the maximum allowable number of HCON sessions, but the system load may not be appreciably reduced. In this case, adding real (physical) memory to your local system can enhance system performance. To determine the amount of real memory installed on your system, enter:

```
lsattr –E –l sys0
```

Increasing the number of allowable user processes, available system paging space, or the default limits in the SNA Services /**dev**/**sna** server can also enhance system performance. See “Tuning Local Systems When Using SNA Services with HCON” on page 3-51 for detailed information about these tasks.

Configuring SNA Services for Use with HCON

This article provides information on configuring SNA services for use with HCON.

Prerequisites

- The HCON program and messages should be installed on your system.
- SNA Services must be installed on your system.
- You must have root user authority to set up SNA profiles.

Procedure

Configure SNA to communicate with HCON by:

1. Setting up an SNA physical network and configuring the necessary adapters. HCON supports running SNA Services over the following types of physical networks:

   - Synchronous Data Link Control (SDLC)
   - Token-Ring
   - Ethernet
   - X.25

   Before you can use HCON to connect to a host using SNA Services, use the **smit devices** fast path command to configure the adapters necessary for the physical network you choose.

2. Setting up the SNA Services profiles using the **smit sna** fast path command. Profiles must be set up to provide an attachment for each physical communications link and a connection for each HCON session.

   a. Set up an attachment by configuring the following profiles:

      - SNA Physical Link
      - SNA Logical Link
      - SNA Control Point
      - SNA Attachment
      - SNA Node

      Note: Set the `SERVER synonym name` field of the SNA Node Profile to `sna`.

   b. Set up a connection by configuring the following profiles for each logical unit (LU) address:

      - SNA Local LU
      - SNA Logical Connection

Notes:

1. The `notify support` field of the SNA Logical Connection profile must be set to `yes`.
2. Set up the SNA Control Point profile, the SNA Local LU profiles, and the SNA Logical Connection profiles, using the SMIT SNA panel named `Configure LU Profiles for 3270 Communication`.
3. It is not advisable to use a : (colon) when entering information into SMIT text-entry fields. SMIT interprets a : (colon) as a field delimiter.

HCON Display Session Pooling

Pooling is a method for partitioning resources to ensure a logical distribution of the workload.

- Hardware adapters
- A collection of logical units (LUs) based on departmental requirements
- Connectivity to the host
- Host transaction application environment
- Type or frequency of usage

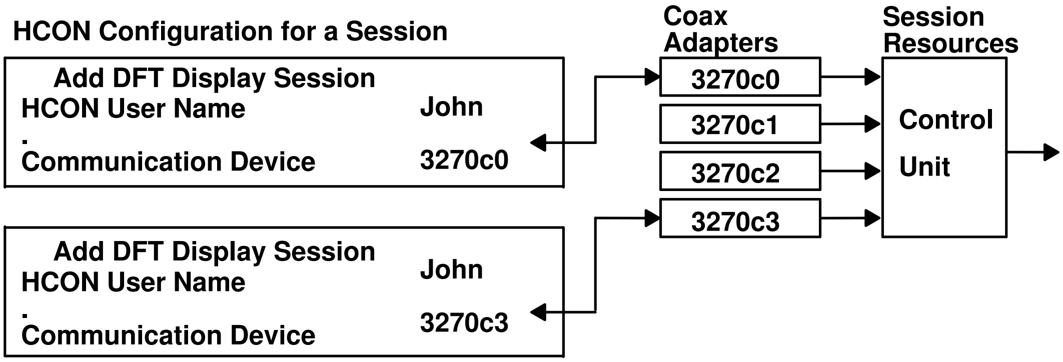
When an HCON session is initiated, an available session from the pool is used. When the session ends, the session is returned to the pool. Session pooling applies to display sessions only. Session pooling support is available for these connectivity types:

- Distributed Function Terminal (DFT)
- Host Interface Adapter (HIA)
- SNA Node T2.1

DFT and HIA pools are automatically defined based on the adapter name. SNA Node T2.1 pools must be defined by using the SNA SMIT **Configure LU Profiles for 3270 Communication** option.

HCON DFT Pooling

The DFT Session Configuration and Adapter Relationship figure shows the logical relationship between a display session, 3270 coax adapters, and session resources.



DFT Session Configuration and Adapter Relationship

These restrictions apply to DFT pooling:

- The controller, configured through control unit customization, defines the number of sessions available on a given coax port. The controller allows up to five sessions per port.
- The Virtual Telecommunications Access Method/Network Control Program (VTAM/NCP) defines the session type, display or printer, for each session. The host definition and session profile must have the same session type configuration.

SNA DFT

Only display sessions are supported for SNA DFT. All sessions are available to defined users. According to the pooling principle, each 3270 connection adapter is an LU pool. The LUs are assigned by the first available, lowest address. All users are pooled within the same adapter. The emulator issues an error message if a user attempts to start a session when the resource is not available.

Non-SNA DFT

For non-SNA DFT sessions, the principle is the same as for SNA DFT sessions except printer sessions are ignored.

Note: The 3270 Connection Adapter must be configured with the printer address so that printer sessions can be detected and bypassed.

HIA Pooling

Only display sessions are supported for Host Interface Adapter (HIA) connectivity. All sessions are available to defined users. According to the pooling principle, HIA is a pool. The sessions are assigned by the first available, lowest address. All users are pooled within the same adapter. The emulator issues an error message if a user attempts to start a session when the resource is not available.

SNA Node T2.1 Pooling

Guidelines for using SNA Node T2.1 pooling pertain to:

- Pooling support
  - Only display (LU type 2) sessions are pooled.
  - LUs can be grouped into different resource pools.
  - SMIT provides configuration support through the **Configure LU Profiles for 3270 Communication** option, where LU pools are generated.
  - SMIT displays LU pool statistics and specific LU pool information using the **Control** options for HCON.
- Pooling principle
  - LU assignments are performed on a last in, first out (LIFO) strategy that uses LUs exhibiting stability.
  - After eight consecutive failed attempts to activate an LU, the LU is disabled and removed from further consideration until all sessions using the pool are terminated.
  - Disabled LUs are recycled either after all available LUs are tried or after all sessions using a pool are terminated.
- Host VTAM/NCP information affecting pooling availability
  - The host VTAM/NCP definition determines the number of LUs within a physical unit.
  - The LU type (type 2 for display, or types 1 and 3 for printer sessions) is defined from the host's VTAM/NCP definition. The host's VTAM/NCP definition determines the LU type 2 sessions available for pooling use.
- Usability characteristics
  - The `SNA Logical Connection Profile` name selected from the pool can be displayed within { } (braces) in the `Session Use` field of the Operator Information Area (OIA). The SNA profile name shares the same area with the Session Use characteristic defined in the HCON session profile. The SNA profile name appears only if a session is available and if sufficient space in the `Session Use` field is available. The SNA profile name is useful during problem determination.

    To ensure the `SNA Logical Connection Profile` name is displayed in the `Session Use` field, limit the length of both fields or the `Prefix` characteristic. To calculate a workable length for the `Session Use` field, subtract the length of the `SNA Logical Connection Profile` name from 15. For example, if the RVLTN320 pool is being used (8 characters), `Session Use` should not exceed 7 characters.

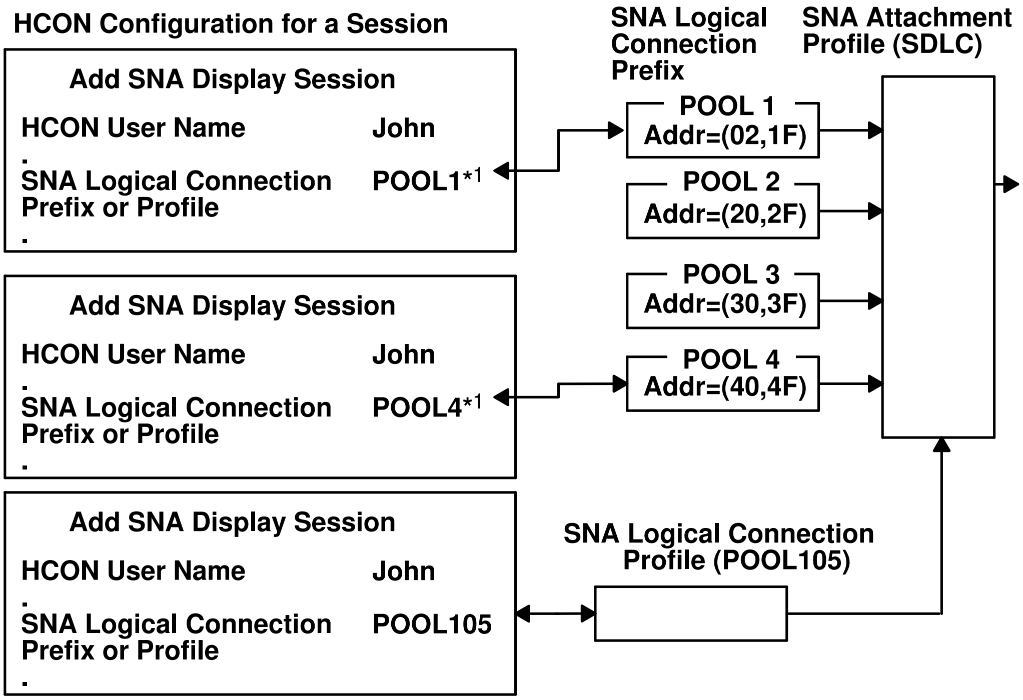
    Note: As a general guide, use only 10 characters for the `Session Use` field and 5 characters for the `SNA Logical Connection Profile` or `Prefix` field. These are recommended lengths. The actual maximum lengths are:

Field	**Max Length**
`Session Use`	20 characters
`SNA Logical Connection` or `Prefix`	12 characters

- If an LU is not available in the defined pool, an error message displays or writes to the **$HOME/hconerrors** file.

Configuration of SNA T2.1 Sessions with Multiple Pools

The SNA T2.1 Session Configuration and SNA Profile Relationship figure shows the relationship between multiple HCON users with multiple pools of SNA Logical Connection profiles. All users are configured with a single SNA Attachment Profile (SDLC) for a given communication adapter.


HCON Configuration for a Session
SNA Logical Connection Prefix
SNA Attachment Profile (SDLC)
Add SNA Display Session
HCON User Name John
.
SNA Logical Connection Prefix or Profile POOL1*1
.
Add SNA Display Session
HCON User Name John
.
SNA Logical Connection Prefix or Profile POOL4*1
.
Add SNA Display Session
HCON User Name John
.
SNA Logical Connection Prefix or Profile POOL105
.
POOL 1 Addr=(02,1F)
POOL 2 Addr=(20,2F)
POOL 3 Addr=(30,3F)
POOL 4 Addr=(40,4F)
SNA Logical Connection Profile (POOL105)

[1]An * (asterisk) indicates pooling occurs within the defined pool.

SNA T2.1 Session Configuration and SNA Profile Relationship

Setting Up an SNA Node T2.1 LU Pool

In working with an SNA Node T2.1 pool, you must enable and disable SNA Node T2.1 display session pooling.

Enable SNA Node T2.1 Display Session Pooling

1. Obtain the required host information from the host system programmer, including:
   - Device attachment information
   - LU address range
   - LU type of each address
2. Create the SNA Attachment Profile that operates with these characteristics.

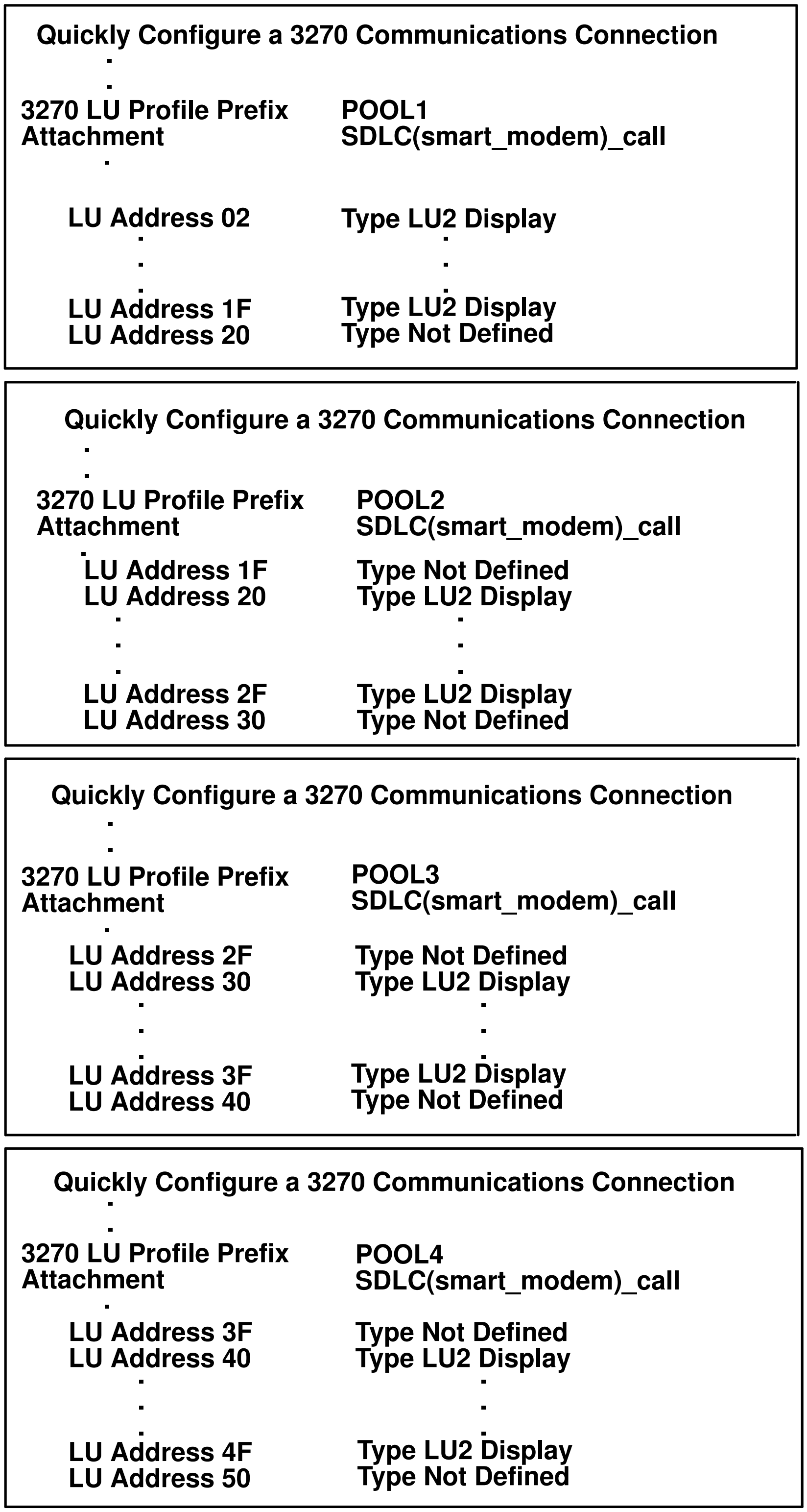
   Note: You have the option to create the SNA Attachment Profile before or during the Quick Configuration.
3. Partition the LUs into one or more pools based on the LU address range provided and the operating environment.
4. Define each pool using the **Configure LU Profiles for 3270 Communication** option in SMIT. The LU pool name is represented by its LU Profile Prefix.

   Note: It is not advisable to use a : (colon) when entering information into SMIT text-entry fields. SMIT interprets a : (colon) as a field delimiter.

5. Assign each HCON user's session to a pool based on the session profile and the user's requirements. HCON does not verify that the pool exists during the configuration process.

   Note: An * (asterisk) at the end of the pool name indicates that pooling occurs within the defined pool.

The LU Prefix Example for Pooling figure shows the Quick Configuration process to create POOL1, POOL2, POOL3, and POOL4.



```
Quickly Configure a 3270 Communications Connection
     .
     .
3270 LU Profile Prefix      POOL1
Attachment                  SDLC(smart_modem)_call
     .

    LU Address 02           Type LU2 Display
          .                          .
          .                          .
          .                          .
    LU Address 1F           Type LU2 Display
    LU Address 20           Type Not Defined
```

```
Quickly Configure a 3270 Communications Connection
   .
   .
3270 LU Profile Prefix      POOL2
Attachment                  SDLC(smart_modem)_call
   .
    LU Address 1F           Type Not Defined
    LU Address 20           Type LU2 Display
         .                           .
         .                           .
         .                           .
    LU Address 2F           Type LU2 Display
    LU Address 30           Type Not Defined
```

```
Quickly Configure a 3270 Communications Connection
     .
     .
3270 LU Profile Prefix      POOL3
Attachment                  SDLC(smart_modem)_call
     .
    LU Address 2F           Type Not Defined
    LU Address 30           Type LU2 Display
          .                           .
          .                           .
          .                           .
    LU Address 3F           Type LU2 Display
    LU Address 40           Type Not Defined
```

```
Quickly Configure a 3270 Communications Connection
     .
     .
3270 LU Profile Prefix      POOL4
Attachment                  SDLC(smart_modem)_call
     .
    LU Address 3F           Type Not Defined
    LU Address 40           Type LU2 Display
          .                           .
          .                           .
          .                           .
    LU Address 4F           Type LU2 Display
    LU Address 50           Type Not Defined
```

LU prefix Example for Pooling and Quick Configuration

Disable SNA Node T2.1 Display Session Pooling

To disable pooling support for a session, use the entire `SNA Logical Connection Profile` name. The entire profile name must be entered because the prefix and * (asterisk) value are only used to enable pooling.

Use these examples of LU prefix values in the `SNA Logical Connection Prefix or Profile` field:

Value	Meaning
POOL1*	Select any available LU from POOL1.
POOL105	Connect to the host using LU Connection Profile POOL105 and its related profiles. Pooling is not in effect for this session.

LU Pooling Management

The **stathcon** command and the **HCON Control** option in SMIT are available for LU pooling management. The **stathcon** command lists the status of HCON session profiles and SNA logical unit (LU) pools. The **HCON Control** option in SMIT is useful for administering host resources and balancing the load between user needs and system requirements.

To manage LU pooling you can:

- Monitor specific LU pools during peak periods to ensure fair distribution.
- Reassign LU pools with low usage to other pools. The reassignment process requires restarting the SNA subsystem.
- Display the status of each LU within a pool for session management and host problem determination.
- Identify congested pools.
- Perform pool assignment by using the **sna3270lu** command in a SMIT shell script (see SNA documentation for more information).

HCON Screen Size Management

The screen size of the display session depends on the attachment protocol and the model size defined in the session profile. For non-SNA DFT, HIA, and TCP/IP sessions, the default screen size is 24 rows by 80 columns. The alternate screen size is the model size configured in the HCON session profile. The screen size information is returned to the host application during a 3270 Read Partition Query function.

For SNA sessions, the session characteristics, including screen size, are defined using a LOGMODE entry within the host LOGMODE table. Users select the appropriate mode entry during session establishment time to achieve the desired screen size. (For more information, refer to “Setting Up the Host Logmode Table for HCON” on page 3-68.) The session characteristics are transported to HCON using an SNA BIND command. Both the default and alternate screen sizes can be determined from the BIND command parameters (bytes 20 through 24) during the primary logical unit (PLU) to Secondary Logical Unit (SLU) session establishment time.

For the SSCP to LU session, the screen size is fixed at 24 rows by 80 columns. When the LU to LU session is established, the default and alternate sizes are returned to the host application during a Read Partition Query function. If the session owner changes to SSCP by pressing the System Request (SysReq) key, the screen size is set to the default.

The SNA BIND command parameters (bytes 20 to 24) and the influence upon the screen size include:

SNA Screen Size Handling			
Byte 24	**Base Screen Size**	**Alternate Screen Size**	**Display Models**
X'00'	24 x 80	24 x 80	2
X'02'	24 x 80	24 x 80	2
X'03'	24 x 80	Unspecified[4]	2 through 5
X'7E'	Use byte 20, 21[1]	Use byte 20, 21[5]	2 through 5
X'7F'	Use byte 20, 21[1]	Use byte 22, 23[2]	2 through 5
X'01'	[3]		

Notes:

1. For SNA DFT, the BIND is rejected if the base screen size is not 24 by 80. For Standalone mode, the BIND is rejected if the base screen size is less than 24 by 80 or greater than the physical display area.
2. For SNA DFT, the BIND is rejected if the alternate screen size is greater than the 3270 model (rows by columns) specified in the session profile. For Standalone mode, ensure the alternate screen size fits the physical display (at least 24 by 80).
3. For SNA DFT, the BIND is rejected. For Standalone mode, the BIND is accepted, but causes an irrecoverable error in HCON.
4. For Standalone mode, the alternate screen size is determined by the best fit of model 2 through 5 to the physical display area and returns to the host during Read Partition Query.
5. For SNA Standalone mode, Erase/Write Alternate (EWA) 3270 data stream commands are rejected with the sense code `0x1003`.

Installing and Updating HCON

Before using HCON on a local system, you must install:

- HCON software
- HCON message catalog Program Integrated Information (PII)
- One or more adapters used to connect to a host
- SNA Services, if running HCON as an SNA Node T2.1 standalone attachment

To complete the set-up of HCON, configure HCON on both a local system and the mainframe host.

Note: Before using the HCON API to communicate with a host API application, the HCON host API must be installed on the mainframe host. For this installation, establish an HCON session with the host and log on. Before logging on, you must configure HCON on both a local system and the host.

HCON Software

Install the HCON system by using either the System Management Interface Tool (SMIT) or the **installp** command. The HCON installation process:

- Backs up files overwritten during a reinstallation.
- Installs the new files.
- Adds HCON configuration menus to the SMIT menus and HCON databases using the Object Data Manager (ODM).
- Adds commands to the System Resource Controller (SRC) to start the **hcondmn** subsystem at system startup.

Note: If the installation is not completed successfully, the process automatically removes the newly installed files and replaces them with the backed-up files. This process can adversely affect the integrity of the previous version of HCON.

HCON Message Catalog (PII)

The Program Integrated Information (PII) provides HCON messages in the appropriate national language for your system. Additional PIIs can be installed for other languages. When multiple PIIs are installed, the first PII installed on the system becomes the default PII for HCON. To use another PII, set the **LANG** environment variable to the appropriate national language. Install the HCON PII after the HCON software has been installed.

Adapters for HCON

Before HCON will run on your system, you must install and configure one of the following:

- 3270 Connection Adapter
- Host Interface Adapter (HIA)
- Any adapters supported by both SNA Services and HCON
- Any adapters supported by both TCP/IP and HCON

Install the adapter before or after you install the HCON software and PII, but HCON cannot run until at least one adapter is installed. The adapters are installed and configured the first time the system starts after attaching the adapter hardware. Use SMIT to modify the adapter configuration, as needed (see “Adapters Supported by HCON” on page 3-49).

SNA Services Profiles

For SNA Node T2.1 attachments, you must configure SNA Services profiles. For more information, see SNA documentation.

Updating HCON

Occasionally HCON software needs updating. Use SMIT or the **installp** command. The update procedure is the same as for the install procedure.

Adapters Supported by HCON

HCON uses these types of adapters to communicate with the mainframe host:

- 3270 Connection Adapter
- Host Interface Adapter (HIA)
- SNA Services software with any of these adapters:
  - 4-Port Multiprotocol Communications Controller, which supports these physical interface types:
    - EIA-232D
    - CCITT V.35
    - CCITT X.21
  - Single Port Multi-Protocol Adpater/2
- EIA-232D
  - X.25 Interface Co-Processor/2, which supports the physical X.21 interface and X.21 bis interface, including:
    - V.24/EIA-232D
    - V.35
  - Token-Ring High-Performance Network Adapter, compatible with the IEEE 802.5 specifications at the following network speeds:
    - 4 Mbps
    - 16 Mbps
  - Ethernet High-Performance LAN Adapter
- TCP/IP with any of these adapters:
  - Token-Ring High-Performance Network Adapter
  - Ethernet High-Performance LAN Adapter
  - FDDI Adapter
  - X.25 Interface Co-Processor/2.
  - Block Multiplexer Channel Adapter
  - ESCON Adapter

Stopping the hcondmn Subsystem

Prerequisites

- HCON must be installed on your system.
- You must have root user authority to stop HCON.

Procedure

Warning: Be sure all HCON activity has ceased before stopping the **hcondmn** subsystem. To stop the **hcondmn** subsystem, you must:

1. Log on as the root user.
2. Ensure no HCON processes are active. Use the 0**ps** command to display a list of processes. If any of the following processes are active, they must be stopped before you stop HCON:
   - **xhcon**
   - **e789**
   - **e789pr**
   - **e789x**
   - **xhconx**
   - **e789lus**
   - **fxfer**
   - **dfxfer**
   - Any HCON HLLAPI program.

   To stop these processes, choose one of the following:

   - Wait for the processes to terminate normally.
   - Have the users who started the display processes stop them using the Ctrl-D, Ctrl-D key sequence.
   - Have the users who started the printer processes stop them using control menu options.
   - Stop the processes using the **e789cln** command.
3. To end the **hcondmn** subsystem, use **smit hcon.** The Control menu provides the **Stop hcondmn Subsystem** option.

Tuning Local Systems When Using SNA Services with HCON

Prerequisites

1. The HCON program and messages must be installed on your system. For installation information, refer to the *AIX Installation Guide*.
2. SNA Services must be installed on your system.
3. You must have root authority to increase the following:
   - The number of processes allowed for each user
   - Available paging space
   - The default limits in the SNA Services server /**dev**/**sna**

Procedure

If a large number of SNA standalone sessions are run concurrently with HCON, your local system may require tuning to avoid problems associated with processor or memory utilization. Tune local systems, when using SNA services, using the following procedures.

Increase Allowable User Processes

To increase the number of allowable processes for each user, use the **lsattr** and **chdev** commands.

1. To determine the maximum number of processes allotted to a user, enter:

   ```
   lsattr -E -l sys0
   ```

   This determines the value of the `maxuproc` variable.
2. To reset the maximum number of processes allotted to a user, enter:

   ```
   chdev -a 'maxuproc=n_procs' -l sys0
   ```

   This sets the value of the `maxuproc` variable to the value of *n_procs*.

Increase Available System Paging Space

To increase the amount of available system paging space, use either the System Management Interface Tool (SMIT) facility or the **lsps** and **chps** commands:

1. To determine the current number of partitions within each paging device, enter:

   ```
   lsps -a
   ```
2. To increase the number of logical partitions (of 2 Mb each), enter:

   ```
   chps -s n_partitions page_device
   ```

   This increases the total number of partitions by *n_partitions*.

Increase SNA Services Default Limits

To run more than 200 HCON standalone sessions on your system, increase the default limits in the SNA Services server /**dev**/**sna**.

1. Enter `smit sna` from the command line.
2. Select the **Configure SNA Profiles** menu option.
3. Select the **Nodes** menu option.
4. Select the **System Network Architecture** menu option.
5. Enter `sna` as the desired value of the `PROFILE` variable.
6. Set the value of the `CONNECTIONS` variable to the maximum allowable number of SNA standalone sessions to be run on your system.

7. Set the value of the SESSIONS and CONVERSATIONS variables to a number equaling twice the value of the CONNECTIONS variable.

Note: It is not advisable to use a : (colon) when entering information into SMIT text-entry fields. SMIT interprets a : (colon) as a field delimiter.

Configuring HCON

HCON supports attachment to an SNA network as a Type 2.1 Node. For this attachment, the SNA network characteristics are configured using SMIT, and SNA Services must be installed on your system. For more information, read “Configuring SNA Services for Use with HCON” on page 3-41.

The configuration of HCON provides session user and session characteristics information. With this information, HCON establishes a session with a host computer. To configure HCON, you must complete the following tasks.

Prerequisites

- The HCON program and messages should be installed on your system. For installation information, refer to the *AIX Installation Guide*.
- Beginning with Version 2.1.3, to register HCON users, to set the maximum number of sessions, and to create an HCON session profile, you must have root user authority.

Procedure

1. Set up the HCON connection devices:
    a. To use HCON with SNA (using SNA standalone sessions), carry out the steps in “Configuring SNA Services for Use with HCON” on page 3-41.
    b. To use HCON with a Host Interface Adapter (HIA) (for HIA sessions) or a 3270 Connection Adapter (for DFT sessions), configure the appropriate communication adapter with the **smit devices** command.
    c. To use HCON with TCP/IP, configure both TCP/IP and the appropriate communication adapter with the **smit tcpip** and **smit devices** commands.
2. Register HCON users using the **smit hcon** or **mkhconu** command.
3. Beginning with Version 2.1.3, set the maximum number of sessions using the **smit hcon** command or the **sethcons** command.
4. Define HCON session profiles using the **smit hcon** command or the **mkhcons** command.
5. Configure the host for use with HCON.
6. Make sure that each HCON user has an appropriate logon ID on the host.

Note: It is not advisable to use a : (colon) when entering information into SMIT text-entry fields. SMIT interprets a : (colon) as a field delimiter.

Optional Steps

Optionally, you can:

- Customize the keyboard and color definition tables for HCON (either for the entire system or an individual user).
- Develop shell procedures that invoke the HCON file transfer process.
- Set up automatic logon procedures for connecting to the host computer using automatic logon (AUTOLOG).
- Add a new terminal for use with HCON.

Defining a New Terminal for HCON

This procedure explains how to define a new terminal for HCON.

Prerequisites

- HCON must be installed on your system. For installation information, refer to the *AIX Installation Guide*.
- You must have read access to the **/usr/share/lib/terminfo** directory.
- You must have read and write access to the **/usr/lib/hcon/terminfo** directory.
- You should be familiar with using the **terminfo** facility to create terminal definitions.

Procedure

When installed, HCON supports all high-function terminals (HFTs) and the following ASCII terminals: 3151, 3161, 3162, 3163, 3164, DEC VT100, DEC VT220, WYSE WY-50, and WYSE WY-60.

The **terminfo** source files (the **ibm.ti.H**, **dec.ti.H**, and **wyse.ti.H** files) used to create the supported terminals are in the **/usr/lib/hcon/terminfo** directory. Look at these files to see an example of a terminal definition. The **terminfo** binary files for these supported terminals are in subdirectories of the **/usr/lib/hcon/terminfo** directory. Each subdirectory is named with the first letter of the terminal file name. For example, the 5081 **terminfo** binary file, **ibm5081.H**, is in the **/usr/lib/hcon/terminfo/i** directory.

To run HCON on another type of terminal, use the **terminfo** facility to map the new terminal keys to the HCON key names.

To define a new terminal for HCON, you must:

1. Create a **terminfo** source file in the **/usr/lib/hcon/terminfo** directory.
   a. Put a **terminfo** entry for your new terminal in the file. The name of the **terminfo** entry must be the name of your terminal with a **.H** (dot H) appended to it. For example, if the terminal you are adding is an XYZ2500, use `XYZ2500.H` for the entry name.
   b. If your **terminfo** entry uses definitions from other **terminfo** source files (by including them with the **terminfo use** capability), you must include the contents of those files in your source file, preceding the entry for the new terminal.
2. Set the **TERMINFO** environment variable to **/usr/lib/hcon/terminfo**.
3. Execute the **tic** command to create your new terminal definition.
4. To use your new terminal definition, set the **TERM** environment variable to the new terminal name (without the **.H**).
5. If necessary, create a new keyboard definition table for HCON and map keys on your new keyboard to the emulator functions.

HCON and terminfo Key Names

The following table shows how the names of **terminfo** capabilities are mapped to HCON key names.

HCON and terminfo Key Names			
HCON Key Name	**terminfo Name**	**HCON Key Name**	**terminfo Name**

key_tab	ktab	key_pf6	kf6
key_btab	kbtab	key_pf7	kf7
key_enter	kcmd	key_pf8	kf8
key_sysreq	khlp	key_pf9	kf9
key_clear	kclr	key_pf10	kf10
key_backspace	kbs	key_pf11	kf11
key_chgdis	ksel	key_pf12	kf12
key_insert	kich1	key_pf13	kf13
key_delete	kdch1	key_pf14	kf14
key_home	khome	key_pf15	kf15
key_pa1	kpp	key_pf16	kf16
key_pa2	knp	key_pf17	kf17
key_pa3	kll	key_pf18	kf18
key_spaceof	kend	key_pf19	kf19
key_down	kcud1	key_pf20	kf20
key_ddown	kc3	key_pf21	kf21
key_right	kcuf1	key_pf22	kf22
key_rright	ka3	key_pf23	kf23
key_left	kcub1	key_pf24	kf24
key_lleft	kcl	key_print	kf0
key_up	kcuu1	key_saves	kil1
key_uup	ka1	key_repls	kdl1
key_pf1	kf1	yen_sign	kind
key_pf2	kf2	overbar	kel
key_pf3	kf3	english_pound	kri
key_pf4	kf4	cent_sign	ked
key_pf5	kf5	key_attn	kquit
key_pf25	kf25	key_pf27	kf27
| (vertical bar)	ktbc	c_cedilla	kd0
florin_sign	kri	key_cursel	knpn
key_newline	knl		

Customizing HCON for System Management

Several customization options are available to the HCON system manager.

Customizing Color and Keyboard Definitions

Use the HCON utility program, **hconutil**, to customize the display of 3270 character and field attributes on a terminal. Use **hconutil** to customize the keyboard location of emulator keys. With write access to the system default files, /**usr**/**lib**/**hcon**/**e789_ctbl** and /**usr**/**lib**/**hcon**/**e789_ktbl**, you can customize these aspects for the entire system. Binary color and keyboard definition tables are stored in the /**usr**/**lib**/**hcon** directory.

Users can develop their own customized color and keyboard definitions, overriding system defaults. For more information on individual customization, see “Customizing HCON Color and Highlight Values with the Utility Program” on page 2-47.

Setting the Terminal Type

When installed, HCON supports these ASCII terminals:

- 3151
- 3161
- 3162
- 3163
- 3164
- DEC VT100
- DEC VT220
- WYSE WY-50
- WYSE WY-60
- WYSE WY-370

The terminal type must be set before starting HCON. The **TERM** environment variable depends on the type of terminal where the session is started. To set the **TERM** environment variable, issue the **TERM** command from the command prompt. This example sets the **TERM** environment variable for a 3151 terminal type:

```
TERM=ibm3151-132;export TERM
```

The following **TERM** environment variables are supported.

TERM Environment Variables

Terminal Type	TERM Variable	Descriptions
3151	ibm3151	24x80 (model 2)*
3151	ibm3151-25	25x80 (model 2) with OIA line
3151	ibm3151-132	28x132 (model 5) with OIA line
316X	ibm3161	24x80 (model 2)*
316X	ibm3161-c	24x80 (with NLS cartridge)*
316X	ibm3162	24x80 (model 2)*

TERM Environment Variables

Terminal Type	TERM Variable	Descriptions
316X	ibm3162-132	28x132 (model 5) with OIA line
316X	ibm3163	24x80 (model 2)*
316X	ibm3164	24x80 (model 2)*
5081	ibm5081	All 3270 models, font-size dependent
VT100	vt100	24x80 (model 2)*
VT220	vt220	24x80 (model 2)*
WYSE	wy50	24x80 (model 2)*
WYSE	wy60	24x80 (model 2)*
WYSE	wy370	24x80 (model 2)*

Note: *The OIA line is not displayed. To see the OIA line, use the CTRL-X key sequence to toggle between line 24 and the OIA line.

To use another terminal with HCON on your system, define the new terminal's key values for HCON. "Defining a New Terminal for HCON" on page 3-54 describes the steps for defining a new terminal.

Note: For the Japanese language, the PS/55 with DEC VT100 interface can be used to run 3270 Japanese Language applications. The **TERM** variable should be set to VT100. The PS/55 requires:

- Nihongo DOS Version K3.3 and up.
- Nihongo Procomm 5600-JCK or 5605-JCK

Converting Color and Keyboard Definition Tables

HCON customized color and keyboard tables from HCON Release 1.1 convert to the new format using the HCON utility. Existing customized binary tables are input to the **hconutil** command using the **–c** or **–k** flag. The defined keys are read correctly by the utility. Any undefined keys in the existing file are identified by the system as NOFUNC and can be defined again.

When converting an HCON 1.1 keyboard table to a newer release, define these keys:

Emulator Key	Default Setting for HCON
CLICK	Ctrl-Y
HCONUTIL	Ctrl-V
ATTN	key-attn
SYSREQ	key-sysreq

Although no longer used by HCON, the **e789_ktbl.p** and **e789_ctbl.p** ASCII files may be used to view previous display and keyboard customization settings. The settings can then be duplicated using the HCON utility redefinition procedure.

Developing File Transfer Shell Scripts

To minimize user interaction with the file transfer process, write a shell script for similar file transfers that are performed frequently. For further information on developing shell scripts see “Creating HCON File Transfer Shell Procedures” on page 3-28.

Maintaining HCON

To maintain HCON you can:

- Add and delete users from the registered user list.
- Create new session profiles for existing users. For example, if a new 3270 Connection Adapter is added to the system, you must create DFT profiles for using the new device.
- Recover from interrupted file transfers.
- Stop interrupted sessions or free up system resources if a session is interrupted.
- Troubleshoot problems; for example:
  - Check session profiles to ensure all the characteristics are correctly defined.
  - Check the host configuration as well as the host hardware device connections.
  - Use the **ps** command to ensure:
    - The **hcondmn** subsystem is running at all times.
    - Display sessions running explicitly have an **e789** process is in the process display.
    - Each individual session has one **e789x** process.
    - A SNA-attached DFT display session has one **e789lus** process.
    - File transfers in progress have the **dfxfer** process running.
    - HLLAPI program or file transfers running implicitly have an associated **e789x** process in the process display.
    - A host addressable printer session has an **e789pr** process and the correct **e789x** child process.

Recovering from Interrupted HCON File Transfers

Users can interrupt file transfers before completion. Any unrecoverable communication error can interrupt a file transfer. An interrupted file transfer can be started again without loss of data. When a transfer is interrupted, the state of the transfer is saved in a restart file in the user's **$HOME** directory. A maximum of five transfer requests can be saved in restart files.

Restart an interrupted file transfer using the **fxfer** command with the **–R** flag. The **–R** flag brings up a menu displaying these choices:

- Restart the file transfer.
- Delete the **restart** file.
- Exit from the file transfer program.

The **fxfer** command restarts the previous file transfer using the information saved in the **$HOME/x_fxfer.r** or **$HOME/i_fxfer.r** file. The **$HOME/i_fxfer.r** file contains restart information for implicit file transfers. The **$HOME/x_fxfer.r** file contains restart information for explicit file transfers.

If the user runs a new file transfer, after a file transfer has been interrupted, the **fxfer** command reminds the user a restart file exists. A restart menu displays with these choices:

- Restart the interrupted file transfer.
- Delete the **restart** file.
- Exit from the file transfer program.
- Continue with the current file transfer.

If the user elects to continue the current file transfer, the **restart** file for the previous transfer can be deferred or deleted.

If the host communication is lost or disconnected, an implicit file transfer attempts to recover by reconnecting and logging back on to the host using the **dfxfer** process. The length of time the **dfxfer** process attempts recovery is determined by the File Transfer Recovery Time value in the session profile. Once the host communication is established, the **dfxfer** process begins the file transfer. If communication cannot be established, the file transfer program generates a **restart** file.

Stopping Interrupted HCON Sessions with the e789cln Command

HCON sessions can be interrupted by a power failure or a loss of connection to the host. If a session is interrupted, the processes associated with the session may not be stopped. Stop these processes with the **e789cln** command. The **e789cln** command stops specified HCON sessions and the processes associated with those sessions. These guidelines govern the use of the **e789cln** command.

- Any HCON user can use the command to stop that user's sessions.
- A root user can use the command to stop the sessions of other users.
- Use the command to stop one session, multiple sessions, or all sessions for a given user.
- Use the command only when there is a problem requiring the processes associated with a session to be stopped.
- Using the command to stop a session in progress normally causes errors.

Note: Use the QUIT emulator key (by default, the Ctrl-D key sequence) to stop a normal session.

Troubleshooting HCON

In maintaining HCON, you may need to address problems with:

- Host configuration
- Host configuration and the HCON session profile
- SNA Node T2.1 emulation using LU type 1, 2, and 3
- SNA Node T2.1 sense codes
- SNA Standalone Node T2.1

Problems with Host Configuration

Problem: The following HCON problems relate to the configuration of the host system and the control unit.

Host Panel Does Not Display on the Emulator

Problem: For a coaxial connection to a control unit, the host panel does not display on the emulator screen.

Press the Clear key and then the Enter key to receive the initial screen. If the screen does not display, check for and correct the following:

- OIA contains an error code indicating a problem.
- Coaxial cable is disconnected.
- Control unit (3174, 3274, 4361, or 9370) is not operational.
- Host channel address is configured for a device model number not supported by HCON.
- Network or terminal address for the session is configured incorrectly on the host.
- Control unit is configured incorrectly.

For more information, see "Configuring Hosts for HCON" (on page 3-66).

File Transfer Time Out on a Mainframe Host

Problem: The file transfer times out on a mainframe host.

Solution: Check for and correct the following:

- The `PSERVIC` field of the **MODEENT** macro is not set correctly for HCON.
- VTAM has not been started after changing the value in the `PSERVIC` field.

- The control unit for the emulator is not configured to support DFT terminals.
- An insufficient number of sessions have been allocated to the control unit port.

Note: The emulator screen displays message `0789-114` as a result of any of the preceding configuration errors, a disconnected coaxial cable, or a control unit that has been turned off.

Program Checks Occur During File Transfer

Problem: Program checks occur during a file transfer while running an application program interface (API). This problem occurs under non-SNA DFT attachments when using the **pvm** or pass-through facility on the host if the Maximum I/O Buffer Size characteristic is greater than 3456 bytes.

Solution: Check and correct the Maximum I/O Buffer Size in the session profile.

Time Outs When Messages Are Longer Than 4096 bytes

Problem: The API or the file transfer times out when messages longer than 4096 bytes are sent to the host computer.

Solution: Refer to “Configuring Hosts for HCON” on page 3-66 for the type of host or control unit involved.

Problems with Host Configuration and the HCON Session Profile

The following HCON problems relate to how the host configuration is reflected in the session profile.

+z_505 or +z_504 Is Displayed in the OIA

Problem: When running a SNA standalone session, `+z_505` or `+z_504` is displayed in the Operator Information Area (OIA).

Solution: This can occur if the SNA Services attachment is inactive.

- Check the status of all physical connections.
- Verify that the following are correct: SSCP ID and LU Address settings in the SNA Services Local Logical Unit profile, the NOTIFY SUPPORT setting in the SNA Services Local Logical Connection profile, the Secondary Station address in the SNA Services Logical Link profile, and the XID Node ID setting in the SNA Services Control Point profile.
- Check the connection profiles activity. For information on starting and stopping SNA Services, refer to SNA documentation. If the profiles are not active, verify all profile settings and report the problem using your local problem reporting procedures.

SNA Session Handshaking (BIND) Fails

Problem: The SNA session handshaking (BIND) fails.

Solution: Review any BIND-related messages displayed on the screen or in the **$HOME/hconerrors** file. Report the error using your local problem reporting procedures.

Problems with SNA Node T2.1 Emulation Using LU Type 1, 2, and 3

The following HCON problems relate to SNA Node T2.1 emulation using LU type 1, 2, and 3. The diagnosis may apply to either a SNA standalone (Node T2.1) display or a printer session.

Note: Several of the following solutions require contact with the Virtual Telecommunications Access Method (VTAM) administrator.

The VTAM administrator may need to know the LU name, LU address, or station address for your session. This information can be obtained using SMIT to examine pertinent SNA Services profiles. The HCON session profile (SNA Logical Connection profile characteristic) names the corresponding SNA Services Connection profile.

The SNA Services Connection profile names a local LU profile that in turn contains the LU address or LU name associated with your HCON session.

The Connection profile also names an attachment profile that in turn names a Logical Link profile. The Logical Link profile contains the Secondary Station address associated with your HCON session.

Problem: The emulator displays a blank screen at startup. The OIA ready indicators are `2 <`.

If this is a display session, then the NOTIFY SUPPORT setting may not have been specified in the SNA Services LU Connection profile for this session. If this is a printer session, then no further action is necessary because this condition is normal when an SNA standalone printer session is in conversation with the SSCP.

Problem: For a display session, press the Enter key to see the SSCP screen. To avoid this problem in the future, set NOTIFY SUPPORT to `yes` in the SNA LU Connection Profile for this session. The HCON session profile (SNA Logical Connection Profile characteristic) names the corresponding SNA Services connection profile.

Emulator Displays a Blank Screen

The emulator displays a blank screen. The OIA ready indicators are `2 ?` or `2B?`. An `X -f` (unavailable function) indicator appears whenever an AID key is pressed. The communications link may have been varied off by the host.

Contact the VTAM administrator to check the line status and to vary it on, if necessary.

LU Definition Messages and OIA Indicators (2B<) Are Displayed

Problem: The SNA standalone display session shows the following messages and OIA indicators:

```
This LU is defined as a printer (LU 1 or LU 3). On a display
enter command with an override for the log mode name.
```

```
Enter application access code or logon command.
```

The OIA ready indicators are:

```
2B<
```

The host VTAM configuration and HCON session type disagree.

Solution: Perform one of the following operations:

- Remove this session profile from the HCON profiles and reconfigure it as a printer session.
- Contact the host VTAM administrator to change the host VTAM definition to LU type 2.

084B0000 Sense Code Received

Problem: The host indicates that a `084B0000` sense code was received for certain LUs while initiating communication with SNA Services.

The message displayed at the host will be similar to:

```
ERROR FOR ID=NDMLU - REQUEST: ACTLU, SENSE: 084B0000
```

In this example, the host sent an ACTLU to LU name NDMLU, whose LU address was not defined in any of the SNA Local Logical Unit profiles associated with the attachment (PU).

Solution: This is a normal occurrence. The host sends ACTLUs to request activation of each LU defined for a given PU (as determined by the VTAM definition).

In the event that some of these LUs do not have a corresponding Local Logical Unit and connection profile definitions for the attachment in SNA Services, the host ACTLU requests for these LUs are rejected by SNA with a `084B` sense code.

Note: The error does not affect the HCON SNA standalone session operation.

0831 Sense Code Received During Printer Session

Problem: The host's print spooler indicates a `0831` sense code was received from an HCON SNA standalone printer session.

Solution: The independent LU setting in the SNA Services Local LU profiles is incorrect for the HCON printer session.

Perform one of the following operations:

1. Export your SNA profiles. From a local system prompt, enter:

   ```
   exportsna -f /tmp/snaprofs
   ```

   Substitute the name of any desired file to hold the exported data for `/tmp/snaprofs`.

2. Edit the exported profiles using a text editor. Change all occurrences of `independent_lu = yes` in your LU 1, 2, and 3 Local Logical Unit profile descriptions to `independent_lu = no`.

   If you have no LU6.2 logical units, use the global search and replace options. For example,

   ```
   %s/independent_lu = yes/independent_lu = no/g
   ```

   can be entered from the vi : (colon) line.

3. Import your modified profiles. At the local system prompt, enter:

   ```
   importsna -l /tmp/snaprofs
   ```

   Substitute the file name used in step 1 for the `/tmp/snaprofs` portion.

4. Verify your imported profiles. At the local system prompt, enter:

   ```
   verifysna
   ```

5. To activate the changes, restart the SNA server. For information on starting and stopping SNA Services, refer to the SNA documentation.

Invalid Session Parameter Specified

Problem: Host print spooler encounters an error similar to the following while attempting to send data to an HCON SNA standalone session:

```
INVALID SESSION PARAMETER PSERVIC SPECIFIED
```

The host VTAM configuration and HCON session type disagree.

Solution: Perform one of the following operations:

- Remove this session profile from the HCON profiles and reconfigure it as a display session.
- Contact the host VTAM administrator to change the host VTAM definition for this LU to be LU type 1 or 3.

Host Data Rejected

Problem: HCON SNA Standalone LU type 1 (standard character set (SCS)) printer session rejects host data. The OIA ready indicators `2B″` and the 756 program check, `X PROG756`, can be seen briefly before the printer session unbinds (returning to the SSCP session).

The host print spooler may indicate the print request was rejected with a `1003` sense code.

The host VTAM definition for the printer session LU may have specified Function Management Header (FMH) support while the host print application did not properly format SCS printer data for FMH transmission.

Solution: Perform one of the following operations:

- Contact the VTAM administrator to change the VTAM definition for the LU so that the FMH support will be disabled.

- Use a host print application that sends properly formatted SCS data and the FMHs.

SNA Node T2.1 Sense Codes

The sense codes in the following table describe SNA standalone (Node T2.1) conditions only.

SNA Node T2.1 Sense Codes		
Sense Code	**Sub Code**	**Description**
081B	0000	SSCP-LU data was received while conversing on the LU-LU session.
082D	0000	LU-LU data was received while conversing on the SSCP-LU session.
082F	0000	The print spooling program failed. The emulator issued a 793 program check.
0863	0000	An SFE (start field extended), MF (modify field), or SA (set attribute) 3270 order was received by the emulator with an invalid character set value. The emulator generated a 751 program check.
0871	0000	Read Partition SF (start field) received while in retry state. The emulator generated a 729 program check.
1001	0000	The RU data was rejected either due to error-recovery actions taking place in HCON, or because of program checks generated by the emulator that could not be described better by another sense code.
1003	0000	One of the following conditions was intercepted: A. An EWA (erase/write alternate) 3270 command was received for a static screen size. Screen size determination is made by byte 24 of the BIND (values 0x02 and 0x7E (126) specify static sizes). B. A WSF (write structured field) 3270 command was received without extended data stream support indication in the BIND (bit 0 of byte 15 of the BIND image was 0). C. The emulator detected one of the following program checks: 750: An invalid or unsupported 3270 command was received. 753: Extraneous data followed an RM (read modified), RMA (read modified all), RB (read buffer), or EAU (erase all unprotected) 3270 command, or invalid SCS control code (0x2Bnn) was issued. 756: An invalid or unsupported SF (structured field) type was received. 758: A SRM (set reply mode) SF (structured field) was received which specified an invalid mode. 760: Reserved locations in the received SF (structured field) were not 0. 771: The received SF (structured field) contained an invalid 3270 command.

SNA Node T2.1 Sense Codes		
Sense Code	**Sub Code**	**Description**
1005	0000	The emulator detected one of the following program checks: 752: Invalid 3270 address parameter for an SBA (set buffer address), RA (repeat to address), or EUA (erase unprotected to address) order. MF (modify field) order attempted to act on an incorrect 3270 field location (notified attribute). 754: Insufficient data supplied with an SA (set attribute), SBA (set buffer address), SF (start field), SFE (start field extended), MF (modify field), RA (repeat to address), or GE (graphic escape) order. 759: SF (start field) order length was incorrect. 761: PID (partition ID) was invalid for query or SF (start field) order. 791: Invalid SCS SHF (set horizontal format) or SVF (set vertical format) parameter was issued. 792: Invalid SCS SLD (set line density) parameter was received.
1008	2009	The received outbound FMH indicated an incorrect FMH length. Byte 0 of the FMH header was not 0x06.
1008	200B	The received outbound FMH selected a DSSEL (unsupported destination). Bits 0-2 of byte 4 of the FMH were not B'011' BEDS (begin and end destination selection).
1008	200D	The received outbound FMH indicated an unsupported DST (data set transmission) format. Bit 3 of byte 4 of the FMH was 1 BEF (basic exchange format).
1008	2019	The received outbound FMH contained an unsupported SRI (stack reference indicator). Bit 0 of byte 3 of the FMH was 1 (the receiver's send stack).
1008	4001	The received outbound FMH indicated an unsupported FMH type. Bits 1-7 of byte 1 of the FMH were not 0x01.
1008	4003	The received outbound FMH indicated CMI (RU data compression). Bit 5 of byte 4 of the FMH was 1.
1008	4004	The received outbound FMH indicated CPI (RU data compaction). Bit 6 of byte 4 of the FMH was 1.
1008	4007	The received outbound FMH indicated an unsupported data medium (other than the console). Bits 0-3 of byte 2 of the FMHs were not 0x0.
1008	4009	The received outbound FMH indicated FMH concatenation. Bit 0 of byte 1 of the FMH was 1.
1008	400A	The received outbound FMH indicated an unsupported demand select option. Bit 1 of byte 3 of the FMH was 1. Spooling was prohibited.
1008	400C	The received outbound FMH indicated an unsupported data medium sub-address. Bits 4-7 of byte 2 of the FMH were not 0x0.
1008	400E	The received outbound FMH selected an unsupported DSP (data stream profile). Bits 4-7 of byte 3 of the FMH were not 0xb (structured field DSP).

Configuring Hosts for HCON

Before users on the system can use the Host Connection Program (HCON) to communicate with a System/370 mainframe host, the host must meet certain configuration requirements. Different systems have differing requirements, depending on the hardware and operating system installed. However, the Virtual Telecommunications Access Method (VTAM) configuration necessary for HCON is the same for all system types. To set up HCON-related VTAM Network Control Program (VTAM/NCP) information on the mainframe host, you need to:

- Understand host requirements.
- Configure a host terminal control unit for HCON.
- Set Up the host LOGMODE table.

See “VTAM/NCP Node Definition Examples” on page 3-70 for descriptions of node tables for specific connection types.

Host Requirements

VTAM release 3.2 or later is recommended when using HCON. Because the host definitions needed to support different links and protocols vary, consult the VTAM publications for details of VTAM and NCP generation descriptions.

After you have configured the host for use with HCON, provide each HCON user with an appropriate logon ID on the host computer. Before writing programs with the HCON Application Programming Interface (API) to communicate with a host system, you must install the host API on that system.

The host definitions for HCON can be classified into these categories:

- Channel attachment:
  - DFT using a 3174/3274 or equivalent
- Remote attachment:
  - DFT using a 3174/3274 or equivalent
- Standalone:
  - Using a Node T2.1 device
  - Using SDLC (switched or leased line)
  - Using a Token-Ring network
  - Using an X.25 wide area network.

These macros are used in VTAM and NCP connection definitions for connecting to local systems:

GROUP Defines a group of communication lines attached to the NCP or VTAM. All of the lines in each physical line group have common physical attributes. Many parameters from the **LINE**, **PU** and **LU** macros may be specified in the **GROUP** macro for ease of coding and readability. This grouping eliminates the need to include common parameters in each subsequent macro and allows overrides when appropriate.

LINE Supplies specific characteristics of the communication link. Proper values should be determined by checking with the common carrier and modem supplier.

PU Defines the characteristics of the node’s physical unit.

LU Defines the characteristics of a logical unit (LU). A physical unit type 2.1 node, such as HCON, can support multiple LUs. An LU provides the interface to an SNA network for terminals and printer support to a host application. An LU's session is established between the two LUs by the SNA BIND command. The BIND parameters determine the protocol for the session. The BIND image is an entry in a logon mode (LOGMODE) table, which is created by the **MODETAB**, **MODEENT**, and **MODEEND** macros. The LOGMODE parameters define session parameters that make up the BIND image.

HCON supports the following host control units. Each control unit has different configuration requirements.

3274/3174 Control Unit

Following are the 3274 controller customization requirements (for 3274 Configuration Support D) for a local system running the HCON 3278/79 emulator, the 3270 file transfer program, or the application programming interface (API):

- Customize the 3274 to include Distributed Function Terminal (DFT) support.
- Customize the controller for Extended Data Stream processing.
- If a local system is to support multiple sessions, customize the controller for Multiple Interactive Screens.

5088/6098 Graphics Control Unit

The 5088 controller address is normally set up during the installation process. Refer to the *5088 Models 1, 2, and 1R Graphics Controller Maintenance Information* manual for details.

The setup parameter of the HIA adapter on the local system and the 5088 control unit must match. Use **SMIT 5085** from the command line to view or change the HIA setup parameters. For host channel and terminal type definition, refer to the *System Planning and Installation Guide for 6098 Graphics System*.

Setting Up the Host LOGMODE Table for HCON

The table definition LOGMODE entry controls the session types and operation parameters and is vital to the HCON session during the invocation time. These entries are used in the Host Definition examples. LOGMODE entries differ between SNA connections and non-SNA connections.

LOGMODE Table for SNA Sessions

The following LOGMODE entries are supported by HCON using SNA connections.

Note: The first bit of the second byte of the `PSERVIC` parameter field must be on to indicate support of the 3270 data stream write structured field. This is mandatory for HCON’s data stream communication.

```
*****************************************************
* Mode table for SNA display session (LU type 2)    *
* Model 2,3,4,5                                     *
*****************************************************
MOD23270  MODEENT  LOGMODE=MOD23270,FMPROF=X’03’,       C
                   TSPROF=X’03’,PRIPROT=X’B1’,          C
                   SECPROT=X’90’,COMPROT=X’3080’,       C
                   RUSIZES=X’8587’,                     C
                   PSERVIC=X’028000000000185018507F00’
MOD33270  MODEENT  LOGMODE=MOD33270,FMPROF=X’03’,       C
                   TSPROF=X’03’,PRIPROT=X’B1’,          C
                   SECPROT=X’90’,COMPROT=X’3080’,       C
                   RUSIZES=X’8587’,                     C
                   PSERVIC=X’028000000000185020507F00’
MOD43270  MODEENT  LOGMODE=MOD43270,FMPROF=X’03’,       C
                   TSPROF=X’03’,PRIPROT=X’B1’,          C
                   SECPROT=X’90’,COMPROT=X’3080’,       C
                   RUSIZES=X’8587’,                     C
                   PSERVIC=X’02800000000018502B507F00’
MOD53270  MODEENT  LOGMODE=MOD53270,FMPROF=X’03’,       C
                   TSPROF=X’03’,PRIPROT=X’B1’,          C
                   SECPROT=X’90’,COMPROT=X’3080’,       C
                   RUSIZES=X’8587’,                     C
                   PSERVIC=X’02800000000018501B847F00’
*****************************************************
* Mode table for SNA printer session (LU type 1)    *
*****************************************************
LU13270   MODEENT  LOGMODE=LU13270,FMPROF=X’03’,        C
                   TSPROF=X’03’,PRIPROT=X’B1’,          C
                   SECPROT=X’90’,COMPROT=X’3080’,       C
                   RUSIZES=X’8587’,PSNDPAC=X’01’,       C
                   SRCVPAC=X’01’,                       C
                   PSERVIC=X’018000000000000000000000’
*****************************************************
* Mode table for SNA printer session (LU type 1)    *
* FMH-1 used in a DBCS environment                  *
*****************************************************
LU1F3270  MODEENT  LOGMODE=LU1F3270,FMPROF=X’03’,       C
                   TSPROF=X’03’,PRIPROT=X’B1’           C
                   SECPROT=X’90’,COMPROT=X’7080’        C
                   RUSIZES=X’8587’,PSNDPAC=X’01’,       C
                   SRCVPAC=X’01’,                       C
                   PSERVIC=X’018000000000000000000000’
*****************************************************

*****************************************************
* Mode table for SNA printer session (LU type 3)    *
*****************************************************
```

```
LU33270   MODEENT  LOGMODE=LU33270,FMPROF=X’03’,       C
                   TSPROF=X’03’,PRIPROT=X’B1’,         C
                   SECPROT=X’90’,COMPROT=X’3080’,      C
                   RUSIZES=X’8587’,PSNDPAC=X’01’,      C
                   SRCVPAC=X’01’,                      C
                   PSERVIC=X’038000000000185018507F00’
                     .
                     .
                     .
```

LOGMODE Table for Non-SNA Sessions

The following LOGMODE entries are supported for non-SNA sessions.

Note: The `PSERVIC` field’s second byte must be set to either `X’80’` or `X’C0’`.

```
*******************************************************
* Mode table for non-SNA display session, Model 2-5   *
*******************************************************
DS23279     MODEENT   LOGMODE=DS23279,FMPROF=X’02’,        C
                      TSPROF=X’02’,PRIPROT=X’71’,          C
                      SECPROT=X’40’,COMPROT=X’2000’,       C
                      PSERVIC=X’00C000000000185018507F00’
*
DS33279     MODEENT   LOGMODE=DS33279,FMPROF=X’02’,        C
                      TSPROF=X’02’,PRIPROT=X’71’,          C
                      SECPROT=X’40’,COMPROT=X’2000’,       C
                      PSERVIC=X’00C000000000185020507F00’
*
DS43279     MODEENT   LOGMODE=DS43279,FMPROF=X’02’,        C
                      TSPROF=X’02’,PRIPROT=X’71’,          C
                      SECPROT=X’40’,COMPROT=X’2000’,       C
                      PSERVIC=X’00C00000000018502B507F00’
*
DS53279     MODEENT   LOGMODE=DS53279,FMPROF=X’02’,        C
                      TSPROF=X’02’,PRIPROT=X’71’,          C
                      SECPROT=X’40’,COMPROT=X’2000’,       C
                      PSERVIC=X’00C00000000018501B847F00’
*
*******************************************************
* Mode table for non-SNA printer session              *
*******************************************************
NSNAPRT     MODEENT   LOGMODE=NSNAPRT,FMPROF=X’02’         C
                      TSPROF=X’02’,PRIPROT=X’71’,          C
                      SECPROT=X’40’,COMPROT=X’2000’,       C
                      PSERVIC=X’008000000000185018507F00’
                        .
                        .
                        .
```

VTAM/NCP Node Definition Examples

These examples define nodes on a Virtual Telecommunctations Access Mode Network Control Program (VTAM/NCP) operating system for:

- SNA Local Channel Attachment
- Non-SNA Local Channel Attachment
- Remote Non-SNA Binary Synchronous Communication Attachment
- Remote Leased Synchronous Data Link Control (SDLC) Attachment
- Remote Switch SDLC Attachment
- Token-Ring Attachment

SNA Local Channel Attachment Example

This example shows how to define an SNA local channel subsystem on the VTAM operating system. For more information about the mainframe I/O channel definition, refer to the mainframe documentation.

Note: This example is based on the LOGMODE table for SNA sessions defined in “Setting Up the Host LOGMODE Table for HCON” on page 3-68.

```
*******************************************************
* Local SNA Majornode (VTAMSNA)                       *
*                                                     *
*******************************************************
VTAMSNA LBUILD TYPE=LOCAL
PU330   PU     CUADDR=330,PUTYPE=2,PACING=1,VPACING=1,     C
               SSCPFM=USSSCS,ISTATUS=ACTIVE,               C
               MODE=MODE6000
*-----------------------------------------------------*
*RISC System/6000 display sessions example (LU type 2)*
*-----------------------------------------------------*
LU3301  LU     LOCADDR=2,DLOGMODE=MOD23270
LU3302  LU     LOCADDR=3,DLOGMODE=MOD33270
LU3303  LU     LOCADDR=4,DLOGMODE=MOD43270
LU3304  LU     LOCADDR=5,DLOGMODE=MOD53270
*-----------------------------------------------------*
*RISC System/6000 printer session example (LU type 1) *
*-----------------------------------------------------*
LU3305  LU     LOCADDR=6,DLOGMODE=LU13270
*-----------------------------------------------------*
*RISC System/6000 printer session example (LU type 3) *
*-----------------------------------------------------*
LU3306  LU     LOCADDR=7,DLOGMODE=LU33270
*-----------------------------------------------------*
          .
          .
          .
```

Non-SNA Local Channel Attachment HCON Example

This example shows how to define a non-SNA local channel subsystem on the VTAM operating system. For more information about the mainframe I/O channel definition, refer to the mainframe documentation.

Note: This example is based on the LOGMODE table for SNA sessions defined in “Setting Up the Host LOGMODE Table for HCON” on page 3-68.

```
*******************************************************
* Local non-SNA Majornode (VTMNSNA)                   *
*                                                     *
*******************************************************
VTMNSNA LBUILD
*------------------------------------------------------*
* RISC System/6000 display sessions example, Model 2-5 *
*------------------------------------------------------*
NSB02   LOCAL CUADDR=B02,TERM=3277,                         C
              FEATUR2=(MODEL2,EDATS),ISTATUS=ACTIVE,        C
              DLOGMOD=DS23279,MODETAB=MODE6000
*
NSB03   LOCAL CUADDR=B03,TERM=3277,                         C
              FEATUR2=(MODEL2,EDATS),ISTATUS=ACTIVE,        C
              DLOGMOD=DS33279,MODETAB=MODE6000
*
NSB04   LOCAL CUADDR=B04,TERM=3277,                         C
              FEATUR2=(MODEL2,EDATS),ISTATUS=ACTIVE,        C
              DLOGMOD=3279DS4,MODETAB=MODE6000
*
NSB05   LOCAL CUADDR=B05,TERM=3277,                         C
              FEATUR2=(MODEL2,EDATS),ISTATUS=ACTIVE,        C
              DLOGMOD=DS53279,MODETAB=MODE6000
*

*------------------------------------------------------*
* RISC System/6000 printer session example             *
*------------------------------------------------------*
NSB06   LOCAL CUADDR=B06,TERM=3286,                         C
              FEATUR2=(MODEL2,EDATS),ISTATUS=ACTIVE,        C
              DLOGMOD=NSNAPRT,MODETAB=MODE6000
                .
                .
                .
```

Remote Non-SNA Binary Synchronous Communication Attachment Example

This example shows how to define an network control program (NCP) major node for a remote binary synchronous communication (BSC) 3174/3274 subsystem or equivalent.

Note: This example is based on the LOGMODE table for SNA sessions defined in “Setting Up the Host LOGMODE Table for HCON” on page 3-68.

```
********************************************************
* Remote Leased BSC host definition                    *
*              - 3174/3274 BSC attachment              *
********************************************************
CL100    CLUSTER   CUTYPE=3271,GPOLL=40407F7F,                C
                   XMITLIM=1,FEATUR2=(MODEL2,EDATS),          C
                   MODETAB=MODE6000,ISTATUS=ACTIVE
*------------------------------------------------------*
* Display session example, model 2-5                   *
*------------------------------------------------------*
CL1001   TERMINAL  TERM=3277,ADDR=60604040,                   C
                   POLL=40404040,DLOGMODE=DS23279
*
CL1002   TERMINAL  TERM=3277,ADDR=6060C1C1,                   C
                   POLL=4040C1C1,DLOGMODE=DS33279
*
CL1003   TERMINAL  TERM=3277,ADDR=6060C2C2,                   C
                   POLL=4040C2C2,DLOGMODE=DS43279
*
CL1004   TERMINAL  TERM=3277,ADDR=6060C3C3,                   C
                   POLL=4040C3C3,DLOGMODE=DS53279
*------------------------------------------------------*
* Printer session example                              *
*------------------------------------------------------*
CL1005   TERMINAL  TERM=3277,ADDR=6060C4C4,                   C
                   POLL=4040C4C4,DLOGMODE=NSNAPRT
                     .
                     .
                     .
```

Remote Leased SDLC Attachment Example

This example illustrates a typical synchronous data link control (SDLC) leased line definition in an NCP.

Note: This example is based on the LOGMODE table for SNA sessions defined in “Setting Up the Host LOGMODE Table for HCON” on page 3-68.

```
*****************************************************************
* Leased SDLC line host definition at 9600 bps for              *
*     - standalone RISC System/6000 SDLC attachment             *
*     - 3174/3274 SDLC attachment                               *
*****************************************************************
HFNLSD1 GROUP   LNCTL=SDLC,
                DIAL=NO,                                          C
                TYPE=NCP,                                         C
                CLOCKNG=EXT,                                      C
                DUPLEX=FULL,                                      C
                NEWSYNC=NO,                                       C
                NRZI=YES,                                         C
                SPEED=9600,                                       C
                PUTYPE=2,                                         C
                OWNER=H2VTAM
THF01   LINE    ADDRESS=001,                                      C
                RETRIES=(7),                                      C
                SPAN=(5200)
        SERVICE ORDER=(THF01C,THF01D,THF01E,THF01F)
*---------------------------------------------------------------*
* Physical Unit Definition                                      *
*---------------------------------------------------------------*
THF01C  PU      ADDR=C3,MAXDATA=265,MAXOUT=7,PASSLIM=3,           C
                IRETRY=NO,VPACING=(2,1),SSCPFM=FSS,               C
                SPAN=(5200),ISTATUS=ACTIVE,PACING=(1,1),          C
                MAXLU=48,MODETAB=MODE6000
*---------------------------------------------------------------*
* Logical Unit Definitions (Display sessions)                   *
*---------------------------------------------------------------*
THF01C02  LU     LOCADDR=2,DLOGMOD=MOD23270
THF01C03  LU     LOCADDR=3,DLOGMOD=MOD33270
THF01C04  LU     LOCADDR=4,DLOGMOD=MOD43270
THF01C05  LU     LOCADDR=5,DLOGMOD=MOD53270
*---------------------------------------------------------------*
* Logical Unit Definitions (Printer sessions)                   *
*---------------------------------------------------------------*
THF01C06  LU     LOCADDR=6,DLOGMOD=LU13270
THF01C07  LU     LOCADDR=7,DLOGMOD=LU33270
                  .
                  .
                  .
```

Remote Switch SDLC Attachment Example

The switched SDLC link definition has two components:

- **GROUP**, **LINE**, and **PU** macros in an NCP definition
- **PU** and **LU** macros in a VTAM switched major node

An example NCP component of an SDLC switched line definition follows.

Note: This example is based on the LOGMODE table for SNA sessions defined in “Setting Up the Host LOGMODE Table for HCON” on page 3-68.

```
*******************************************************
* NCP definition for a switched SDLC line             *
*******************************************************
HFNSSD GROUP  LNCTL=SDLC,                               C
              DIAL=YES,                                 C
              TYPE=NCP
THF12  LINE   ADDRESS=012,                              C
              ANSTONE=NO,                               C
              ANSWER=ON,                                C
              CALL=IN,                                  C
              CLOCKNG=EXT,                              C
              DISCNT=NO,                                C
              DUPLEX=HALF,                              C
              ISTATUS=ACTIVE,                           C
              MAXPU=1,                                  C
              MEWSYNC=NO,                               C
              NRZI=YES,                                 C
              SPEED=2400,                               C
              SPAN=(8000),                              C
              TRANSFR=5
THF12A  PU    PUTYPE=2,                                 C
              MAXLU=32,                                 C
              SPAN=(8000)
```

The associated VTAM switched major node component of the same SDLC switched line definition follows:

```
*-----------------------------------------------------*
* Physical Unit Definition                            *
* IDBLK = 071 for RISC System/6000                    *
*       = 017 for 3X74 controller or equivalent       *
*       = 05C for RT/PC                               *
*-----------------------------------------------------*
THX303     PU  ADDR=C1,MAXDATA=265,MAXOUT=3,PASSLIM=3,  C
               IRETRY=NO,VPACING=3,SSCPFM=FSS,          C
               SPAN=(5200),DISCNT=NO,ISTATUS=ACTIVE,    C
               PACING=(1,1),MAXLU=48,MAXPATH=2,         C
               MODETAB=MODE6000,PUTYPE=2,IDBLK=071,     C
               IDNUM=00000
*-----------------------------------------------------*
* Logical Unit Definitions (Display sessions)         *
*-----------------------------------------------------*
THX30302   LU  LOCADDR=2,DLOGMOD=MOD23270
THX30303   LU  LOCADDR=3,DLOGMOD=MOD33270
THX30304   LU  LOCADDR=4,DLOGMOD=MOD43270
THX30305   LU  LOCADDR=5,DLOGMOD=MOD53270
*-----------------------------------------------------*
* Logical Unit Definitions (Printer sessions)         *
*-----------------------------------------------------*
THX30306   LU  LOCADDR=6,DLOGMOD=LU13270
THX30307   LU  LOCADDR=7,DLOGMOD=LU33270
             .
             .
             .
```

Token-Ring Attachment Example

The definitions for a Token-Ring attachment are similar to those for a switched line. Two components, the NCP and VTAM areas, are involved.

An example NCP component of a Token-Ring connection definition for a 4MB connection follows.

Note: This example is based on the LOGMODE table for SNA sessions defined in “Setting Up the Host LOGMODE Table for HCON” on page 3-68.

```
*******************************************************
* NCP definition for a token-ring connection          *
*******************************************************
HANLEC1  GROUP  ECLTYPE=PHYSICAL,                       C
                LNCTL=SDLC,                             C
                TYPE=NCP
*
THAT0    LINE   ADDRESS=(209,FULL),                     C
                PORTADD=0,                              C
                LOCADD=400001551042,                    C
                RCVBUFC=4095
*
THAT0PP  PU     XID=NO
*
THAT0PL  LU     LOCADDR=2,ISTATUS=ACTIVE
                   .
                   .
                   .
```

The associated VTAM switched major node component of the same Token-Ring connection definition follows:

```
*-----------------------------------------------------*
* Physical Unit Definition                            *
*-----------------------------------------------------*
THAT0C     PU  ADDR=04,PUTYPE=2,IDBLK=071,IDNUM=00000,  C
               MAXPATH=1,SSCPFM=USSSCS,SPAN=(5200),     C
               USSTAB=USSHATS,MODETAB=MODE6000,         C
               MAXDATA=265,MAXOUT=1,VPACING=0
*-----------------------------------------------------*
* Logical Unit Definitions (Display sessions)         *
*-----------------------------------------------------*
THAT0C02   LU  LOCADDR=2,DLOGMOD=MOD23270,SPAN=(5200)
THAT0C03   LU  LOCADDR=3,DLOGMOD=MOD33270,SPAN=(5200)
THAT0C04   LU  LOCADDR=4,DLOGMOD=MOD43270,SPAN=(5200)
THAT0C05   LU  LOCADDR=5,DLOGMOD=MOD53270,SPAN=(5200)
*-----------------------------------------------------*
* Logical Unit Definitions (Printer sessions)         *
*-----------------------------------------------------*
THAT0C06   LU  LOCADDR=6,DLOGMOD=LU13270,SPAN=(5200)
THAT0C07   LU  LOCADDR=7,DLOGMOD=LU33270,SPAN=(5200)
             .
             .
             .
```

Problem Determination Using an SNA Standalone Node T2.1 with HCON

When using an SNA standalone session with HCON, problems associated with the emulator may occur. Determine the source of a problem by reading the error message and finding the description in the “Error Messages for SNA Standalone Node T2.1,” on page 3-76. The list of error messages also contains suggested remedies for each problem.

Reading the Error Message

If the **e789** program stops unexpectedly, look for a message beginning with the number 0789 displayed at the terminal. The message number is followed by text describing the error. If no message is displayed, look for a message in the **$HOME/hconerrors** file. The last (most recent) entry in the file contains the error message.

If an error message is displayed in the **hconerrors** file, find the message number in the following list and take the indicated action to remedy the error. If the message number is not described in the list, contact system support.

Note: The text of an error message may include the following types of numbers:

- Numbers displayed in bit form (for example, `B‘0’` or `B‘1’`)
- Numbers displayed in dotted decimal form (for example, `101.64.0`)
- Numbers displayed in hexadecimal form with the prefix 0x (for example, `0x000`)

Error Messages for SNA Standalone Node T2.1

This list describes causes and remedies for errors that may occur when using SNA Services with HCON.

Error Message

```
0789-002 Command usage error. . .
```

Cause The session names on the **e789** command line are separated by blanks or additional characters follow the session names; for example:

```
e789 ab cd
```

OR

```
e789 abcd%%
```

Remedy Ensure all session names appear contiguously and no extraneous characters (other than shell operators, such as & (ampersand)) follow the session names; for example:

```
e789 abcd
```

OR

```
e789 abcd &
```

Error Message

```
0789-003 Session could not recover from internal error. . .
```

Cause An internal error occurred during HCON execution.

Remedy Record the internal error code and contact system support.

Error Message

```
0789-004 Cannot start more than 26 sessions. . .
```

Cause More than 26 session names were entered on the **e789** command line; for example:

```
e789 abcdefghijklmnopqrstuvwxyza
```

Remedy Specify no more than 26 sessions on the **e789** command line.

Error Message

```
0789-009 The e789 program cannot start the e789x process. . .
```

Cause The **fork**, **execl**, or **wait** subroutine failed to initiate the HCON emulator session child process.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `2` (**ENOENT**) or `52` (**ESTALE**), verify that the **e789x** file exists in the /**usr**/**bin** directory. That is, the program file has not been erased and the file system containing the HCON program is mounted.
- If the error number is `4` (**EINTR**), the subroutine was interrupted (possibly by a **kill** command or a Ctrl-C key sequence).
- If the error number is `8` (**ENOEXEC**), the **e789x** program file is corrupted. Install the HCON program again. For more information, see “Installing and Updating HCON” on page 3-48.
- If the error number is `10` (**ECHILD**), the **e789x** program stopped unexpectedly.

  Try the operation again. If the problem persists, record the error number and contact system support.
- If the error number is `11` (**EAGAIN**), the user process limit has been exceeded. Increase the number of processes allowed for each user, or stop some of the active processes.
- If the error number is `12` (**ENOMEM**), there is not enough memory on the system to run the **e789x** program.
- If the error number is `13` (**EACCES**) or `1` (**EPERM**), verify that the **e789x** file has permissions set to allow execution. Verify that the directories in the path to the **e789x** file allow access. Verify that the /**usr** and /**usr**/**bin** directories, as well as the **e789x** file, have access permissions set for read and execute.

  Note: The **ls** command will display the permissions of a file or directory. The **chmod** command can be used to change permissions.

For information on how to change system parameters (such as user process limits or available memory), refer to:

- “Changing Operating System Parameters” in *AIX System Management Guide: Operating System and Devices*
- “Tuning Local Systems When Using SNA Services with HCON” on page 3-51

Error Message

```
0789-010 Abnormal end of e789x process. . .
```

Cause The **e789x** or **e789lus** process for the indicated session exited abnormally. This error may be a side effect of another primary cause. This error may also arise from improper installation of the HCON program.

Remedy Look for other messages just prior to `0789-010` in the **$HOME**/**hconerrors** file.

Verify that the **e789x** and **e789lus** files reside in the /**usr**/**bin** directory, that both files have read and execute permission, and that the /**usr** and /**usr**/**bin** directories have read and execute permission.

Try the operation again. If the problem persists, record the error number and exit code, and contact system support.

Error Message

`0789-011 Cannot attach to shared memory segment. . .`

Cause The **shmat** subroutine returned a negative value.

Remedy If the error number is `12` (**ENOMEM**), there is not enough memory on the system to run HCON.

For information on how to change system parameters (such as available memory), refer to:

- "Changing Operating System Parameters" in *AIX System Management Guide: Operating System and Devices*
- "Tuning Local Systems When Using SNA Services with HCON" on page 3-51

Try the operation again. If the problem persists, record the shared memory key and error number, and contact system support.

Error Message

`0789-012 The e789 program cannot start the hconutil process. . .`

Cause The **execl** subroutine failed to initiate the HCON utility (**hconutil**) child process.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `1` (**EPERM**) or `13` (**EACCES**), verify that the **hconutil** file and the /**usr** and /**usr**/**bin** directories have read and execute permission.
- If the error number is `2` (**ENOENT**) or `52` (**ESTALE**), verify that the **hconutil** file exists in the /**usr**/**bin** directory. Verify that the program file has not been erased and that the file system containing the **hconutil** process is mounted.
- If the error number is `8` (**ENOEXEC**), the **hconutil** file has become corrupted. Install the HCON program again. For more information, see "Installing and Updating HCON" on page 3-48.
- If the error number is `12` (**ENOMEM**), there is not enough memory on the system to run the **hconutil** process.

For information on how to change system parameters (such as available memory), refer to:

- "Changing Operating System Parameters" in *AIX System Management Guide: Operating System and Devices*
- "Tuning Local Systems When Using SNA Services with HCON" on page 3-51

Error Message

`0789-013 The hconutil process ended abnormally. . .`

Cause The **hconutil** process ended with an unexpected exit code. This error is either due to program malfunction (from nonexistent or corrupted keyboard or color table files) or due to usage error.

Remedy Stop and start the emulator and try the operation again. If the problem persists, record the exit code and contact system support.

Error Message

`0789-018 Cannot attach to shared memory segment. . .`

Cause Refer to message `0789-011`

Error Message

```
0789-020 Cannot open file. . .
```

Cause The **open** subroutine returned a negative value. The message usually refers to the color table, keyboard mapping table, screen save, or screen replace files.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `4` (**EINTR**), the **open** subroutine was interrupted (possibly by a **kill** command or a Ctrl-C key sequence).
- If the error number is `13` (**EACCES**) or `30` (**EROFS**), verify that the referenced file exists with at least read permission in the directory. For writable files (such as screen save and replace files), verify that the parent directory for the file has create and write permissions.

  For modifiable files (such as **hconutil** operations on the color and keyboard mapping table files), verify that the parent directory for the file has create and write permissions.
- If the error number is `11` (**EAGAIN**), the file is locked by another process. Wait until the locking process has released the file, or stop the locking process.
- If the error number is `28` (**ENOSPC**) or `88` (**EDQUOT**), insufficient disk space (or disk quota) exists to create the file. Determine which limits have been exceeded; for example, directory entries (i-nodes), disk blocks, or user quotas. Either extend the limits or release resources to accommodate HCON. If the problem persists, contact system support.

Error Message

```
0789-021 Cannot get communication device status. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting device driver status inquiry.

Remedy Stop and start SNA Services again. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If this problem persists, record the error number and contact system support.

Error Message

```
0789-023 Not enough memory available. . .
```

OR

```
0789-026 Not enough memory available. . .
```

Cause The **malloc** subroutine failed to obtain memory. The system has insufficient memory to run HCON.

Remedy For information on how to change system parameters (such as available memory), refer to:

- "Changing Operating System Parameters" in *AIX System Management Guide: Operating System and Devices*
- "Tuning Local Systems When Using SNA Services with HCON" on page 3-51

Error Message

```
0789-029 Cannot read from communication device special file. . .
```

Cause The **readx** subroutine was unsuccessful.

Remedy Try the operation again. If the problem persists, record the error number and contact system support.

Error Message

```
0789-030 Cannot write to communication device special file. . .
```

Cause The **writex** subroutine was unsuccessful.

Remedy Try the operation again. If the problem persists, record the error number and contact system support.

Error Message

```
0789-032 Unrecognized message from the logical terminal interface.. .
```

Cause A logical terminal interface (LTI) message that did not meet length criteria was sent to the **e789x** file.

Remedy Stop and start the emulator and any LTI clients (for example, the **fxfer** command or API). If the problem persists, record the error number and contact system support.

Error Message

```
0789-033 Cannot get message from the logical terminal interface. . .
```

Cause An error occurred while retrieving an LTI message. For example, the **msgrcv** subroutine may have been unsuccessful. Necessary interprocess communication (IPC) resources may have been removed by either the **e789cln** or **ipcrm** command.

Remedy Stop and start the emulator and any LTI clients (for example, the **fxfer** command or API). If the problem persists, record the error number and contact system support.

Error Message

```
0789-034 Cannot send message to the logical terminal interface. . .
```

Cause An error occurred while sending an LTI message. For example, the **msgsnd** subroutine may have been unsuccessful. Necessary IPC resources may have been removed by either the **e789cln** or **ipcrm** command.

Remedy Stop and start the emulator and any LTI clients (such as, the **fxfer** command or API). If the problem persists, record the error number and contact system support.

Error Message

```
0789-046 Cannot send communication device status. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting to send sense code data to the host. This may have occurred while attempting to send an inbound Function Management (FM) header or a LUSTAT request to the host.

Remedy Stop and start SNA Services again. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

`0789-047 The communication device or keyboard queue poll failed. . .`

Cause The **poll** subroutine was unsuccessful.

Remedy Stop and start the emulator. If the problem persists, record the error number and contact system support.

Error Message

`0789-048 Not enough memory for inbound data stream. . .`

Cause The maximum size of the inbound data buffer was computed incorrectly.

Remedy Contact system support.

Error Message

`0789-051 Cannot start printer session. . .`

Cause Neither a printer queue name nor a print file name was specified in the HCON profile for the indicated session.

Remedy Provide a valid printer queue name or file name for the session profile and stop and start the emulator.

Error Message

`0789-053 Cannot open printer spooler output file. . .`

Cause The **open** subroutine on the printer spooler file or on the print file name was unsuccessful.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `4` (**EINTR**), the **open** subroutine was interrupted (possibly by a **kill** command or a Ctrl-C key sequence).
- If the error number is `11` (**EAGAIN**), the file is locked by another process. Wait until the locking process has released the file, or stop the locking process.
- If the error number is `13` (**EACCES**) or `30` (**EROFS**), ensure the parent directory for the file has permission for creating the file. Print spooler files are distinguished by the naming convention (**e789p_***xxxxx*, where *xxxxx* is the **e789** process ID). For these files, the parent directory is the user's home directory.
- If the error number is `28` (**ENOSPC**) or `88` (**EDQUOT**), there is insufficient disk space (or disk quota) to create the file. Determine which limits have been exceeded; for example, directory entries (i-nodes), disk blocks, or user quotas. Either extend the limits or release resources to accommodate HCON.

  Try the operation again. If the problem persists, Record the file name and error number, and contact system support.

Error Message

`0789-054 Session cannot use the new window size. . .`

Cause The new virtual terminal window size is too small to accommodate the alternate screen size.

Remedy Size or open the window with a different font size. Ensure the number of rows and columns in the display space can accommodate the alternate screen size, given in the BIND (bytes 22-23 of the BIND image). Stop and start the emulator and try the operation again.

Error Message

```
0789-057 Print spooler is unavailable. . .
```

Cause Unable to locate a stanza in the /**etc**/**qconfig** file that names the specified print spooler.

Remedy Ensure the print spooler has been properly configured and is available for use. A stanza in the /**etc**/**qconfig** file contains the name of the print spooler. For additional information, refer to the “Printer Overview” in *AIX Guide to Printers and Printing*.

Error Message

```
0789-058 Cannot open the /etc/qconfig file. . .
```

Cause The /**etc**/**qconfig** file is inaccessible to HCON.

Remedy Ensure the /**etc**/**qconfig** file exists and has read permission.

Error Message

```
0789-061 Cannot receive a message. . .
```

Cause The **msgrcv** subroutine was unsuccessful during the processing of a keyboard or Operator Information Area (OIA) event.

Remedy Stop and start the emulator. If the problem persists, record the error number and contact system support.

Error Message

```
0789-063 Cannot open communication device special file. . .
```

Cause The **open** subroutine was unsuccessful while attempting to access the device driver.

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-064 Communication device special file does not exist. . .
```

Cause The SNA Services Logical Connection profile, named in the SNA profile of the indicated HCON session, does not exist.

Remedy Verify that the SNA profile named is a valid Logical Connection profile.

Error Message

```
0789-065 File contains data which is not valid. . .
```

Cause The indicated file is not a valid color table definition file. The file is corrupted.

Remedy Using the **hconutil** command, generate the color table file specified. Stop and start the emulator session. See the **hconutil** command for more information.

Error Message

```
0789-066 Cannot read from file. . .
```

Cause The **read** subroutine was unsuccessful, or the HCON keyboard-mapping or color-table file specified is not in a valid format. The file is corrupted.

Remedy Using the **hconutil** command, generate either the keyboard-mapping or color table file specified. Stop and start the emulator session. See the **hconutil** command for more information.

If the error number is `4` (**EINTR**), `5` (**EIO**), `11` (**EAGAIN**), or `45` (**EDEADLK**), stop and start the emulator session.

For other errors, or if the message continues, record the error number and contact system support.

Error Message

```
0789-068 File contains data which is not valid. . .
```

Cause The indicated file is not a valid keyboard mapping definition file. The file is corrupted.

Remedy Using the **hconutil** command, generate the specified keyboard mapping file. Stop and start the emulator session. See the **hconutil** command for more information.

Error Message

```
0789-071 File system for print file is almost full. . .
```

Cause The file system containing the directory for the session print file does not have enough space for the incoming print data.

Remedy Extend the file system or remove unneeded files to free space. Examine the end of the print file. Ensure all data is intact. If not, submit the print job from the host again. Stop and start the emulator session and try the operation again.

Error Message

```
0789-072 Pipe could not be created for ASCII terminal. . .
```

Cause This error arises when the **pipe** subroutine fails to create a pipe structure. For slow display devices, HCON attempts to create a pipe to buffer traffic between the emulator and the display.

The error is not fatal to HCON execution, but the integrity of the display may be compromised. Unreadable data may appear on slow display devices.

Remedy If the error number is `23` (**ENFILE**) or `24` (**EMFILE**), stop and start the emulator. If the problem persists, record the error number and contact system support.

Error Message

`0789-073 Cannot redirect standard output to a pipe. . .`

Cause The **close** or **dup** subroutine was unsuccessful while performing operations associated with a slow display device pipe.

Remedy If the error number is `24` (**EMFILE**), stop and start the emulator. If the problem persists, record the error number and contact system support.

Error Message

`0789-074 Cannot read from a pipe of an ASCII terminal. . .`

Cause The **read** subroutine was unsuccessful while attempting to get data from a pipe created to buffer output to a slow display device. This problem may arise from file-system damage.

Remedy Stop and start the emulator and try the operation again. If the problem persists, record the error number and contact system support.

Error Message

`0789-075 Cannot write to a pipe of an ASCII terminal. . .`

Cause The **write** subroutine was unsuccessful while attempting to send data obtained from the output buffer pipe to the display. This problem may arise from file-system damage.

Remedy Stop and start the emulator and try the operation again. If the problem persists, record the error number and contact system support.

Error Message

`0789-077 Cannot get input from the keyboard. . .`

Cause The **getch** curses subroutine was unsuccessful while attempting to get data from the keyboard.

Remedy Stop and start the emulator to reset the curses state that lead to the error. If the problem persists, record the error number and contact system support.

Error Message

`0789-078 Cannot send a message to a session. . .`

Cause The **msgsnd** subroutine was unsuccessful while attempting to send an IPC message to the **e789x** file. This error may arise during procedures to show or hide a session displayed on the screen; for example, during processing for the NEXT key.

The error may also occur while handling a change in the virtual terminal window size, or while performing internal emulator shutdown protocols.

The necessary IPC resources may have been removed with either the **e789cln** or **ipcrm** command.

Remedy Stop and start the emulator. If the problem persists record the error number and contact support personnel.

Error Message

`0789-079 Cannot start an emulator shell. . .`

Cause An **open** or **dup** subroutine was unsuccessful while attempting to open terminal standard in and out (file descriptors for input and output). The open was attempted in order to start an shell or to invoke the **hconutil** command.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `2` (**ENOENT**), `6` (**ENXIO**), or `13` (**EACCES**), ensure the terminal device special file exists and has read and write permission to the terminal. See “Understanding I/O Access Through Special Files” in *AIX Kernel Extensions and Device Support Programming Concepts*.

- If the error number is `4` (**EINTR**), the **open** or **dup** subroutine was interrupted (possibly by a **kill** command or the Ctrl-C key sequence). Try the operation again. If the problem persists, record the error number and contact system support.

Error Message

```
0789-080 Cannot allocate the SSCP-LU session. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting to initiate an SSCP-LU session (ALLOCATE) in response to a host ACTLU request.

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-081 Cannot allocate the LU-LU session. . .
```

Cause The **readx** subroutine was unsuccessful while attempting to accept a host BID to begin a bracket.

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-082 Cannot allocate the LU-LU session. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting to obtain a Resource ID (RID) from the SNA Services device driver. This error arises during the processing of control information:

- Attention (**REQUEST_TO_SEND**)
- System-request (**LUSTAT**)
- Inbound FMH (**SEND_FMH**)
- Negative responses (**SEND_ERROR**) occurring between brackets.

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-083 Cannot deallocate the SSCP-LU session. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting to stop or recycle the SSCP-LU session (**RSHUTD**).

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-084 Cannot deallocate the LU-LU session. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting to return a RID to the SNA Services device driver. This error arises during the processing of control information:

- Attention (**REQUEST_TO_SEND**)
- System-request (**LUSTAT**)
- Inbound FMH (**SEND_FMH**)
- Negative responses (**SEND_ERROR**) occurring between brackets

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-085 Cannot respond to CONFIRM request from the host. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting to respond positively (**CONFIRMED**) to host data.

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-086 Cannot send change direction notification to the host. . .
```

Cause The **ioctl** subroutine was unsuccessful while attempting to flush the inbound data buffer and give execute permission to the host (**PREPARE_TO_RECEIVE**).

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-087 Attempting to receive while in send state. . .
```

Cause The half-duplex, flip-flop protocol was violated while in bracket state and during the LU-LU session. Host data arrived before HCON gave permission with a change-direction request.

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-089 Attempting to issue PREPARE_TO_RECEIVE while not in bracket. . .
```

Cause An attempt was made to give the host execute permission while half-duplex, flip-flop protocol was not in effect (that is, outside bracket state).

Remedy Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-090 Cannot create session because display space is too small. . .
```

Cause The physical display space is too small to accommodate the default or alternate screen size specified in the BIND (bytes 20-23 of the BIND image).

Remedy Enlarge the virtual terminal window or use a smaller font. Adjust the display space to have at least the number of rows and columns indicated in the text of the message. Stop and start the emulator and try the operation again. If the problem persists, contact system support.

Error Message

```
0789-091 Cannot open the SNA logical connection profile. . .
```

Cause The SNA Services server is not active.

Remedy Ensure the SNA Services server is active. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the server is active, verify that the SNA profile named is a valid logical connection profile. Stop and start the emulator and try the operation again. If the problem persists, contact system support.

Error Message

```
0789-099 Usage e789. . .
```

Cause An unrecognized option on the **e789** command line has been specified.

Remedy Ensure only supported flags are used on the **e789** command line, and try again.

Error Message

```
0789-101 Cannot create another process at this time. . .
```

Cause The **fork** subroutine failed to initiate a child process for use as a shell.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `11` (**EAGAIN**), the user process limit has been exceeded. Increase the number of processes allowed for each user, or stop some of the active processes.
- If the error number is `12` (**ENOMEM**), there is not enough memory on the system to honor the request.

For information on how to change system parameters (such as user process limits or available memory), refer to:

- “Changing Operating System Parameters” in *AIX System Management Guide: Operating System and Devices*
- “Tuning Local Systems When Using SNA Services with HCON” on page 3-51

Try the operation again. If the problem persists, record the error number and contact system support.

Error Message

```
0789-102 Cannot create another process at this time for HCON utility. . .
```

Cause The **fork** subroutine failed to initiate a child process to execute the **hconutil** command.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `11` (**EAGAIN**), the user process limit has been exceeded. Increase the number of processes allowed for each user, or stop some of the active processes.
- If the error number is `12` (**ENOMEM**), there is not enough memory on the system to honor the request.

For information on how to change system parameters (such as user process limits or available memory), refer to:

- “Changing Operating System Parameters” in *AIX System Management Guide: Operating System and Devices*
- “Tuning Local Systems When Using SNA Services with HCON” on page 3-51

Try the operation again. If the problem persists, record the error number and contact system support.

Error Message

```
0789-103 Cannot open a pipe to print the screen. . .
```

Cause The **pipe** subroutine was unsuccessful while attempting to create a pipe to buffer screen data sent to the printer.

Remedy If the error number is `23` (**ENFILE**) or `24` (**EMFILE**), stop and start the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-104 Cannot create another process at this time to print the screen. . .
```

Cause The **fork** subroutine failed to initiate a child process to execute a print spooler queuing request.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `11` (**EAGAIN**), the user process limit has been exceeded. Increase the number of processes allowed for each user, or stop some of the active processes.
- If the error number is `12` (**ENOMEM**), there is not enough memory on the system to honor the request.

For information on how to change system parameters (such as user process limits or available memory), refer to:

- “Changing Operating System Parameters” in *AIX System Management Guide: Operating System and Devices*
- “Tuning Local Systems When Using SNA Services with HCON” on page 3-51

If the problem persists, record the error number and contact system support.

Error Message

```
0789-105 Cannot execute command to print. . .
```

Cause The print spooler queueing request was unsuccessful.

Remedy Ensure the printer device file is correctly configured:

- Ensure the printer device file, named in the HCON profile for the indicated session, is available.
- Ensure all permissions are set to allow writing to the device.

Test the configuration by using the print command, specified in the error message, to operate on a trial print file (explicitly from an shell prompt). If the print request is successful, the printer device file is correctly configured.

Stop and start the emulator and try the operation again. If the problem persists, record the print command and error number, and contact system support.

Error Message

```
0789-106 Press Ctrl-D to exit the emulator. . .
```

Cause A QUIT key sequence has been issued. This message is a prompt to confirm an intent to stop the emulator session.

Remedy Press the Ctrl-D key sequence to confirm the exit. Press any other key to resume the emulator session.

Error Message

```
0789-107 Cannot initialize the terminal screen for curses. . .
```

Cause The **tcgetattr**, **tcsetattr**, or **initscr** subroutine was unsuccessful during the screen initialization procedure.

Remedy If the error number is `19` (**ENODEV**) or `25` (**ENOTTY**), ensure the input device for the HCON utility is a valid, accessible terminal (not redirected from a pipe or file). Stop and start the emulator and try the operation again. If the problem persists, record the error number and contact system support.

Error Message

`0789-108 Session ended abnormally. . .`

Cause The **msgsnd** subroutine failed to communicate with the **hcondmn** system while attempting to stop the session.

Remedy Ensure the **hcondmn** system is active before starting any further emulator sessions. Enter:

```
'lssrc -s hcon'
```

from an shell prompt. If the problem persists, contact system support.

Error Message

`0789-109 Cannot initiate sessions. . .`

Cause The **msgsnd** subroutine failed to communicate with the **hcondmn** system while attempting to initiate sessions.

Remedy Ensure the **hcondmn** system is active. Enter:

```
lssrc -s hcon
```

from an shell prompt. If the problem persists, contact system support.

Error Message

`0789-111 Cannot access file. . .`

Cause The **access** subroutine was not permitted to access the HCON **terminfo** file or the specified debug trace file.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `2` (**ENOENT**) and the file is the HCON **terminfo** file, ensure the file exists in the **/usr/lib/hcon/terminfo** directory.
- If the error number is `13` (**EACCES**), verify that the referenced file has correct permissions:
  - The HCON **terminfo** file must have read access.
  - The parent directory for the debug file must allow file creation and writing.
- If the error number is `30` (**EROFS**), verify that the referenced file has correct permissions.

Try the operation again. If the problem persists, record the file name and error number, and contact system support.

Error Message

`0789-112 Cannot get the file size. . .`

Cause The **fstat** subroutine failed to obtain the size of the HCON keyboard table file named.

Remedy If the error number is `2` (**ENOENT**) or `14` (**EFAULT**), ensure the file exists in the directory specified in the session profile. Record the file name and error number, and try again. If the problem persists, contact system support.

Error Message

`0789-114 Cannot open the communication device special file. . .`

Cause The **open** subroutine was interrupted while attempting to access the device driver. This error may also be the result of a time out during an attempt to establish connections with communications equipment; for example, modems or controllers attached to the system.

Remedy Verify that the interruption was not caused by process management functions (for example, a **kill** command or the Ctrl-C key sequence). Verify that the attached communication equipment is configured and functioning properly.

Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-115 Cannot open the communication device special file. . .
```

Cause Due to memory constraints, the **open** subroutine failed to access the device driver. There is not enough memory on the system to perform the open request.

Remedy For information on how to change system parameters (such as available memory), refer to:

- "Changing Operating System Parameters" in *AIX System Management Guide: Operating System and Devices*
- "Tuning Local Systems When Using SNA Services with HCON" on page 3-51

Stop and start the emulator session and try the operation again. If the problem persists, contact system support.

Error Message

```
0789-116 Cannot open the communication device special file. . .
```

Cause The **open** subroutine failed to access the device driver.

Remedy Ensure the **/dev/sna** file exists and has read and write permissions.

Error Message

```
0789-118 Communication with the ASCII terminal has been lost. . .
```

Cause The asynchronous terminal carrier has been dropped.

Remedy Ensure the terminal being used is operational. Before trying the operation again, issue the **e789cln** command to stop the HCON sessions that were active on the ASCII terminal. This remedy will release the HCON resources.

Error Message

```
0789-119 Cannot write to the save file. . .
```

Cause The **write** subroutine failed to write data to the indicated HCON save file.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `11` (**EAGAIN**), the file is locked by another process. Wait until the locking process has released the file or stop the locking process.
- If the error number is `28` (**ENOSPC**), `27` (**EFBIG**), or `88` (**EDQUOT**), insufficient disk space (or disk quota) exists to write to the file. Determine which limits have been exceeded; for example disk blocks, user quotas, or both. Either extend or release resources to accommodate HCON.

Try the operation again. If the problem persists, record the file name and error number, and contact system support.

Error Message

```
0789-120 Cannot write to the replace file. . .
```

Cause The **write** subroutine failed to write data to the indicated HCON replace file.

Remedy The remedy depends on the error number specified in the error message:

- If the error number is `11` (**EAGAIN**), the file is locked by another process. Wait until the locking process has released the file, or stop the locking process.
- If the error number is `28` (**ENOSPC**), `27` (**EFBIG**), or `88` (**EDQUOT**), insufficient disk space (or disk quota) exists to write to the file. Determine which limits have been exceeded: for example, disk blocks, user quotas, or both. Either extend or release resources to accommodate HCON.

Try the operation again. If the problem persists, record the file name and error number, and contact system support.

Error Message

```
0789-121 Cannot write to the print spool file. . .
```

Cause The **write** subroutine failed to write data to the print file for this session.

Remedy The name of the print file is specified in the File to Store Printer Output characteristic in the HCON printer session profile.

The file is located in the user's home directory and is named **e789p***nn_xxxxx*, where *nn* is the session number and *xxxxx* is the **e789** process ID number.

The remedy depends on the error number specified in the error message:

- If the error number is `11` (**EAGAIN**), the file is locked by another process. Wait until the locking process has released the file, or stop the locking process.
- If the error number is `28` (**ENOSPC**), `27` (**EFBIG**), or `88` (**EDQUOT**), insufficient disk space (or disk quota) exists to write to the file. Determine which limits have been exceeded; for example, disk blocks, user quotas, or both. Either extend or release resources to accommodate HCON.
- Examine the end of the print file to ensure all data is intact. If not, submit the print job from the host again.

Try the operation again. If the problem persists, record the file name and error number, and contact system support.

Error Message

```
0789-122 Cannot attach to the buffer shared memory. . .
```

Cause The **shmat** subroutine failed to attach to a shared memory segment while communicating with an LTI client (the **fxfer** command or API).

Remedy If the error number is `12` (**ENOMEM**), there is not enough memory on the system to run the HCON utility.

For information on how to change system parameters (such as available memory), refer to:

- "Changing Operating System Parameters" in *AIX System Management Guide: Operating System and Devices*
- "Tuning Local Systems When Using SNA Services with HCON" on page 3-51

Try the operation again. If the problem persists after starting the emulator and any LTI client, record the shared memory key and error number and contact system support.

Error Message

```
0789-126 Cannot send change direction notification to the host. . .
```

Cause The **ioctl** subroutine was unsuccessful while processing an attention request (**REQUEST_TO_SEND**).

Remedy Try the operation again.

Stop and start SNA Services. Refer to SNA documentation on starting and stopping SNA Services before attempting to invoke the emulator.

If the problem persists, record the error number and contact system support.

Error Message

```
0789-129 BIND failure negotiable BIND not supported. . .
```

Cause Byte 1 of the BIND image is not set to 0x01.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-130 BIND failure FM profile must be 3. . .
```

Cause Byte 2 of the BIND image is not set to 0x03.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-131 BIND failure TS profile must be 3. . .
```

Cause Byte 3 of the BIND image is not set to 0x03.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-132 BIND failure specify PLU immediate request mode. . .
```

Cause Bit 1 of byte 4 of the BIND image is set to B‘1’. It should be set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-133 BIND failure invalid PLU chaining response. . .
```

Cause Bits 2 and 3 of byte 4 of the BIND image are set to B‘00’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-134 BIND failure PLU data compression not supported. . .
```

Cause Bit 6 of byte 4 of the BIND image is set to B‘1’. It should be set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-135 BIND failure PLU must deliver end bracket. . .
```

Cause Bit 7 of byte 4 of the BIND image is set to B‘0’. It should be set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-136 BIND failure invalid SLU chaining response. . .
```

Cause Bits 2 and 3 of byte 5 of the BIND image are set to B‘00’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-137 BIND failure invalid bracket reset state. . .`

Cause Bit 2 of byte 6 of the BIND image is set to B‘0’. It should be set to B‘1’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-138 BIND failure bracket termination rule must be 1. . .`

Cause Bit 3 of byte 6 of the BIND image is set to B‘0’. It should be set to B‘1’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-139 BIND failure alternate code set not supported. . .`

Cause Bit 4 of byte 6 of the BIND image is set to B‘1’. It should be set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-140 BIND failure specify half-duplex flip-flop flow. . .`

Cause Bits 0 and 1 of byte 7 of the BIND image are not set to B‘10’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-141 BIND failure PLU must be responsible for recovery. . .`

Cause Bit 2 of byte 7 of the BIND image is set to B‘1’. It should be set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-142 BIND failure PLU must be contention loser. . .`

Cause Bit 3 of byte 7 of the BIND image is set to B‘1’. It should be set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-143 BIND failure Maximum inbound RU size cannot be zero. . .`

Cause Bit 0 of byte 10 of the BIND image is set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-144 BIND failure Maximum outbound RU size cannot be zero. . .`

Cause Bit 0 of byte 11 of the BIND image is set to B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

`0789-145 BIND failure LU type is not valid for display session. . .`

Cause The HCON profile for the indicated session specifies a display session, and byte 14 of the BIND image is not 0x02 (LU type 2). The LU type and the HCON session type do not agree.

Remedy Perform one of the following actions:

Remove the session from the HCON profiles and configure the session as a printer session.

OR

Have the host VTAM administrator correct the LU type in the BIND image. Stop and start the emulator session indicated.

Error Message

```
0789-146 BIND failure LU type 2 is not valid for printer session. . .
```

Cause The HCON profile for the indicated session specifies a printer session, and byte 14 of the BIND image is 0x02 (LU type 2). The LU type and the HCON session type do not agree.

Remedy Perform one of the following actions:

Remove the session from the HCON profiles and configure the session as a display session.

OR

Have the host VTAM administrator correct the LU type in the BIND image. Stop and start the emulator session indicated.

Error Message

```
0789-147 BIND failure Cryptography is not supported. . .
```

Cause Byte 26 of the BIND image is not set to 0x00.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-148 BIND failure SLU chains must allow multiple elements. . .
```

Cause Bit 0 of byte 5 of the BIND image is set to B‘0’ for LU type 2. It should be B‘1’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-149 BIND failure Maximum inbound RU size must be at least 64. . .
```

Cause Byte 10 of the BIND image specifies a maximum inbound RU request or response unit size less than 64 for LU type 2.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-182 BIND failure LU type is not supported. . .
```

Cause Byte 14 of the BIND image specifies a value other than 0x01, 0x02, or 0x03 (LU type 1, 2, or 3, respectively).

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-183 BIND failure FMH data not allowed. . .
```

Cause Bit 1 of byte 6 of the BIND image is set to B‘1’ for LU type 2 or 3. It should be B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-184 BIND failure screen size convention 01 is not valid. . .
```

Cause Byte 24 of the BIND image is set to 0x01 for LU type 2 or 3.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-185 BIND failure specify 3270 extended data stream support. . .
```

Cause Byte 24 of the BIND image is set to 0x03 for LU type 2 or 3 (screen size convention 03), and bit 0 of byte 15 of the BIND image is set to B‘0’.

Remedy Set Bit 0 of byte 15 to B‘1’ whenever screen size convention 03 is used. This convention determines the alternate screen size by query reply, which is only available in the 3270 extended data stream.

Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-186 BIND failure default row cannot be less than 24. . .
```

Cause Byte 20 of the BIND image is set to a decimal value less than 24 for LU type 2 or 3.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-187 BIND failure default columns cannot be less than 80. . .
```

Cause Byte 21 of the BIND image is set to a decimal value less than 80 for LU type 2 or 3.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-188 BIND failure screen convention not supported. . .
```

Cause Byte 24 of the BIND image is set to a value other than 0x00, 0x02, 0x03, 0x7E (decimal 126), or 0x7F (decimal 127) for LU type 2 or 3.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-190 BIND failure specify SLU immediate request mode. . .
```

Cause Bit 1 of byte 5 of the BIND image is set to B‘1’. It should be B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-191 BIND failure SLU data compression is not supported. . .
```

Cause Bit 6 of byte 5 of the BIND image is set to B‘1’. It should be B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Error Message

```
0789-192 BIND failure SLU cannot deliver end bracket. . .
```

Cause Bit 7 of byte 5 of the BIND image is set to B‘1’. It should be B‘0’.

Remedy Have the host VTAM administrator correct this value. Stop and start the emulator session indicated.

Chapter 4. High-Level Language Application Programming Interface

The Host Connection Program (HCON) emulates a 3278/79 display or a 3286/87 printer attached to a System/370 mainframe host. This chapter provides information for using the High-Level Language Application Programming Interface (HLLAPI) and HLLAPI functions to provide an interface to the Host Connection Program.

Programming HLLAPI

The High-Level Language Application Programming Interface (HLLAPI) is an application programming interface (API) supported by the AIX 3270 Host Connection Program (HCON). This interface enables a program on a workstation to access a host presentation space. A host presentation space is a region in computer memory that can be displayed on the screen of a 3270 terminal emulator.

Consult the following for more information about HLLAPI:

- HLLAPI for AIX 3270 Host Connection
- Programming with HLLAPI (on page 4-7)
- HLLAPI Functions by Function Number (on page 4-9).

HLLAPI for AIX 3270 Host Connection

The High-Level Language Application Programming Interface is an API supported by HCON. This interface allows workstations to interact with a host using 3270 terminal emulation. Consult the following for more information about the High-Level Language Application Programming Interface:

- HLLAPI Execution Environment on page 4-1.
- HLLAPI Components on page 4-3.
- Uses of HLLAPI on page 4-4.
- HLLAPI Services on page 4-4.
- HLLAPI Connections on page 4-5.
- HLLAPI Presentation Spaces on page 4-5.
- Printer Sessions on page 4-5.
- Running HLLAPI Programs on page 4-5.
- HLLAPI Current Connection on page 4-5.
- Keyboard Remap with Utility Session on page 4-6.
- Ending HLLAPI Communication on page 4-6.

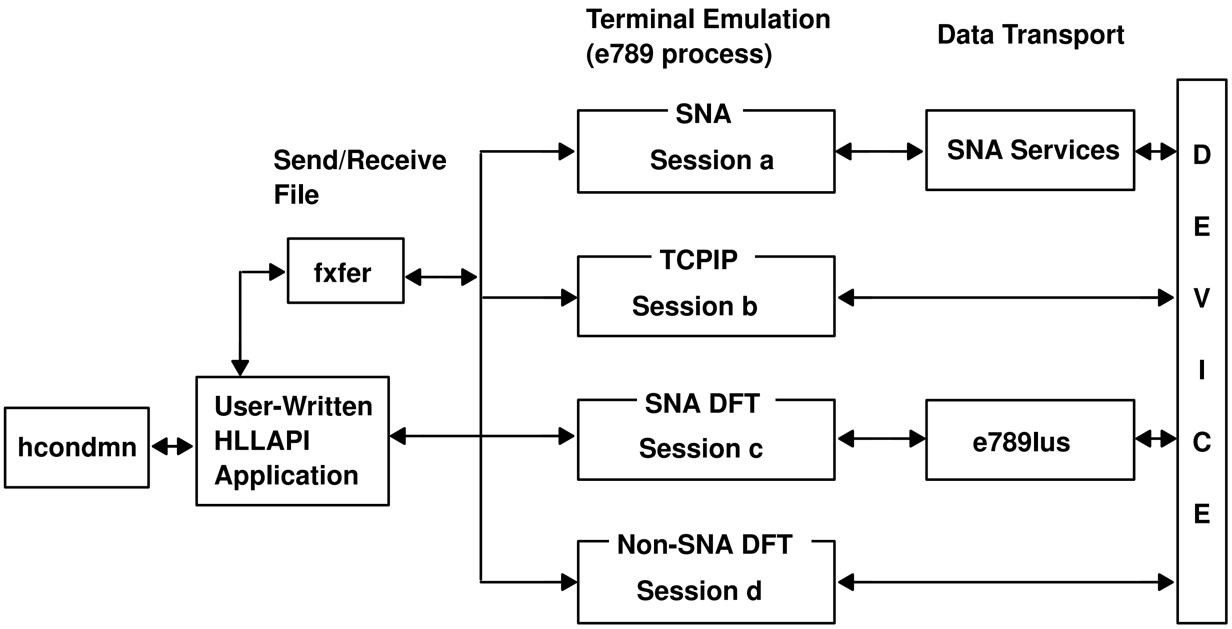
HLLAPI Execution Environment

The HLLAPI application executes in a process environment. When you run the HLLAPI application, the following processes are generated:

Name	Description
hcondmn	Daemon process
e789x	Emulator child process for each session as initiated by the HLLAPI program

e789lus	Emulator child process for DFT SNA protocol processing
fxfer File	File transfer parent process
dfxfer File	File transfer child process

The HLLAPI Execution Environment figure illustrates HLLAPI processes.



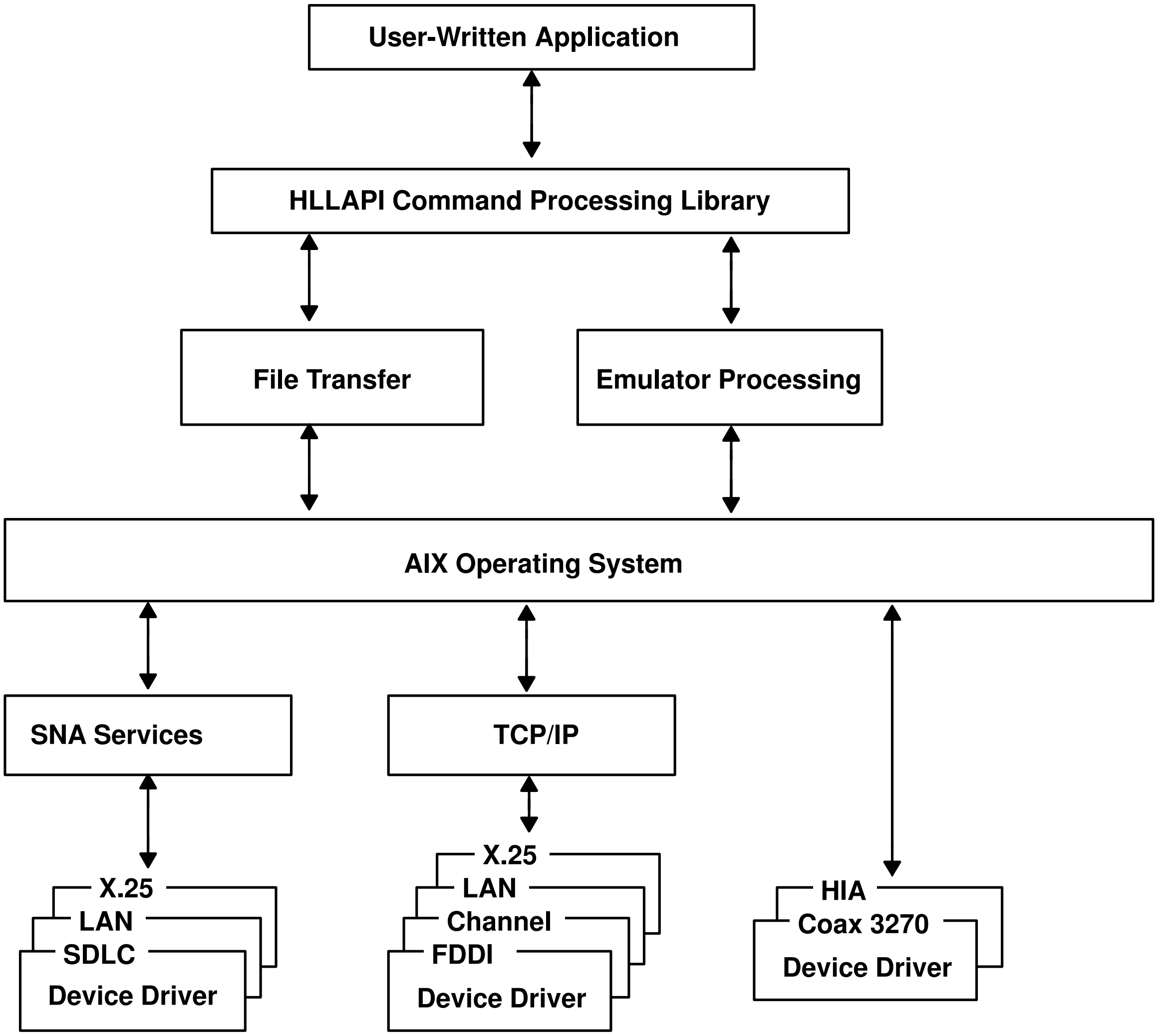
HLLAPI Execution Environment

Note: The **xhconx** process may be used in place of the **e789x** process if **xhcon** is started explicitly.

HLLAPI Components

The HLLAPI components of HCON provide comprehensive communications capabilities in a single system. HCON enables users to connect directly or indirectly (using control unit) to a range of workstations.

The following figure represents the components of the AIX Host Connection Program (HCON).



Components of AIX 3270 Host Connection Program

Uses of HLLAPI

HLLAPI is a valuable tool in a variety of work environments. It provides interaction between mainframes and workstations, thereby enabling both inexperienced and experienced users to become more productive.

HLLAPI acts as a programmed operator (a program that performs and monitors activities that are usually done by the user). HLLAPI can perform the following functions:

- Automate repetitive tasks.
- Mask entire applications from the user.
- Consolidate several complicated tasks into one simple task.
- Simplify existing host applications.
- Monitor response time and availability.
- Monitor events that are diverse in nature.
- Automate console operations.

In addition, HLLAPI facilitates communication from workstation application programs to host application programs by using the 3270 data stream structured fields. This allows for the generation of programs, such as the file transfer applications used to transfer files between host and workstation environments.

HLLAPI Services

HLLAPI is divided into several service groups:

- Operator services:
  - Query system or sessions.
  - Send keystrokes to the host.
  - Request host update notification.
- Presentation space services:
  - Query the cursor position.
  - Search the field.
  - Copy to and from the host presentation space.
- Device services:
  - Intercept keystrokes.
  - Reserve and release the keyboard.
- Communications services
  - Send and receive files.
- Utility services:
  - Convert presentation space (PS) position values or row and column coordinates.

HLLAPI Connections

HLLAPI supports the following 3270 connections:

- Distributed Function Terminal (DFT) using 3x74 or equivalent control:
  - SNA mode
  - Non-SNA mode
- DFT using 5088/6098 Graphics Control Unit
- SNA Standalone:
  - IEEE 802.5 (Token-Ring)
  - IEEE 802.3 (Ethernet)
  - X.25
- TCP/IP using the Telnet Option:
  - IEEE 802.5 (Token-Ring)
  - IEEE 802.3 (Ethernet)
  - FDDI
  - Block Multiplexer Channel
  - Enterprise System Connection (ESCON) Architecture

Note: To configure and start HCON with a 3270 terminal emulation connection, refer to the printed and online documentation for this software.

HLLAPI Presentation Spaces

A Presentation Space (PS) is a region in computer memory that can be displayed on the screen of 3270 terminal emulation. Mainframe interactive (MFI) or host sessions are 3270 sessions that are displayed on the screen of a 3270 terminal emulation. These sessions keep data transmitted to and from a host application.

Each PS has a unique one-character identifier called a *short name*. The short name is defined in the session profile of a user.

Some host programs can override the configured size. Host override size is typically 1920 bytes. The host override is always less than the configured PS size for 3270 terminal emulation sessions.

HLLAPI functions use the PS size as defined by the host program. The supported sizes are:

- Model 2 (24 by 80)
- Model 3 (32 by 80)
- Model 4 (43 by 80)
- Model 5 (27 by 132)

Printer Sessions

An application can connect only to host PS. There are two types of host sessions: display and printer. The printer session contains a PS but it cannot be connected to by an application.

Printer sessions are supported only by QUERY SESSIONS (10) and QUERY SESSION STATUS (22).

Running HLLAPI Programs

There are no special steps to execute your HLLAPI program. Refer to “Programming with HLLAPI” on page 4-7 for more information.

HLLAPI Current Connection

To communicate with a host session, an application must be connected using the CONNECT PRESENTATION SPACE (1) function. This function allows the sending or monitoring of host presentation space activity.

The term “current connection” refers to the most recent connection between the HLLAPI application program and the specified host PS using the CONNECT PRESENTATION SPACE (1) function. For example, if the HLLAPI application connects to PS short name A, and then connects to PS short name B, PS short name B becomes the current connection. Any further PS functions are sent to PS B, the current connection. The application must connect to A to make it the current session before sending any functions to that PS.

Keyboard Remap with Utility Session

The AIX 3270 Host Connection Program keyboard remap has no effect on HLLAPI functions that send data to the host PS.

Ending HLLAPI Communication

The following is required to disconnect your HLLAPI application:

1. Stop all keystroke intercept sessions by issuing the STOP KEYSTROKE INTERCEPT (53) function to all PSs for which the START KEYSTROKE INTERCEPT (50) function was issued.
2. Disconnect each connected PS from each thread that performed a CONNECT PRESENTATION SPACE (1) function. Disconnection is accomplished by using the DISCONNECT PRESENTATION SPACE (2) function. This affects only the current connection; therefore, it is necessary to reconnect to a presentation space before disconnecting it.
3. Stop all HOST NOTIFICATION for all sessions by issuing the STOP HOST NOTIFICATION (25) to all sessions that have an active START HOST NOTIFICATION (23) function.

Note: Your HLLAPI application can use the RESET SYSTEM (21) function to disconnect all PSs. If the display session is terminated by pressing the Ctrl-D key sequence twice, or if the session process is stopped, your HLLAPI program must be stopped. Then, both the display session and your HLLAPI program can be restarted.

Programming with HLLAPI

HLLAPI supports three different languages: C, COBOL, and FORTRAN. The source code requirements for calls are different for each supported language. This is because the high-level languages handle data in different ways and reserved words or syntax vary. Consult the following for information about how to use direct calls in each of the supported languages and source code preparation is discussed.

- HLLAPI Guidelines for C Programs (on page 4-7)
- HLLAPI Guidelines for COBOL Programs (on page 4-7)
- HLLAPI Guidelines for FORTRAN Programs (on page 4-8)

Programs using HLLAPI functions are typed in as source code in a compiled and linked supported language. Source programs in any supported language need the following six libraries to create the final executable:

- **libhllapi.a**
- **libg3270.a** (valid only in HCON 1.3 versions)
- **libiconv.a**
- **libcur.a**
- **libodm.a**
- **libfxfer.a**

HLLAPI Guidelines for C Programs

The following guidelines are helpful in preparing applications that use HLLAPI functions in C language.

Source Code Preparation

There are no required statements for the C language that call HLLAPI function. However, instead of defining their own header files, the C applications can use the sample **hapi_ c.h** program, which has defined constants and structures.

HLLAPI Functional Call Syntax

The syntax for calls to HLLAPI functions in the C language is:

```
hllc( func, apistring, len, ret)
int *func;
char *apistring;
int *len;
int *ret;
```

Compiling and Linking

To compile a C source program **sample.c** into an executable, use this command with the following order:

```
cc sample.c (libg3270.a in HCON 1.3 versions only) –lhllapi
–liconv –lcur –lodm –lfxfer –o test
```

HLLAPI Guidelines for COBOL Programs

The following guidelines are helpful in preparing applications that use HLLAPI functions in COBOL language.

Source Code Preparation

There are no required statements for the COBOL language that call HLLAPI functions. However, the COBOL applications can create their own include files according to the definition provided by the **hapi_ c.h** sample program.

HLLAPI Functional Call Syntax

The syntax for calls to HLLAPI functions in the COBOL language is:

```
CALL “COBLIM” USING FUNC STR DLEN RETC.
```

The parameter types are defined as:

```
01 FUNC PIC S9(4) COMP.
01 DLEN PIC S9(4) COMP.
01 RETC PIC S9(4) COMP.
01 STR.
03 FILLER PIC X(256).
```

For applications migrating from an Bull OS/2 environment, the parameters are defined as:

```
01 FUNC PIC 9(4) COMP-0.
01 DLEN PIC 9(4) COMP-0.
01 RETC PIC 9(4) COMP-0.
01 STR. 03 FILLER PIC X(256).
```

Compiling and Linking

To compile the COBOL source program **test.cob** into an executable, use this command with the following order:

```
cob -x test.cob -lhllapi -lg3270 -liconv -lcur -lodm -lfxfer -o
'test'
```

HLLAPI Guidelines for FORTRAN Programs

The following guidelines are helpful in preparing applications that use HLLAPI functions in FORTRAN language.

Source Code Preparation

There are no required statements for the FORTRAN language that call HLLAPI function. However, the FORTRAN applications can create their own include files according to the definition provided by the **hapi_ c.h** file.

HLLAPI Functional Call Syntax

The syntax for calls to HLLAPI functions in the FORTRAN language is:

```
hllc(FUNC, %REF(CHAR_ARG), LEN, RET)
```

The parameter types are defined as:

```
INTEGER*4 FUNC, LEN, RET CHARACTER*256 CHAR_ARG
```

Compiling and Linking

To compile a FORTRAN source program **test.f** into an executable, use this command with the following order:

```
xlf test.f -lhllapi -lg3270 -liconv -lcur -lodm -lfxfer -o test
```

This compilation will include all the needed libraries in the final executable.

HLLAPI Functions by Function Number

The following lists the HLLAPI functions organized by function number.

1	CONNECT PRESENTATION SPACE
2	DISCONNECT PRESENTATION SPACE
3	SEND KEY
4	WAIT
5	COPY PRESENTATION SPACE
6	SEARCH PRESENTATION SPACE
7	QUERY CURSOR LOCATION
8	COPY PRESENTATION SPACE TO STRING
9	SET SESSION PARAMETERS
10	QUERY SESSIONS
11	RESERVE
12	RELEASE
13	COPY OIA
14	QUERY FIELD ATTRIBUTE
15	COPY STRING TO PRESENTATION SPACE
18	PAUSE
20	QUERY SYSTEM
21	RESET SYSTEM
22	QUERY SESSION STATUS
23	START HOST NOTIFICATION
24	QUERY HOST UPDATE
25	STOP HOST NOTIFICATION
30	SEARCH FIELD
31	FIND FIELD POSITION
32	FIND FIELD LENGTH
33	COPY STRING TO FIELD
34	COPY FIELD TO STRING
40	SET CURSOR
50	START KEYSTROKE INTERCEPT
51	GET KEY
52	POST INTERCEPT STATUS
53	STOP KEYSTROKE INTERCEPT
90	SEND FILE
91	RECEIVE FILE
99	CONVERT POSITION or CONVERT ROWCOL

Summary of Prerequisite Calls for HLLAPI Functions

This table lists the prerequisite calls for each HLLAPI function. Prerequisite calls are required when using any of the application programs.

Function	Prerequisite Call
(1) CONNECT PRESENTATION SPACE	None
(2) DISCONNECT PRESENTATION SPACE	CONNECT PRESENTATION SPACE (1)
(3) SEND KEY	CONNECT PRESENTATION SPACE (1)
(4) WAIT	CONNECT PRESENTATION SPACE (1)
(5) COPY PRESENTATION SPACE	CONNECT PRESENTATION SPACE (1)
(6) SEARCH PRESENTATION SPACE	CONNECT PRESENTATION SPACE (1)
(7) QUERY CURSOR LOCATION	CONNECT PRESENTATION SPACE (1)
(8) COPY PRESENTATION SPACE	CONNECT PRESENTATION SPACE (1)
(9) SET SESSION PARAMETERS	None
(10) QUERY SESSIONS	None
(11) RESERVE	CONNECT PRESENTATION SPACE (!)
(12) RELEASE	CONNECT PRESENATTION SPACE (1)
(13) COPY OIA	CONNECT PRESENTATION SPACE (1)
(14) QUERY FIELD ATTRIBUTE	CONNECT PRESENTATION SPACE (1)
(15) COPY STRING TO PRESENTATION SPACE	CONNECT PRESENTATION SPACE (1)
(18) PAUSE	None
(20) QUERY SYSTEM	None
(21) RESET SYSTEM	None
(22) QUERY SESSION STATUS	None
(23) START HOST NOTIFICATION	None
(24) QUERY HOST UPDATE	START HOST NOTIFICATION (23)
(25) STOP HOST NOTIFICATION	START HOST NOTIFICATION (23)
(30) SEARCH FIELD	CONNECT PRESENTATION SPACE (1)
(31) FIND FIELD POSITION	CONNECT PRESENTATION SPACE (1)
(32) FIND FILED LENGTH	CONNECT PRESENTATION SPACE (1)
(33) COPY STRING TO FIELD	CONNECT PRESENTATION SPACE (1)
(34) COPY FILED TO STRING	CONNECT PRESENTATION SPACE (1)
(40) SET CURSOR	CONNECT PRESENTATION SPACE (1)
(50) START KEYSTROKE INTERCEPT	None
(51) GET KEY	START KEYSTROKE INTERCEPT (50)
(52) POST KEYSTROKE INTERCEPT	START KEYSTROKE INTERCEPT (50)
(53) STOP KEYSTROKE INTERCEPT	START KEYSTROKE INTERCEPT (50)
(90) SEND FILE	None
(91) RECEIVE FILE	None
(99) CONVERT POSITION / CONVERT ROWCOL	None

CONNECT PRESENTATION SPACE (1)

Purpose

Establishes a connection between a HLLAPI application program and a specified host Presentation Space (PS).

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring*;
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the CONNECT PRESENTATION SPACE function:

func — Specifies the number of the function called; must be 1 for the CONNECT PRESENTATION SPACE function.

apistring — Specifies the address of the parameters of the calling function; must be the one-character short session ID of the host PS.

len — Specifies the address of the length of the parameter of the calling function; does not apply to the CONNECT PRESENTATION SPACE function (1 is implied).

ret — Specifies the address of the returned value of the calling function; does not apply to the CONNECT PRESENTATION SPACE function.

Returned Parameters

The CONNECT PRESENTATION SPACE function sets the return code to indicate the status of the attempt and, if successful, the status of the host PS.

ret — Specifies the address of the returned value of the calling function; does not apply to the CONNECT PRESENTATION SPACE function. The following return codes are valid:

0 — Indicates the CONNECT PRESENTATION SPACE function was successful; the host PS is connected and ready for input.

1 — Indicates an incorrect short session ID for the host PS was specified.

4 — Specifies that a successful connection was achieved, but the host PS is busy.

5 — Specifies that a successful connection was achieved, but the host PS is locked (input inhibited).

9 — Indicates a system error occurred.

11 — Specifies that this resource is unavailable. The host PS is already being used by another system function.

Remarks

When establishing a connection between your HLLAPI application and a specific host PS, remember that the HLLAPI application can connect to multiple PSs, but not concurrently. The connections must be sequential, and the application cannot go back and forth between connections without reconnecting. Calls requiring the CONNECT PRESENTATION SPACE function as a prerequisite use the currently connected PS. For example, if an application connects to PSs A, B, and C in that order, the application must connect to B or A again in order to issue functions against that PS. PSs not connected to this application are available for use by other HLLAPI applications.

Note: The maximum number of connected sessions per program is 10. A user can connect and disconnect several sessions as long as the maximum connects never exceeds 10.

A user connecting to an HCON session must be a valid HCON user with configured sessions. Connection to other users is not allowed.

The RESET SYSTEM (21) function causes the HLLAPI application to disconnect from its Presentation Space.

CONVERT POSITION or CONVERT ROWCOL (99)

Purpose

Converts the host presentation space (PS) positional value into the display row-column coordinates or converts the display row-column coordinates to the host PS positional value.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func*;
char **apistring;*
int **len*;
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the CONVERT POSITION or CONVERT ROWCOL function:

func Specifies the number of the function called; must be 99 for the CONVERT POSITION or CONVERT ROWCOL function.

apistring Specifies the host PS short session ID and **P** for the CONVERT POSITION function (for example, `AP` converts the position of session `A`).

OR

Specifies the host PS short session ID and **R** for the CONVERT ROWCOL function (for example, `AR` converts the row and column position of session `A`).

len Specifies a row when **R** is in the supplied data string parameter. Valid input is a number between 1 and the maximum row length (typically 24). This parameter is not applicable when **P** is specified in the supplied data string parameter.

ret Specifies a column when **R** is specified in the supplied data string parameter. Valid input is a number between 1 and the maximum column (typically 80).

OR

Specifies the host PS position when **P** is specified in the supplied data string parameter. Valid input is a number between 1 and the maximum PS size (typically 1920).

Returned Parameters

len For the CONVERT POSITION function, a number between 1 and the maximum row is returned. This value is the number of the row that contains the PS position specified in the supplied PS position parameter. For the CONVERT ROWCOL function, a value of 0 indicates an error in the input value for row (calling the *len* parameter).

ret The CONVERT POSITION or CONVERT ROWCOL function is the exception to the rule that the return code parameter always contains a return code. For this function, the value returned in the return code parameter is a status code. The following status codes are valid:

0 Specifies that incorrect column input was provided.

>0 Specifies that this is the PS position or column.

9998 Specifies that an invalid host PS ID was specified or a system error occurred.

9999 Specifies that the input character string in position two is neither **P** nor **R**.

Remarks

When converting the PS into a row-column format, this function does not change the cursor position. To determine how many rows and columns there are in your PS size, refer to bytes 13 and 15 of the returned data string for the QUERY SESSION STATUS (22) function.

COPY FIELD TO STRING (34)

Purpose

Transfers characters from a field in the host-connected presentation space (PS) to a string.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the COPY FIELD TO STRING function:

func Specifies the number of the function called; must be 34 for the COPY FIELD TO STRING function.

apistring Specifies preallocated target data string.

len Specifies number of bytes to copy. (Length of data string.)

ret Identifies the source, which can be the PS position of any byte within the source. The COPY FIELD TO STRING function always starts at the beginning of the field.

Returned Parameters

len A string containing data from the identified field in the host PS. The first byte in the returned data string is the beginning byte of the identified field in the host PS. The number of bytes in the returned data string is determined by the smaller of the following:

- Number of bytes specified in the *len* parameter.
- Number of bytes in the identified field in the host PS.

ret The following return codes are valid:

0 Indicates the COPY FIELD TO STRING function was successful.

1 Specifies that your program is not currently connected to the host session.

2 Indicates an error was made in specifying parameters.

6 Specifies that the data to be copied and the source were not the same size. The data is truncated if the string length was smaller than the field copied.

7 Indicates the host PS position is invalid.

9 Indicates that a system error occurred.

24 Specifies that the host PS is unformatted.

Remarks

Before transferring characters from a field in the host-connected PS to a string, you should locate field position and length information. Find field position and length information by using the FIND FIELD POSITION (31) and FIND FIELD LENGTH (32) HLLAPI functions. Use the COPY FIELD TO STRING function with either protected or unprotected fields, but only in a field-formatted host PS.

The string ends when one of the following conditions occurs:

- The length of the target string is exceeded.
- The end of the field is reached.

Note: If the field at the end of the host PS wraps, the COPY FIELD TO STRING function continues at the start of the PS.

DBCS Remarks

If the target string ends at the first byte of a DBCS character, this byte is transferred as a one-byte blank character.

COPY OIA (13)

Purpose

Returns the current Operator Information Area (OIA) data from the host Presentation Space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the COPY OIA function:

func	Specifies the number of the function called; must be a 13 for the COPY OIA function.
apistring	Specifies the preallocated target data string for the COPY OIA function.
len	Specifies the data string length; must be a minimum of 103 bytes.
ret	Does not apply for the COPY OIA function. Should be set to NULL.

Returned Parameters

apistring

A 103-byte string containing the OIA data strings following:

Position 1 OIA format byte (1 for 3270)

Positions 2-81 OIA image of the connected host session:

- 2-7 Readiness and System Connection Information field
- 10-18 Input-Inhibit field
- 23-29 Communication Check Reminder field
- 53 Insert Mode field

Positions 82-103 OIA group indicator meanings.

ret

The following return codes are valid:

0	COPY OIA was successful.
1	Your program was not connected to the host session.
2	An error was made in specifying string length. OIA data was not returned.
4	OIA data was returned, but the host presentation space is busy.
5	OIA data was returned, but the host presentation space is locked (input inhibited).
9	An internal system error occurred. OIA data was not returned.

OIA Group Bit Meanings and Corresponding Images for 3270 Sessions

The following is a breakdown of each OIA group for 3270 terminal emulation sessions. The bits and starting column position in the OIA buffer are shown in the following tables. The images returned in 3270 PC format are also provided.

Note: Group 8 (byte 0) machine, communications, and program check images are followed by a three-digit number related to the type of check.

HCON can connect to multiple concurrent session types, the first byte of the OIA image indicates the active type. This byte can be used to discover the connectivity type during the program execution. The following tables shows all the possible connections.

Symbol	Hex Value	Connection type
4	F4	3274 control unit attachment. A DFT session.
S	B2	3172 control unit attachment. A DFT session.
I	A8	4381 system attachment. A DFT session.
N	AD	9370 system attachment. A DFT session.
2	22	SNA standalone attachment using the SNA Services. This is a PU 2.1 node implementation over LAN or WAN.
T	B3	TCP/IP Telnet 3270 option attachment. This is a non-SNA connection.

Table 1. OIA Group Bit Meanings and Corresponding Images

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-1	Reserved		
2	SSCP-LU session (SNA)	2	F4CDF0F6F6F6
3	LU-LU session (SNA)	2	F4CDCFF6F6F6
	Session with host (Non-SNA)	2	F4CCCFF6F6F6
4	Online and not owned	2	F4CDF1F6F6F6
5	Subsystem ready	2	F4F6F6F6F6F6
6-7	Reserved		

Table 2. Group 1 (offset 82): Online and screen ownership

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Reserved		
1	APL	37	A0AFABF6F6
2-7	Reserved		

Table 3. Group 2 (offset 83): Character selection (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Upper shift	43	F6E3F6
1	Numeric	43	ADB4AC
2-7	Reserved		

Table 4. Group 3 (offset 84): Shift state (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-7	Reserved		

Table 5. Group 4 (offset 85): PSS group 1 (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Operator-selectable	48	E4
1	Field inherit	48	EFEB
2-7	Reserved		

Table 6. Group 5 (offset 86): Highlight group 1 (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Operator-selectable	50	EFE4
1	Field inherit	50	EFEB
2-7	Reserved		

Table 7. Group 6 (offset 87): Color group 1 (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Insert mode	53	D0
1-7	Reserved		

Table 8. Group 7 (offset 88): Insert

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Reserved		
1	Reserved		
2	Machine check	10	C6F6ACA0A2A7
3	Communications check	10	C6F6A2AEACAC
4	Program check	10	C6F6AFB1AEA6
5	Reserved		
6	Device not working	10	C6F6FAC1FBF6F6F6F6
7	Reserved		

Table 9. Group 8 (offset 89-93): Input inhibited (5 bytes)

- Byte 1 (offset 89)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	OIA time	10	C6F6FAC1FAC4CEF6F6
1	Terminal wait	10	C6F6C4C5F6F6F6F6F6
2	Reserved		
3	Minus function	10	C6F63185F6F6F6F6F6
4	Too much entered	10	C6F6E408F6F6F6F6F6
5-7	Reserved		

- Byte 2 (offset 90)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Reserved		
1	Operator-unauthorized	10	C6F6E466F6F6F6F6F6
2	Operator-unauthorized, minus function		C6F63185E4C6F6F6F6
3	Invalid dead key combination	10	C6F6E4F63518F6F6F6
4	Wrong place	10	C6F6C8E4E2F6F6F6F6
5-7	Reserved		

- Byte 3 (offset 90)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Reserved		
2	System wait	10	C6F6B2B8B2B3A4ACF6
3-7	Reserved		

- Byte 4 (offset 92)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-7	Reserved		

- Byte 5 (offset 93)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-7	Reserved		

Table 10. Group 9 (offset 94): PSS group 2 (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Selected		
1-7	Reserved		

Table 11. Group 10 (offset 95): Highlight group 2 (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Selected		
1-7	Reserved		

Table 12. Group 11 (offset 96): Color group 2 (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Communications error	23	C1C0C2C3
1-7	Reserved		

Table 13. Group 12 (offset 97): Communication error reminder

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0	Reserved		
1	Printer malfunction	62	FAC1C9
2	Printer printing	62	FAC1C7
3	Printer assignment	62	FAC1FA
4-7	Reserved		

Table 14. Group 13 (offset 98): Printer status (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-7	Reserved		

Table 15. Group 14 (offset 99): Graphics (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-7	Reserved		

Table 16. Group 15 (offset 100): A reserved group
Group 16 (offset 101): Autokey play/record status (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-7	Reserved		

Table 17. Group 17 (offset 102): Autokey abort/pause status (not supported)

Bit	Meaning	Data String Starting Position	MFI Hex Code Points
0-7	Reserved		

Table 18. Group18 (offset 103): Enlarge state (not supported)

Remarks

To receive the current OIA information from the host PS, select the **OIA** option in the SET SESSION PARAMETERS (9) function. The **OIA** option in the SET SESSION PARAMETERS affects the format of the **OIA** image returned by the COPY OIA function. The only supported option is **OLDOIA**. The returned image is in the 3270 PC format.

OIA groups comprise bits representing the state of the connected session. Groups are divided by the host function they represent (for example, Group 8 contains all the bits representing input-inhibited conditions possible for the session). The bits in each group are ordered so that the high-order bits represent the states of higher priority. Therefore, if more than one state is active within a group, the state with the highest priority is the one represented in the OIA option for the session.

COPY PRESENTATION SPACE (5)

Purpose

Copies the contents of the host presentation space (PS) into a data string that you defined in your HLLAPI application program.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the COPY PRESENTATION SPACE function:

func Specifies the number of the function called; must be 5.

apistring Specifies the attributes of the API string; must be an allocated string of at least the maximum size of the PS (normally 1920 bytes). The size can vary due to 3270 model specification.

Note: Caution should be used when allocating buffer space for the PS. The buffer should be at minimum as large as the largest possible PS size regardless of the configured PS sizes.

len Does not apply for this function (length of the host PS is implied).

ret Does not apply for this function.

Returned Parameters

apistring Specifies the contents of the host PS.

ret The following codes are valid:

0 Specifies that the attempt was successful; the source PS was active, and the keyboard was unlocked.

1 Specifies that the attempt was unsuccessful; your program was not connected to the host session.

4 Specifies that the attempt was successful; the connected host PS was waiting for host response.

5 Specifies that the attempt was successful; the keyboard was locked.

9 Indicates a system error occurred.

Remarks

The COPY PRESENTATION SPACE function translates the characters from the host PS into ASCII format. Attribute bytes and other characters not represented in ASCII are translated into blanks. If you do not want the attribute bytes translated into blanks, use the **ATTRB** option under the SET SESSION PARAMETERS (9) function.

The **EXTENDED ATTRIBUTES BYTES** (**EAB**) option under the SET SESSION PARAMETERS (9) function can be used with this function to return **EAB**s. An **EAB** is associated with each character on the presentation space and follows each character when this option is used.

The **XLATE** option is not supported.

If you want to copy only a portion of the host PS, use the COPY PRESENTATION SPACE TO STRING (8) function.

The COPY PRESENTATION SPACE function is affected by the **ATTRB**/**NOATTRB** and **EAB**/**NOEAB** options. See the command description in SET SESSION PARAMETERS (9) for more information.

The return of attributes by the various COPY (5, 8, and 34) functions is affected by the SET SESSIONS PARAMETERS (9) function. The involved SET SESSION PARAMETERS options have the following effect:

Set Session Parameter	Effect on the COPY Functions
NOEAB	Attributes are not returned. Only text is copied from the presentation space to the user buffer.
EAB and **NOXLATE**	Attributes are returned as defined.

The returned character attributes are defined. The attribute bit positions are in the format of the leftmost bit in the byte is bit 0.

3270 Field Attributes

Bit position	Meaning	
0-1	Character highlighting:	
	00	Normal
	01	Blink
	10	Reverse video
	11	Underline
2-4	Character color (Color remap may override this color definition):	
	000	Default
	001	Blue
	010	Red
	011	Pink
	100	Green
	101	Turquoise
	110	Yellow
	111	White
5–7	Reserved (not used)	

DBCS Remarks

The EAD option under the SET SESSION PARAMETERS (9) function can be used with this function to return two-byte EADs. An EAD follows each character when this option is used without the EAB option and follows each EAB when it is used with the EAB option.

If a copied multibyte character is larger than two bytes, EAB or EAD of the second byte of the DBCS character in the presentation space is returned for the third byte and after.

If the copy starts at the second byte of a DBCS character or ends at the first byte, this byte is copied as a one-byte blank character.

The COPY PRESENTATION SPACE function is affected by the **ATTRB**/**NOATTRB**, **EAB**/**NOEAB**, **EAD**/**NOEAD**, and the **SPACESO**/**SO**/**NOSO** options. See the command description in SET SESSION PARAMETERS (9) for more information.

Set Session Parameter	Effect on the COPY Functions
NOEAB and **NOEAD**	Attributes are not returned. Only text is copied from the presentation space to the user buffer.
EAB and **NOXLATE**	Attributes are returned as defined.
EAD	DBCS attributes are returned as defined.
SPACESO/SO/NOSO	**NOSO** works as **SPACESO**. Therefore, the length of returned presentation space is unchanged.

3270 Field Attributes

Bit position	Meaning
5-6	Character set attributes 00 Default 11 Double-byte character
7	Reserved (not used)

DBCS Attributes

Bit position	Character position	Field attributes position
0	Double–byte character	Reserved
1	First byte of Double–byte character	Reserved
2	SO	Pair of SO/SI exists
3	SI	Reserved
4	Unusable position	Reserved
5	Reserved	SO/SI creation enable
6	Reserved	Character attributes exists
7	Reserved	Reserved

Byte 2:

Bit position	Character position	Field attributes position
0	Reserved	Left vertical line(field attributes)
1	Reserved	Over line(field attributes)
2	Reserved	Right vertical line(field attributes)
3	Reserved	Under line(field attributes)
4	Left vertical line	Left vertical line
5	Over line	Over line
6–7	Reserved	Reserved

COPY PRESENTATION SPACE TO STRING (8)

Purpose

Copies all or part of the host-connected Presentation Space (PS) into a data string defined in your HLLAPI application program.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the COPY PRESENTATION SPACE TO STRING function:

func Specifies the number of the function called; must be 8 for the COPY PRESENTATION SPACE TO STRING function.

apistring Specifies the attributes of the API string; must be a previously allocated target data string.

len Specifies the length of the target data string.

ret Specifies the position in the host PS where the copy begins; between 1 and the maximum PS size.

Returned Parameters

apistring Specifies the contents of the host PS.

ret The following codes are valid:

0 Specifies that the attempt was successful; the host PS contents were copied to the application program. The target PS was active, and the keyboard was unlocked.

1 Specifies that the attempt was unsuccessful; your program was not connected to the host session.

2 Indicates that a string length of 0 was specified.

4 Specifies that the attempt was successful; the connected host PS was waiting for host response.

5 Specifies that the attempt was successful; the keyboard was locked.

7 Indicates the host PS position is invalid.

9 Indicates that a system error occurred.

Remarks

The COPY PRESENTATION SPACE TO STRING function translates the characters in the host source PS into ASCII format. Attribute bytes and other characters not represented in ASCII are translated into blanks. If you do not want the attribute bytes translated into blanks, use the **ATTRB** option under the SET SESSION PARAMETERS (9) function.

The **EXTENDED ATTRIBUTES BYTES** (**EAB**) option under the SET SESSION PARAMETERS (9) function can be used with this function to return **EAB**s. An **EAB** is associated with each character on the presentation space and follows each character when this option is used.

The **XLATE** option is not supported.

The input PS position is the offset into the host PS. This offset is based on a layout in which the upper-left corner (row 1, column 1) is position 1. The bottom-right corner of the host PS has the highest position number.

The COPY PRESENTATION SPACE TO STRING function is affected by the **ATTRB**/**NOATTRB**, and **EAB**/**NOEAB** options. See the command description in SET SESSION PARAMETERS (9) for more information.

The return of attributes by the various COPY (5, 8, and 34) functions is affected by the SET SESSIONS PARAMETERS (9) function. The involved SET SESSION PARAMETERS options have the following effect:

Set Session Parameter	Effect on the COPY Functions
NOEAB	Attributes are not returned. Only text is copied from the presentation space to the user buffer.
EAB and **NOXLATE**	Attributes are returned as defined.

The returned character attributes are defined. The attribute bit positions are in the format with bit 0 as the leftmost bit in the byte.

3270 Field Attributes

Bit position	Meaning	
0-1	Character highlighting	
	00	Normal
	01	Blink
	10	Reverse video
	11	Underline
2-4	Character color (Color remap may override this color definition.)	
	000	Default
	001	Blue
	010	Red
	011	Pink
	100	Green
	101	Turquoise
	110	Yellow
	111	White
5–7	Reserved (not used)	

DBCS Remarks

The EAD option under the SET SESSION PARAMETERS (9) function can be used with this function to return two-byte EADs. An EAD follows each character when this option is used without the EAB option and follows each EAB when it is used with the EAB option.

If a copied multibyte character is larger than two bytes, EAB or EAD of the second byte of the DBCS character in the presentation space is returned for the third byte and after.

If the copy starts at the second byte of a DBCS character or ends at the first byte of a DBCS character, this byte is copied as a one-byte blank character.

3270 Field Attributes

The COPY PRESENTATION SPACE TO STRING function is affected by the **ATTRB**/**NOATTRB**, **EAB**/**NOEAB**, **EAD**/**NOEAD**, and the **SPACESO**/**SO**/**NOSO** options. See the command description in SET SESSION PARAMETERS (9) for more information.

Set Session Parameter	Effect on the COPY Functions
NOEAB and **NOEAD**	Attributes are not returned. Only text is copied from the presentation space to the user buffer.
EAB and **NOXLATE**	Attributes are returned as defined.
EAD	DBCS attributes are returned as defined.
SPACESO/**SO**/**NOSO**	NOSO works as SPACESO. Therefore the length of returned presentation space is unchanged.

3270 Field Attributes

Bit position	Meaning	
5-6	Character set attributes	
	00	Default
	11	Double-byte character
7	Reserved (not used)	

DBCS attributes

Byte 1:

Bit position	Character position	Field attributes position
0	Double-byte character	Reserved
1	First byte of Double-byte character	Reserved
2	SO	Pair of SO/SI exists
3	SI	Reserved
4	Unusable position	Reserved
5	Reserved	SO/SI creation enable
6	Reserved	Character attributes exists
7	Reserved	Reserved

Byte 2:

Bit position	Character position	Field attributes position
0	Reserved	Left vertical line(field attributes)
1	Reserved	Over line(field attributes)
2	Reserved	Right vertical line(field attributes)
3	Reserved	Under line(field attributes)
4	Left vertical line	Left vertical line
5	Over line	Over line
6–7	Reserved	Reserved

Related Information

CONNECT PRESENTATION SPACE (1) function on page 4-11 and SET SESSION PARAMETERS (9) function on page 4-73.

COPY STRING TO FIELD (33)

Purpose

Transfers a string of characters into a specified field in the host-connected Ppresentation Space (PS). This function can be used only in a field-formatted host PS.

Prerequiste Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the COPY STRING TO FIELD function:

func Specifies the number of the function called; must be 33 for the COPY STRING TO FIELD function.

apistring Specifies the string containing the data to be transferred to a target field in the host PS.

len Specifies the length, in bytes, of the source data string. This parameter is not applicable if in EOT mode.

ret Identifies the target field. This field can be the PS position of any byte within the target field. The copy always starts at the beginning of the field.

Returned Parameters

ret The following codes are valid:

0	Indicates the COPY STRING TO FIELD function was successful.
1	Indicates that your program was not connected to the host session.
2	Identifies a parameter error; a string length of 0 was specified.
5	Specifies that the target field was protected or inhibited, or data that is not allowed was sent to the target field (such as a field attribute).
6	Specifies that the copy was completed, but data was truncated.
7	Indicates the host PS position was invalid.
9	Indicates a system error occurred.
24	Indicates the host PS was unformatted.

Remarks

The COPY STRING TO FIELD function is affected by the **STRLEN**/**STREOT**, **EAB**/**NOEAB**, and the **EOT** session options. See session options 1, 2, and 9 of the SET SESSION PARAMETERS (9) function for more information. Keyboard mnemonics cannot be sent with the COPY STRING TO FIELD function. (For information on keyboard mnemonics, see the SEND KEY (3) function.) The first byte of the data to be transferred is always placed at the beginning of the field that contains the specified PS position.

The string to be transferred is specified with the calling data string parameter. The string ends when one of the following conditions occurs:

- An end of transmission (EOT) character is encountered in the string (if you selected EOT mode by using the SET SESSION PARAMETERS (9) function). See session options 1, 2, and 9 of the SET SESSION PARAMETERS (9) function.
- The number specified in the length is reached (if EOT mode was not selected).
- An end of field is encountered.

If the field at the end of the host PS wraps, the COPY STRING TO FIELD function continues at the start of the PS.

Additional DBCS Remarks

The COPY STRING TO FIELD function is affected by the **STRLEN**/**STREOT**, **EAB**/**NOEAB**, **EOT**, and the **EAD**/**NOEAD** session options.

DBCS characters can be included in the string. SO/SI is added accordingly. When SBCS and DBCS characters are used, the length in EBCDIC can be longer than in ASCII because of addiitional SO/SI . Some data may be truncated. If the last character of the source data string is the first byte of a DBCS character, it is not transferred.

Control characters are transferred to a one-byte character or two-byte character according to the field condition. NULL + control character between SO and SI is handled as a control character.

COPY STRING TO PRESENTATION SPACE (15)

Purpose

Copies an ASCII data string directly into the host Presentation Space (PS) at the location specified by the PS position parameter.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the COPY STRING TO PRESENTATION SPACE function:

func
Specifies the number of the function called; must be 15 for the COPY STRING TO PRESENTATION SPACE function.

apistring
Specifies the string of ASCII data to be copied into the host PS.

len
Specifies the length, in number of bytes, of the source data string. This parameter is overridden if in EOT mode.

ret
Specifies the position in the host PS where the copy begins.

Returned Parameters

ret
The following codes are valid:

0
Indicates the COPY STRING TO PRESENTATION SPACE function was successful.

1
Indicates your program was not connected to the host session.

2
Identifies a parameter error; a string length of 0 was specified.

5
Specifies that the target PS was protected or inhibited, or data that is not allowed was sent to target PS (such as a field attribute byte).

6
Specifies that the copy was completed, but the data was truncated.

7
Specifies that the host PS position was invalid or string length exceeds PS size.

9
Indicates a system error occurred.

Remarks

The COPY STRING TO PRESENTATION SPACE function is affected by the **STRLEN**/**STREOT**, and the **EOT=c** session options. For more information, see session options 1, 2, and 9 in SET SESSION PARAMETERS (9) function. The string ends when an end-of-transmission (EOT) character is encountered in the string (if you selected EOT mode by using the SET SESSION PARAMETERS (9) function).

Although the SEND KEY (3) function serves the same purpose as the COPY STRING TO PRESENTATION SPACE function, the latter is much faster in answering prompts and entering commands. The SEND KEY (3) function emulates a terminal operator typing data from the keyboard. However, this function is too slow for applications that require large amounts of data for each function. The COPY STRING TO PRESENTATION SPACE function provides a much faster input path to the host.

The keyboard mnemonics cannot be sent with the COPY STRING TO PRESENTATION SPACE function. (For information on keyboard mnemonics, see the SEND KEY (3) function.) Also, the source data (the string being copied) can be no larger than the maximum PS size.

Additional DBCS Remarks

The COPY STRING TO PRESENTATION SPACE function is affected by the **STRLEN**/**STREOT**, **EOT=c**, and the **EAD**/**NOEAD** session options.

DBCS characters can be included in the string. SO/SI is added accordingly. When SBCS and DBCS characters are used, the length in EBCDIC can be longer than in ASCII because of additional SO/SI. Some data may be truncated. If the last character of the source data string is the first byte of a DBCS character, it is not copied. If a character to be copied at the last position of the presentation space is SO/SI or the first byte of a DBCS character, it is not copied.

Control characters are copied to a one-byte character or two-byte character according to the field condition. NULL + control character between SO and SI is handled as a control character.

DISCONNECT PRESENTATION SPACE (2)

Purpose

Drops the connection between your HLLAPI application program and the host Presentation Space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

func	Specifies the number of the function called; must be 2 for the DISCONNECT PRESENTATION SPACE function.
apistring	Does not apply for this function.
len	Does not apply for this function.
ret	Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0	Indicates the attempt to disconnect was successful.
1	Indicates your program was not connected to the host PS.
9	Indicates a system error occurred.

Remarks

The DISCONNECT PRESENTATION SPACE function drops the connection between your HLLAPI application program and the host PS. Once the DISCONNECT PRESENTATION SPACE function has been called, functions that interact with the host PS, such as the SEND KEY (3), WAIT (4), and RESERVE (11) functions are no longer valid.

The DISCONNECT PRESENTATION SPACE function does not reset the session parameters to the defaults. Your HLLAPI application must call the RESET SYSTEM (21) function to reset the defaults. Your HLLAPI application should disconnect from all connected host PSs before exiting.

FIND FIELD LENGTH (32)

Purpose

Returns the length of a target field in the connected Presentation Space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the FIND FIELD LENGTH function:

func Specifies the number of the function called; must be 32 for the FIND FIELD LENGTH function.

apistring Specifies the attributes of the API string; the calling two-character data string can contain:

Option	Description
bb or **Tb**	Specifies this field.
Pb	Specifies the previous field, either protected or unprotected.
Nb	Specifies the next field, either protected or unprotected.
NP	Specifies the next protected field.
NU	Specifies the next unprotected field.
PP	Specifies the previous protected field.
PU	Specifies the previous unprotected field.

Note: The **b** symbol represents a required blank.

len Does not apply for this function (length of 2 is implied).

ret Identifies the field within the host PS where the find begins. This parameter can be the PS position of any byte within the field in that you want the FIND FIELD LENGTH function to start.

Returned Parameters

len The following fields are valid:

=0 Specifies field length of 0 if return code=28 or the unformatted host PS if return code=24.

>0 Specifies length of requested field in host PS.

ret The following codes are valid:

0 Indicates the FIND FIELD LENGTH function was successful.

1 Specifies that your program was not connected to the host session.

2 Indicates a parameter error occurred.

7 Indicates the host PS position was invalid.

9 Indicates a system error occurred.

24 Indicates that no such field was found, or that PS is unformatted.

28 Indicates the field length was 0 bytes.

Remarks

The FIND FIELD LENGTH function returns the number of characters contained in the requested field. The requested field includes all characters from the beginning of the target field up to the character preceding the next attribute byte.

FIND FIELD POSITION (31)

Purpose

Returns the beginning position of a target field in the host connected Presentation Space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the FIND FIELD POSITION function:

func Specifies the number of the function called; must be 31 for the FIND FIELD POSITION function.

apistring Specifies the attributes of the API string; the calling two-character data string can contain:

Code	**Explanation**
bb or **Tb**	Specifies this field.
Pb	Specifies the previous field, either protected or unprotected.
Nb	Specifies the next field, either protected or unprotected.
NP	Specifies the next protected field.
NU	Specifies the next unprotected field.
PP	Specifies the previous protected field.
PU	Specifies the previous unprotected field.

Note: The **b** symbol represents a required blank.

len Does not apply for this function (length of 2 is implied).

ret Identifies the field within the host PS where the find begins. This parameter can be the PS position of any byte within the field in which you desire the FIND FIELD POSITION function to start.

Returned Parameters

len The following fields are valid:

=0 Identifies field length of 0 if return code=28 or the unformatted host PS if return code=24.

>0 Identifies length of requested field in host PS.

ret The following fields are valid:

0 Indicates the FIND FIELD POSITION function was successful.

1 Indicates your program was not connected to the host session.

2 Indicates a parameter error occurred.

7 Indicates the host PS position was invalid.

9 Indicates a system error occurred.

24 Specifies that no such field was found, or that PS is unformatted.

28 Specifies that the field length was 0 bytes.

Remarks

To return the beginning position of a target field, the FIND FIELD POSITION function can be used to find either protected or unprotected fields but only in a field-formatted host PS.

GET KEY (51)

Purpose

Intercepts keystrokes from sessions specified by the START KEYSTROKE INTERCEPT (50) function and then process, accept, or reject the keystrokes.

Prerequisite Calls

This function requires a prerequisite call to the START KEYSTROKE INTERCEPT (50) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the GET KEY function:

func Specifies the number of the function called; must be 51 for the GET KEY function.

apistring Specifies the attributes of the API string; the calling data string can contain:

Byte **Definition**

Position 1 One of the following:

- A one-character presentation space (PS) short session ID
- A blank or null character indicating a function call against the currently connected presentation space

Positions 2-8 Space for the symbol representation of the requested data; the previous field, either protected or unprotected

len Does not apply for this function (length of 8 bytes is implied).

ret Does not apply for this function.

Returned Parameters

The GET KEY function returns the following values:

apistring The following are valid:

Position 1 One of the following:

- A one-character short session ID of the PS
- A blank or null character indicating a function call against the currently connected PS

Position 2 A code character, which is one of the following:

- A for ASCII-returned
- M for keystroke mnemonic
- S for special shift (Alt or Ctrl) returned with other data

Positions 3-8 The 6 bytes of a previously allocated buffer space to be used internally for enqueuing and dequeuing keystrokes. Possible combinations include the following:

- Byte 3 contains an ASCII character and byte 4 contains X' 00'.
- Bytes 3 and 4 contain a keystroke mnemonic (@ or ESC=n character plus an ASCII character).
- Bytes 5 through 8 may be similar to bytes 3 and 4 if a returned ASCII mnemonic is longer than 2 bytes (for example, in the ASCII mnemonic representing Attn, `@A@Q` , `@` would be in byte 5 and `Q` in byte 6). If not used, positions 3–6 are set to X' 00'.

Note: For DBCS, bytes 3 and 4 contain a DBCS character, and bytes 3 through 6 contain a MBCS character.

For clarification, examples of returned data strings follow:

EAt **E** is the presentation space. The keystrokes returned are ASCII. The key being returned is a t (lowercase letter T) (Bytes 4–8 = X' 00').

EM@2 **E** is the presentation space. The keystrokes returned are represented by an ASCII mnemonic. The key being returned is PF2 (Bytes 5–8 = X' 00').

ES@Aa **E** is the presentation space. The keystrokes returned are in special shift state. The keys being received are Alt+a.

ret The following codes are valid:

0 Indicates the GET KEY function was successful.

1 Indicates the PS is invalid.

5 Specifies that under the START KEYSTROKE INTERCEPT (50) function, you specified the **D** option for attention-identifier (AID) keystrokes only. Non-AID keys are inhibited by this session when HLLAPI tries to write invalid keys to the PS.

8 Specifies that no prior START KEYSTROKE INTERCEPT (50) function was called for this PS.

9 Indicates a system error occurred.

20 Specifies that the operator entered an invalid combination of keys for this presentation space session.

25	Specifies that the requested keystrokes are not available on the input queue.
31	Specifies that the keystroke queue overflowed and keystrokes were lost.

Remarks

The GET KEY function behaves as a read command. When keystrokes are available, they are read into the data string you provide with the GET KEY function. User keystrokes are queued by HLLAPI. The GET KEY function dequeues these keystrokes and returns them to the requester one at a time. The GET KEY function is affected by the **NWAIT**/**LWAIT**/**TWAIT** session options. See session option 8 in SET SESSION PARAMETERS (9).

You can use the SEND KEY (3) function to pass both original keystrokes and any other keystrokes that your HLLAPI application wants to send to the target presentation space. Refer to the Keyboard Mnemonics table for a listing of supported keystroke values.

PAUSE (18)

Purpose

Waits for a specified amount of time in any application where a time interval is desired between events. It should be used in place of timing loops to wait for an event to occur.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the PAUSE function:

func Specifies the number of the function called; must be 18 for the PAUSE function.

apistring Specifies the attributes of the API string; the calling data string contains:

Position 1 One of the following:

- A one-character PS short session ID of the PS for which the **IPAUSE** option has been requested
- A blank or null character indicating that the **IPAUSE** option is not being used, or that **IPAUSE** has been requested for all sessions that have called the START HOST NOTIFICATION (23) function

len Contains the pause duration in half-second increments.

ret Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0 Specifies that the wait duration has expired.

2 Indicates a parameter error occurred.

9 Indicates an internal system error occurred. The time results are unpredictable.

26 Specifies that the host session PS or OIA was updated; refer to the QUERY HOST UPDATE (24) function on page 4-49 for more information.

Remarks

The PAUSE function has several options associated with it. To use the **IPAUSE** option for a specific session when multiple sessions are being monitored by the START HOST NOTIFICATION (23) function, place the short session ID of the session for which **IPAUSE** has been requested in the first position of the data string. As a result, the call to the PAUSE function will return only when an event on the specified session has occurred or the PAUSE function has timed out. For example, host events on other sessions will not cause an interruption of the PAUSE function.

Once a PAUSE function call has been satisfied by a host event, the QUERY HOST UPDATE (24) function should be called before PAUSE function is called again. All subsequent calls to the PAUSE function will return immediately with a return code of 26 until the QUERY HOST UPDATE (24) function is complete.

Applications that require a high-resolution timer should not use the PAUSE function. The time interval created by this function is approximate. The **FPAUSE** or **IPAUSE** option in the SET SESSION PARAMETERS (9) function affects the length of the pause that occurs when you call this function.

When a START function is called, the **IPAUSE** option can be used to make the application wait until the host PS or Operator Information Area (OIA), or both, has received an update. The PAUSE function terminates when this occurs and allows the application to issue a query function to determine what changed. The application can then issue a SEARCH PRESENTATION SPACE (6) function call to see if the expected update occurred.

If the START HOST NOTIFICATION (23) function is not enabled, the PAUSE function will wait for a specific amount of time and return to the application with return code 0.

The PAUSE function can be ended by a host event if a prior START HOST NOTIFICATION (23) function has been called. To interrupt the PAUSE application whenever the PS has been updated, set the **IPAUSE** option in conjunction with the enabling of the START HOST NOTIFICATION (23) function.

The **IPAUSE** option is used in conjunction with the following three functions to allow a HLLAPI application to determine if the designated host PS or OIA has been updated:

- QUERY HOST UPDATE (24) function
- START HOST NOTIFICATION (23) function
- STOP HOST NOTIFICATION (25) function

When using the **FPAUSE** option, the specified time interval will not be interrupted if a host update occurs before the interval expires. The **FPAUSE** option is the default.

POST INTERCEPT STATUS (52)

Purpose

Informs the user that a keystroke obtained through the GET KEY (51) function was accepted or rejected.

Prerequisite Calls

This function requires a prerequisite call to the START HOST NOTIFICATION (23) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the POST INTERCEPT STATUS function:

func Specifies the number of the function called; must be 52 for the POST INTERCEPT STATUS function.

apistring Specifies the attributes of the API string; the calling two-character data string contains:

Position 1 One of the following:
- The one-letter character short session ID of the PS
- A blank or null character indicating a function call against the connected PS

Position 2 One of the following:
- A for accept keystroke
- R for reject keystroke

len Does not apply for this function; a length of two is implied.

ret Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0 Indicates the POST INTERCEPT STATUS function was successful.

1 Indicates the PS was invalid.

2 Indicates an invalid option was specified.

8 Specifies that no prior START KEYSTROKE INTERCEPT (50) function was called for this PS short session ID.

9 Indicates a system error occurred.

Remarks

The POST INTERCEPT STATUS function informs the user that a keystroke obtained through the GET KEY (51) function was accepted or rejected. If the keystroke obtained through the GET KEY function was rejected, the POST INTERCEPT STATUS issues a beep signaling the rejection of the keystroke. Otherwise, no beep will sound.

QUERY CURSOR LOCATION (7)

Purpose

Returns the cursor position from the presentation space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the QUERY CURSOR LOCATION function:

func Specifies the number of the function called; must be 7 for the QUERY CURSOR LOCATION function.

apistring Does not apply for this function.

len Does not apply for this function (length of two is implied).

ret Does not apply for this function.

Returned Parameters

len Specifies the presentation space position of the cursor.

ret The following codes are valid:

0 Indicates the QUERY CURSOR LOCATION function was successful.

1 Indicates your program was not connected to the host session.

9 Indicates a system error occurred.

Remarks

The QUERY CURSOR LOCATION function indicates the position of the cursor in the host-connected presentation space (PS) by returning the cursor position.

QUERY FIELD ATTRIBUTE (14)

Purpose

Returns the attribute byte of the field containing the input host Presentation Space (PS) position.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc(*func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the QUERY FIELD ATTRIBUTE function:

func	Specifies the number of the function called; must be a 14 for the QUERY FIELD ATTRIBUTE function.
apistring	Does not apply for this function.
len	Does not apply for this function.
ret	The position within the PS.

Returned Parameters

len If the screen is formatted, the attribute value is the length; if the screen is unformatted, the length is 0. The returned data string length parameter is set to 0 if the screen is unformatted. Attribute bytes are equal to, or greater than, X' C0'.

ret The following codes are valid:

0	Indicates the QUERY FIELD ATTRIBUTE function was successful.
1	Indicates your program was not connected to the host session.
7	Indicates the host PS position was invalid.
9	Indicates a system error occurred.
24	Specifies that the attribute byte was not found (unformatted PS).

The returned field attributes are defined below. The bit positions are in the format with bit 0 as the leftmost bit in the byte.

3270 Field Attribute

Bit Position	Meaning
0-1	Both = 1, field attribute byte
2	Unprotected/protected: • 0 = Unprotected data field • 1 = Protected data field
3	A/N: • 0 = Alphanumeric data • 1 = Numeric data only
4-5	I/SPD: • 00 = Normal intensity, pen not detectable • 01 = Normal intensity, pen detectable • 10 = High intensity, pen detectable • 11 = Non-display, pen not detectable
6	Reserved
7	Modified/Unmodified: • 0 = Field has not been modified • 1 = Field has been modified

Remarks

The QUERY FIELD ATTRIBUTE function returns the attribute byte of the field containing the input host PS position.

QUERY HOST UPDATE (24)

Purpose

Enables the programmed operator to determine if the host has updated the host Presentation Space (PS), or the operator information area (OIA), or both.

Prerequisite Calls

This function requires a prerequisite call to the START HOST NOTIFICATION (23) function.

Syntax

```
hllc (func, apistring, len, ret)
int *func;
char *apistring;
int *len;
int *ret;
```

Supplied Parameters

Supply the following parameters to invoke the QUERY HOST UPDATE function:

func	Specifies the number of the function called; must be 24 for the QUERY HOST UPDATE function.
apistring	Specifies the attributes of the API string; one-character short session ID of the host PS, or a blank or a null indicating the connected PS.
len	Does not apply for this function; a length of 1 is implied.
ret	Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0	Specifies that no updates were made since the last call.
1	Indicates an invalid host PS was specified.
8	Specifies that no prior START HOST NOTIFICATION (23) function was called for the host PS ID.
9	Indicates a system error occurred.
21	Specifies that the OIA was updated.
22	Specifies that the PS was updated.
23	Specifies that the OIA and the host PS were updated.

Remarks

The QUERY HOST UPDATE function lets the programmer determine if the host has updated the host PS, or the OIA, or both. The target PS must be specified in the data string. However, you do not need to be connected to the host PS to check for updates.

QUERY SESSIONS (10)

Purpose

Returns the valid number of configured host sessions for a user.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the QUERY SESSIONS function:

func Specifies the number of the function called; must be 10 for the QUERY SESSIONS function.

apistring Specifies the attributes of the API string; should be a preallocated string of at least 12 times the number of configured host sessions.

len Specifies the number of configured host sessions multiplied by 12.

ret Does not apply for this function.

Returned Parameters

apistring Specifies the returned data string containing a 12-byte session description for each of the host sessions. The format of each 12-byte session descriptor follows:

Position 1	Short session ID.
Position 2–9	First 8 bytes of the `SESSION USE` field of the configuration panel.
Position 10	Session type (H=host).
Position 11–12	Presentation space size. This is a binary number and is not in display format; if the session type is H and is a print session, the value is 0.

Notes: The PS sizes can be:

1. If the session is active, the actual size is returned. This size is dependent on specific applications and may vary from one screen to the next.
2. If the session is not active, the configured session size is returned.

len Specifies the number of configured host sessions.

ret The following codes are valid:

0 Specifies that the QUERY SESSIONS function was successful.

1 Specifies that no session has been configured.

2 Specifies that the string length was invalid.

9 Specifies that a system error occurred.

Remarks

The QUERY SESSIONS function returns the valid number of configured host sessions for a user. If your application receives return codes of either 0 or 2, then the number of active sessions is returned in the length field. Your application can use this number to determine the minimum string length required.

QUERY SESSION STATUS (22)

Purpose

Obtains session-specific information for any configured session of a user.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the QUERY SESSION STATUS function:

func Specifies the number of the function called; must be 22 for the QUERY SESSION STATUS function.

apistring Specifies either the short session ID of the target presentation space (PS) plus 18 bytes for returned data, or a blank or a null indicating the connected PS plus 18 bytes for returned data. The data string can contain:

Position 1 One of the following:

- A one-character PS short session ID
- A blank or null indicating a function call against the current connection PS

Position 2-17 Reserved

len Specifies the length of the target data string; must be a minimum of 19 bytes for this function.

ret Does not apply to this function.

Returned Parameters

apistring A data string of 18 bytes is returned. The bytes are defined in the following positions:

Position 1 Short session ID.

Positions 2–9 First 8 bytes of the SESSION USE field of the configuration panel

Position 10 Session type, where D=DFT display, S=SNA T2.1 display, T=TCP/IP display, P=SNA T2.1 printer, Q=DFT non-SNA printer.

Position 11 Session characteristics, expressed as a binary number containing the following session-characteristics byte:

0	Extended Attribute Byte (EAB)
1–7	Reserved

If bit 0 (EAB) = 0 the session has base attributes.
If bit 0 (EAB) =1, the session has extended attributes.

Position 12 Reserved.

Positions 13–14
Number of rows in the host PS; this is a binary number and is not in display format.

Positions 15–16
Number of columns in the host PS; this is a binary number and is not in display format.

Positions 17–18
Host code page number, expressed as a binary number.

Position 19 Reserved.

Note: The host rows and columns returned are the rows and columns that are currently being used by the host program.

ret The following codes are valid:

0 Indicates the QUERY SESSION STATUS function was successful.

1 Indicates the session requested was invalid.

2 Indicates an invalid string length was made.

9 Indicates a system error occurred.

Remarks

The QUERY SESSION STATUS function is used to obtain session-specific information for any configured session of a user.

QUERY SYSTEM (20)

Purpose

Determines the level of the HLLAPI and HCON support and other system-related values.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret*)
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the QUERY SYSTEM function:

func Specifies the number of the function called; must be a 20 for the QUERY SYSTEM function.

apistring Specifies the attributes of the API string; must be a previously allocated string of 35 bytes.

len Does not apply for this function; a length of 35 is implied.

ret Does not apply for this function.

Returned Parameters

apistring A data string of 35 bytes is returned. The bytes are defined as follows:

Position 1	HLLAPI version number = 1
Positions 2-3	HLLAPI level number = 04
Positions 4-9	043094
Positions 10-12	Reserved
Position 13	Hardware base, U = UNIX
Position 14	Control program type, X = AIX
Positions 15-16	Reserved
Positions 17-18	HCON version level as a 2-byte ASCII value (13)
Positions 19-35	Reserved

ret The following codes are valid:

0 Specifies that the QUERY SYSTEM function was successful; a data string was returned.

9 Specifies that a system error occurred.

Remarks

The QUERY SYSTEM function determines the level of the HLLAPI and HCON support and other system-related values. This function returns a data string that contains the appropriate system data.

RECEIVE FILE (91)

Purpose

Transfers a file from the host session to the workstation session.

Prerequisite Calls

When calling the RECEIVE FILE function, you must *not* currently:

- Be connected to the same session.
- Have another file transfer application active on the same session.
- Have another HLLAPI application active on the same session.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the RECEIVE FILE function:

func Specifies the number of the function called; must be 91 for the RECEIVE FILE function.

len Specifies the length, in number of bytes, of the data string. This parameter is overridden if in end of transmission (EOT) mode.

ret Does not apply to this function.

apistring Specifies the same *RECEIVE* parameters that are used for the **fxfer** command; must be between 1 and 255 bytes. The data string can contain:

Option	**Description**
–a	Appends the file designated by the *SourceFile* parameters of the **fxfer** command to that designated by the *DestFile* parameter if the destination file exists. This flag is ignored and the destination file is created if the file designated by the *Destfile* parameter does not exist.
–n	Specifies short session name of a previously defined session. It is a single character in the range of a to z. Capital letters are treated as lowercase letters.
–r	Specifies replacement of an existing file on the local system. This is done when the transfer is successful. If this option is specified and the file does not exist, a new file is created. Or, if this option is not specified and the file exists, an error condition has occurred.
–t	Performs EBCDIC to ASCII translation for a file. The national language to be used is defined by the **–X** option. The **–t** option assumes the file is a text file. The new-line character is the line delimiter.
–F	Specifies fixed-length records.
–H	Specifies the type of host environment; the values can be CMS, TSO, CICS, and VSE.

–I Specifies file transfer options placed directly within the **IND$FILE** command. This option also allows user comments placed within the file transfer command to the host. For example: `–I "FILE=TS) This is a comment"`

–T Performs EBCDIC-to-ASCII translation for a file to be stored in DOS format.

–X Specifies the AIX code set support for EBCDIC-to-ASCII translation. If this option is not specified, the code set specified by the system locale is used. The supported code sets are IBM–850, IBM–932, ISO8859–1, ISO8859–7, ISO8859–9, IBMeucJP, IBM–eucKR, and IBM–eucTW.

Examples

The following are the examples of the data string used by the RECEIVE FILE function:

To download the **user.test** file from the TSO environment to the AIX operating system by using the HCON profile session a, enter:

```
–n a –H TSO –r user.test samplefile1
```

To download the VM file, **test file a** and append it to the local AIX operating system as **mydir/samplefile** file, enter:

```
–n a –H CMS –t –a test file a mydir/samplefile
```

Returned Parameters

ret The following codes are valid:

0 Specifies that the file transfer was complete.

2 Specifies that a parameter error occurred or you specified a data string length that is too short (0 bytes) or too long (more than 255 bytes) for the HLLAPI buffer; indicates that the file transfer was unsuccessful.

11 Specifies that a session already connected; the resource is not available.

200-368 Specifies file transfer errors. For a complete list of file transfer errors, refer to Appendix A.

Remarks

The RECEIVE FILE function transfers a file from the host session to the workstation session. The interface parameter is a subset of the **fxfer** command used in the AIX 3270 Host Connection Program (HCON). The file-transfer process runs in synchronous mode.

Two sets of options under the SET SESSION PARAMETERS (9) function are related to this function:

- **STRLEN/STREOT**
- **EOT=**

For more information, see session options 1 and 2 of the SET SESSION PARAMETERS (9) function.

If you are linked to the host session already, you receive a return code of 11. Therefore, if you are connected with the CONNECT PRESENTATION SPACE (1) function to the host session, you must disconnect using the DISCONNECT PRESENTATION SPACE (2) function.

RELEASE (12)

Purpose

Frees blocked user input that was prohibited by the RESERVE (11) function.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the RELEASE function:

func	Specifies the number of the function called; must be 12 for the RELEASE function.
apistring	Does not apply for this function.
len	Does not apply for this function.
ret	Does not apply for this function.

Returned Parameters

ret The following are valid:

0	Specifies that the RELEASE function was successful.
1	Specifies that your program was not connected to the host session.
9	Specifies that a system error occurred.

Remarks

The RELEASE function frees blocked user input that was prohibited by the RESERVE (11) function.

If you do not release a host presentation space (PS) that is reserved by the RESERVE (11) function, the keyboard is locked out of that session until one of the following occurs:

- DISCONNECT PRESENTATION SPACE (2) function is completed
- RESET SYSTEM (21) function is completed.

RESERVE (11)

Purpose

Blocks the currently connected host presentation space (PS) from user input.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the RESERVE function:

func	Specifies the number of the function called; must be 11 for the RESERVE function.
apistring	Does not apply for this function.
len	Does not apply for this function.
*re*t	Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0	Specifies that the RESERVE function was successful.
1	Specifies that your program was not connected to the host session.
5	Specifies that the PS was inhibited.
9	Specifies that a system error occurred.

Remarks

The RESERVE function blocks the currently connected host PS from user input. When your HLLAPI program sends a series of transactions to the host, you can use the RESERVE function to prevent the user from gaining access to that session until your program finishes.

The reserved host PS remains blocked until one of the following occurs:

- DISCONNECT PRESENTATION SPACE (2) function is executed.
- RELEASE (12) function is executed.
- RESET SYSTEM (21) function is executed.

Keyboard input entered by the user while the RESERVE function is in effect is lost.

The RESERVE function blocks out both mouse and keyboard inputs. The application must release the PS before any mouse or keyboard inputs will be accepted.

RESET SYSTEM (21)

Purpose

Reinitializes HLLAPI to its starting state.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the RESET SYSTEM function:

func	Specifies the number of the function called; must be a 21 for the RESET SYSTEM function.
apistring	Does not apply for this function.
len	Does not apply for this function.
ret	Does not apply for this function.

Returned Parameters

ret The following are valid:

0	Specifies that the RESET SYSTEM function was successful.
9	Specifies that a system error occurred.

Remarks

To reinitialize HLLAPI to its starting state, use the RESET SYSTEM function to invoke the following events:

- The session parameter options are reset to their defaults.
- Event notification is stopped.
- Reserved host sessions are released.
- Connected host presentation spaces are disconnected.
- The current status of the close intercept is stopped.

The RESET SYSTEM function reinitializes HLLAPI to its starting state. Use the RESET SYSTEM function during initialization or at the end of your program to reset the system to the initial condition.

SEARCH FIELD (30)

Purpose

Examines a field within the connected host Presentation Space (PS) for the occurrence of a specified string.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the SEARCH FIELD function:

func	Specifies the number of the function called; must be 30 for the SEARCH FIELD function.
apistring	Specifies the target data string for search.
len	Specifies the length of the target data string. This parameter is not applicable if in EOT mode.
ret	Identifies the target field. For **SRCHALL**, this parameter can be the PS position of any byte within the target field. For **SRCHFROM**, this parameter is the beginning point of the search for **SRCHFRWD** or the ending point of the search for **SRCHBKWD**.

Returned Parameters

len The following codes are valid:

=0	Specifies that the string was not found.
>0	Specifies that the string was found at the indicated host PS position.

ret The following codes are valid:

0	Specifies that the SEARCH FIELD function was successful.
1	Specifies that your program was not connected to the host session.
2	Specifies that an error was made in specifying parameters.
7	Specifies that the host PS position was invalid.
9	Specifies that a system error occurred.
24	Specifies that the search string was not found, or the host PS was unformatted.

Remarks

When you issue the SEARCH FIELD function call, the function examines a field you specify for the occurrence of a specified string. If the target string is found, this function returns the position of the string numbered from the beginning of the host PS. The upper-left corner (row 1, column 1) is position 1. This function can be used to search either protected or unprotected fields, but only in a field-formatted host PS.

Four sets of parameter options from the SET SESSION PARAMETERS (9) function are related to this function.

- **STRLEN/STREOT**
- **EOT=**
- **SRCHALL/SRCHFROM**
- **SRCHFRWD/SRCHBKWD**

The SEARCH FIELD function normally checks the entire field (**SRCHALL** is the default mode). However, you can use the SET SESSION PARAMETERS (9) function to specify **SRCHFROM**. In this mode, the PS position parameter does more than identify the target field. It also provides a beginning or ending point for the search. Use the SET SESSION PARAMETERS (9) function to determine whether your searches will search forward (**SRCHFRWD**) or search backward (**SRCHBKWD**).

- If the **SRCHFRWD** option is in effect, the search for the designated string begins at the specified PS position and proceeds toward the end of the field. If the target string is not found, the search stops at the end of the field.
- If the **SRCHBKWD** option is in effect, the search for the designated string begins at the end of the field and proceeds backward toward the specified PS position. If the target string is not found, the search stops at the PS position specified in the PS position parameter.

DBCS Remarks

If the specified position where a forward search is to begin is the second byte of a DBCS character, the search begins from the next position. If the last character of the target data string is the first byte of a DBCS character, it is not included.

SO/SI in the presentation space is ignored while searching. Two-byte control characters to be searched must be enclosed between SO(X'OE') and SI(X'OF').

SEARCH PRESENTATION SPACE (6)

Purpose

Enables your HLLAPI program to examine the host Presentation Space (PS) for the occurrence of a specified string.

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the SEARCH PRESENTATION SPACE function:

func Specifies the number of the function called; must be 6 for the SEARCH PRESENTATION SPACE function.

apistring Specifies the attributes of the API string; contains target data string of the search.

len Specifies the length of the target data string. This parameter does not apply in EOT mode.

ret Specifies the position within the host PS where the search is to begin (**SRCHFRWD** option) or to end (**SRCHBKWD** option). This parameter is overridden in **SRCHALL** (default) mode.

Returned Paremeters

l*en* The following codes are valid:

=0 Specifies that the string was not found.

>0 Specifies that the string was found at the indicated host PS position.

ret The following codes are valid:

0 Specifies that the SEARCH PRESENTATION SPACE function was successful.

1 Specifies that the host PS was not connected.

2 Specifies that an error was made in specifying parameters.

7 Specifies that the host PS position was invalid.

9 Specifies that a system error occurred.

24 Specifies that the search string was not found.

Remarks

The SEARCH PRESENTATION SPACE function normally scans the host PS for the first occurrence of the specified string:

- If the string is not located, then the returning length is set to 0.

- If the string is found, then the returning length is set to the string's beginning location in the host PS. This location represents a position in the host PS based on the layout where the upper-left corner (row 1, column 1) is position 1.

Four sets of parameter options from the SET SESSION PARAMETERS (9) function are related to this function:

- **STRLEN/STREOT**
- **EOT=**
- **SRCHALL/SRCHFROM**
- **SRCHFRWD/SRCHBKWD**

You can use the SET SESSION PARAMETERS (9) function to specify **SRCHBKWD**. When this option is in effect, the search function locates the last occurrence of the string.

The SEARCH PRESENTATION SPACE function checks the entire host PS (**SRCHALL** is the default mode). However, you can use the SET SESSION PARAMETERS (9) function to specify **SRCHFROM**. In this mode, the PS position parameter specifies a beginning or ending point for the search:

- If the **SRCHFRWD** option is in effect, the search for the designated string begins at the specified PS position and proceeds toward the end of the host PS. If the target string is not found, the search stops at the end of the PS.
- If the **SRCHBKWD** option is in effect, the search for the designated string begins at the end of the PS and proceeds backward toward the specified PS position. If the target string is not found, the search ends at the PS position specified in the PS position parameter.

Use the **SRCHFROM** option to search for a keyword that may occur more than once in the host PS.

The SEARCH PRESENTATION SPACE function is also useful in determining when the host PS is available. If your HLLAPI application is expecting a specific prompt or message before sending data, the SEARCH PRESENTATION SPACE function allows you to check for a prompt or message before continuing.

DBCS Remarks

If the specified position where a forward search is to begin is the second byte of a DBCS character, the search begins from the next position. If the last character of the target data string is the first byte of a DBCS character, it is not included.

SO/SI in the presentation space is ignored while searching. Two-byte control characters to be searched must be enclosed between SO(X'OE') and SI(X'OF').

SEND FILE (90)

Purpose

Transfers a file from the workstation session where HLLAPI is running to a host session.

Prerequisite Calls

When calling the SEND FILE function, you must not currently:

- Be connected to the same session.
- Have another file transfer application active on the same session.
- Have another HLLAPI application active on the same session.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the SEND FILE function:

func Specifies the number of the function called; must be 90 for the SEND FILE function.

len Specifies the length of the data string. This parameter is overridden if in end of transmission (EOT) mode.

ret Does not apply for this function.

apistring Specifies the attributes of the API string; must be the same parameters that are used for the **fxfer** command. The data string must be between 1 and 255 bytes.

The following is the Data String for the supported parameters:

Option **Description**

–a Appends the file designated by the *SourceFile* parameters of the **fxfer** command to that designated by the *DestFile* parameter if the destination file exists. This flag is ignored and the destination file is created if the file designated by the *Destfile* parameter does not exist.

–n Specifies the short session name of a previously defined session. It is a single character in the range of a to z. Capital letters are treated as lowercase letters.

–r Specifies replacement of an existing file on the host system.

–t Performs EBCDIC to ASCII translation for a file. The country language to be used is defined by the **–X** option. This option assumes the file is a text file. The new-line character is the line delimiter.

–B Specifies the block size of the host data set. This option can only be used in an MVS environment.

–F Specifies fixed-length records.

–H Specifies the type of host environment; the values can be CMS, TSO, CICS, and VSE.

–I Specifies file transfer options placed directly within the **IND$FILE** command. This option also allows user comments placed within the file transfer command to the host; for example: `–I "FILE=TS) This is a comment"`

–L Specifies the logical record length. For new files, the default is 80. For variable-length records, 80 is the maximum record size. For CICS/VS or VSE/ESA environments, this option must be accompanied by the **–F** flag since these environments do not support logical record lengths. The combination of **–F** and **–L** flags causes the file to be padded with blanks to the end of the logical record length. The **–L** option is required if a record length is greater than the default record length of 80.

–S Specifies the amount of space to be allocated for a new data set in an MVS environment.

–T Performs EBCDIC to ASCII translation for a file to be stored in DOS format. The **–U** flag specifies record of undefined length. This option is only valid for MVS environment. The –V flag specifies record of variable length. This is the default. The flags **–F**, **–t**, or **–T** are not specified.

–X Specifies the AIX code set support for EBCDIC to ASCII translation. If this option is not specified, the code set specified by the system locale is used. The supported code sets are IBM–850, IBM–932, ISO8859–1, ISO8859–7, ISO8859–9, IBM–eucJP, IBM–eucKR, and IBM–eucTW.

Returned Parameters

ret The following codes are valid:

0 Specifies the file transfer was complete.

2 Specifies a parameter error occurred or you specified a data string length that was too short (0) or too long (more than 255 bytes) for the HLLAPI buffer. File transfer was unsuccessful.

11 Specifies the session is already connected; resource is not available.

200–368 Refer to Appendix A for file transfer error codes description.

Return codes **2** and **9** are returned if a problem occurred in the system or in the way you specified your data string.

Examples

The following are the examples of the data string used by the SEND FILE function call.

To upload the `samplefile` file, session a, from the current AIX directory to the host and translate the `samplefile` file to the U.S. English translation table, enter:

```
–n a –H CMS –t samplefile "test file a"
```

To upload `file2` to the CMS host for `test file b`, enter:

```
–n a –H CMS –V –L 132 file2 "test file b"
```

To upload the `/etc/test` file to the CICS/VS as test host file with translation and padding of blanks, the data string should be :

```
–n a –H CICS –t –F –I ")This is a comment" /etc/test "testfile"
```

To upload the **newfile** file to a TSO environment with a complete destination file name of `sys4.parmlib.sampefile`, enter:

```
    -n a -H TSO -r -t newfile "'sys4.parmlib.samplefile'"
```

Remarks

The SEND FILE function transfers a file from the workstation session where HLLAPI is running to a host session. The interface parameter is a subset of the **fxfer** command supported by the AIX 3270 Host Connection Program (HCON). The file transfer process operates in synchronous mode. This function does support countries that require a double-byte character set (DBCS). The SEND FILE function can be called by a HLLAPI application program.

The SEND FILE function uses two sets of parameter options from the SET SESSION PARAMETERS (9) function:

- **STRLEN/STREOT**
- **EOT=**

If you are have already connected to the host session with the CONNECT PRESENTATION SPACE (1) function, you must disconnect by using the DISCONNECT PRESENTATION SPACE (2) function.

SEND KEY (3)

Purpose

Sends either a keystroke or a string of keystrokes to the currently connected host Presentation Space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the SEND KEY function:

func	Specifies the number of the function called; must be a 3 for the SEND KEY function.
apistring	Specifies the attributes of the data string; must a string of keystrokes, maximum 255 bytes.
len	Specifies the length of the source data string. This parameter is overridden if in EOT mode.
ret	Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0	Indicates the keystrokes were sent; status was normal.
1	Indicates your program was not connected to the host session.
2	Specifies that an incorrect parameter was passed to HLLAPI.
4	Specifies that the host session was busy; all of the keystrokes could not be sent.
5	Specifies that the input to the target session was inhibited; keystrokes were rejected or invalid keystroke mnemonics were sent. All of the keystrokes could not be sent.
9	Indicates a system error occurred.

Notes:

1. See session option 7 (**NORESET** option) in SET SESSION PARAMETERS (9) function to increase the performance of this function.
2. If **NORESET** is not requested, a reset mnemonic is always prefixed to the keystroke string. This will reset all states that can be reset except input-inhibited states.

3. The **NORESET** option is not the same as the RESET SYSTEM (21) function.

Keyboard Mnemonics

Keyboard mnemonics provide ASCII characters that represent the special function keys of the personal computer keyboard. A mnemonic abbreviation code makes these special keys easy to remember. An alphabetic key code is used for the most common keys. For example, the Clear key is C or the Tab key is T. Please note that the uppercase and lowercase alphabetic characters are mnemonic abbreviations for different keys.

ASCII mnemonics are supported in HLLAPI by the 3270 terminal emulator. The following tables list the supported and nonsupported mnemonic keys for 3270 terminal emulation.

Mnemonics with Uppercase Alphabetic Characters	
ASCII Mnemonic	**Meaning**
@B	Left Tab
@C	Clear
@D	Delete
@E	Enter
@F	Erase EOF
@I	Insert
@L	Cursor Left
@N	New Line
@P	Print
@R	Reset
@T	Right Tab
@U	Cursor Up
@V	Cursor Down
@X	Alternate Character Set (DBCS)
@Z	Cursor Right

Mnemonics with Lowercase Numbers or Letters	
ASCII Mnemonic	**Meaning**
@0	Home
@1	PF1/F1
@2	PF2/F2
@3	PF3/F3
@4	PF4/F4
@5	PF5/F5
@6	PF6/F6
@7	PF7/F7
@8	PF8/F8
@9	PF9/F9
@a	PF10/F10
@b	PF11/F11
@c	PF12/F12
@d	PF13

Mnemonics with Lowercase Numbers or Letters	
ASCII Mnemonic	**Meaning**
@e	PF14
@f	PF15
@g	PF16
@h	PF17
@i	PF18
@j	PF19
@k	PF20
@l	PF21
@m	PF22
@n	PF23
@o	PF24
@x	PA1
@y	PA2
@z	PA3

Mnemonics with @A and @ Uppercase Alphabetic Characters	
ASCII Mnemonic	**Meaning**
@A@D	Word Delete
@A@F	Erase Input
@A@H	System Request
@A@I	Insert Toggle
@A@J	Cursor Select
@A@Q	Attention
@A@T	Print Presentation Space

ASCII Mnemonics Using Data Keys and Combinations of “Shift” (@S) and “@” Uppercase Alpha Keys	
ASCII Mnemonic	**Meaning**
@S@P	POR
@S@x	Dup
@S@y	Field Mark
Note: @S@P for sending only	

Mnemonics with @X and @ Numeric Keys	
ASCII Mnemonic	**Meaning**
@X@I	SI/SO toggle key (DBCS only)

Mnemonics with Special Character Keys	
ASCII Mnemonic	**Meaning**
@@	@
@<	Backspace

Alphabetic Keys

ASCII Mnemonic	Meaning
a - z	a - z
A - Z	A - Z
0 - 9	0 - 9
~	~
#	#
!	!
$	$
%	%
&	&
’	’
(	(
)	)
*	*
+	+
–	–
.	.
/	/
:	:
;	;
<	<
>	>
=	=
?	?
{	{
}	}
[	[
]	]

Remarks

The SEND KEY function is used to send either a keystroke or a string of keystrokes to the currently connected host PS. You define the string of keystrokes to be sent with the data string parameter. The keystrokes appear to the target session as though they were entered by the user. You can also send all attention identifier (AID) keys such as Enter or PA1. All host fields that are input-protected, or are numeric-only, must be treated accordingly.

The SEND KEY use four sets of parameter options under the SET SESSION PARAMETERS (9) function:

- **STRLEN/STREOT**
- **EOT=c**
- **AUTORESET/NORESET**
- **RETRY/NORETRY**

Keystrokes cannot be sent to the host session when the keyboard is blocked or in use, but SEND KEY tries to resend the keystrokes until they are sent, or a 4-minute time out occurs. This can be avoided by specifying **NORETRY** in SET SESSION PARAMETERS (9). The **NORETRY** option causes the function to return immediately after determining the keyboard is blocked or in use. You can check the keyboard status with the WAIT (4) function.

The length of the data string must, by default, be explicitly defined by using the data string length parameter. Or, the length of the data string can be implicitly defined by using the end of transmission (EOT) delimiter specified with the SET SESSION PARAMETERS (9) function.

When explicitly defining length, the value for the data string length parameter passed by the application must be calculated. For this calculation, allow 2 bytes for compound keystrokes such as @E and allow 4 bytes for compound keystrokes such as @A@C.

To send special function keys, a compound character coding scheme is used. This coding scheme uses ASCII characters to indicate one keystroke and is comprised of the @ sign (default escape character) followed by the key code. For example, to type in the sequence `LOGON ABCDE` followed by the Enter key, you code the string `LOGON ABCDE@E`.

This compound coding technique allows an ASCII string representation of all necessary keystroke codes without requiring the use of complex hexadecimal key codes.

If you need higher levels of performance, use the COPY STRING TO FIELD (33) function or the COPY STRING TO PRESENTATION SPACE (15) function rather than send keystrokes with the SEND KEY function. Only the SEND KEY function can send the special function keys.

Keystroke strings with embedded AID keys are sent to the host in multiple passes. Each pass sends a string up to, and including, the first AID key. HLLAPI internally adjusts the length of the string and the starting position for each pass. Depending on the host application, some keystrokes may be lost due to AID key processing. For this reason, sending a list of keystrokes with more than one embedded AID key is not recommended.

While @P (Print) or @A@T (Print Presentation Space) is being processed, any request that updates the PS will be rejected. If a `Busy State or Intervention Required` occurs during such a print request, the mnemonic @A@R will cancel the request and reset the state.

SET CURSOR (40)

Purpose

Sets the position of the cursor within the currently connected host Presentation Space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the SET CURSOR function:

func	Specifies the number of the function called; must be 40 for the SET CURSOR function.
apistring	Does not apply for this function.
len	Does not apply for this function.
ret	Specifies the desired cursor position in the connected host PS.

Returned Parameters

ret The following codes are valid:

0	Specifies that the cursor was successfully located at specified position.
1	Specifies that your program was not connected to the host session.
4	Specifies that the session was busy.
7	Specifies that a cursor location less than one or greater than the maximum PS size was specified.
9	Specifies that a system error occurred.

Remarks

The SET CURSOR function sets the position of the cursor within the currently connected host PS. Before using the SET CURSOR function, connect first to the host PS.

DBCS Remarks

If the desired cursor position is the second byte of a DBCS character, it is moved to the first byte of the DBCS character.

SET SESSION PARAMETERS (9)

Purpose

Enables you to change certain default session options in HLLAPI.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the SET SESSION PARAMETERS function:

func — Specifies the number of the function called; must be a 9 for the SET SESSION PARAMETERS function.

apistring — Specifies the attributes of the data string; string must contain the values of the session options that are changed. The data string parameter can contain any of the values in the session options. The values should be placed on the data string parameter line, separated by commas or blanks. The sets of parameters are explained in terms of the functions they affect.

len — Specifies the exact length of the source data string (the **STREOT** option is not allowed).

ret — Does not apply for this function.

Returned Parameters

len — If nonvalid session options were found in the input data string, the *len* parameter returns the number of valid session parameters that were set. The *len* parameter remains unchanged if no nonvalid session options were found in the input data string.

ret — The following codes are valid:

0	The session parameters were set.
2	One or more parameters were invalid.
9	A system error occurred.

Session Options

The following are session options are represented below. The default session options are the first value.

Option 1 The following values determine how the data string length is defined for functions:

- SEND KEY (3)
- SEARCH PRESENTATION SPACE (6)
- COPY STRING TO PRESENTATION SPACE (15)
- SEARCH FIELD (30)
- COPY STRING TO FIELD (33)
- SEND FILE (90)
- RECEIVE FILE (91)

Value **Explanation**

STRLEN An exact length is passed for all strings.

STREOT String lengths are not explicitly coded. Calling (source) data strings end in an end of transmission (EOT) character.

Option 2 The following values specifies the character to be used as the EOT delimiter in (source) data strings for HLLAPI functions:

- SEND KEY (3)
- SEARCH PRESENTATION SPACE (6)
- COPY STRING TO PRESENTATION SPACE (15)
- SEARCH FIELD (30)
- COPY STRING TO FIELD (33)
- SEND FILE (90)
- RECEIVE FILE (91)

Value **Explanation**

EOT=c This value allows you to specify the EOT character for string terminators (in **STREOT** mode). Binary 0 is the default. Do not leave a blank before and after the equal sign.

To be valid, c must be entered as a 1-byte literal character string with no preceding blanks. The EOT character specified by this value is used to determine the length of a data string parameter only when the **STREOT** option (see session option 1) is in effect.

Option 3 The following values affect the search functions SEARCH FIELD (30) and SEARCH PRESENTATION SPACE (6).

Value **Explanation**

SRCHALL The SEARCH FIELD (30) function and the SEARCH PRESENTATION SPACE (6) function scan the entire host PS or field.

SRCHFROM The SEARCH FIELD (30) function and the SEARCH PRESENTATION SPACE (6) function start from a specified PS position (for **SRCHFRWD**) or end at a specified PS position (for **SRCHBKWD**).

Option 4 The following values affect the search functions SEARCH FIELD (30) and SEARCH PRESENTATION SPACE (6). They determine in which direction searches are performed.

Value **Explanation**

SRCHFRWD The SEARCH FIELD (30) function and the SEARCH PRESENTATION SPACE (6) function perform in an ascending direction.

SRCHBKWD The SEARCH FIELD (30) function and the SEARCH PRESENTATION SPACE (6) function perform in a descending direction. A search is satisfied if the first character of the target string is located within the bounds specified for the search.

Option 5 The following values determine how attribute bytes are treated for functions COPY PRESENTATION SPACE (5), COPY PRESENTATION SPACE TO STRING (8), and COPY FIELD TO STRING (34).

Value Explanation

NOATTRB Converts all unknown values to blanks.

ATTRB Passes back all codes that do not have an ASCII equivalent as their original value.

Option 6 The following values affect the PAUSE (18) function.

Value **Explanation**

FPAUSE Full-duration pause. A pause is instituted for the length of time you specified in the PAUSE (18) function.

IPAUSE Interruptible pause. After the START HOST NOTIFICATION (23) function is executed, a host event satisfies a pause.

Option 7 The following values determine whether HLLAPI automatically precedes strings sent using the SEND KEY (3) function with a reset.

Note: Use the **NORESET** option to increase the performance of this function.

Value **Explanation**

AUTORESET HLLAPI attempts to reset all inhibited conditions by prefixing all strings of keys sent using the SEND KEY (3) function with a reset.

NORESET Do not **AUTORESET**.

Option 8 The following values affect the WAIT (4) function and the GET KEY (51) function.

Value **Explanation**

TWAIT The WAIT (4) function waits up to a minute before timing out on XCLOCK or XSYSTEM for the 3270 terminal emulator or on the input–inhibited indicator for 5250 workstation feature. The GET KEY (51) function waits until a keystroke is enqueued before returning.

LWAIT The WAIT (4) function waits until XCLOCK or XSYSTEM clears for the 3270 terminal emulator or until the input-inhibited indicator clears for 5250 workstation feature. This option is not recommended since control does not return to your application until the host is available. The GET KEY (51) function waits until a keystroke has been enqueued before returning.

NWAIT The WAIT (4) function and the GET KEY (51) function checks the status and returns immediately (no wait).

Option 9 The following values affect the following copy functions:

- COPY PRESENTATION SPACE (5)
- COPY PRESENTATION SPACE TO STRING (8)
- COPY STRING TO PRESENTATION SPACE (15)
- COPY STRING TO FIELD (33)
- COPY FIELD TO STRING (34)

Value **Explanation**

EAB Pass the presentation space data with **EABs**. (You receive two characters for every one that is displayed. You must allocate a buffer twice the size of the presentation space; for example, 2 x 1920 for a Model 2 screen).

NOEAB Pass data only (no **EABs**).

Option 10 The following values affect the format of the Operator Information Area (OIA) image returned by the COPY OIA (13) function.

Value **Explanation**

OLDOIA Returns the session’s OIA in 3270 PC format. For more information, see COPY OIA (13) function.

NEWOIA Does not apply for this function.

Option 11 The following values affect the SEND KEY (3) function. Keystrokes are not processed if the keyboard is blocked or in use. The options determine whether the function tries to resend the keystrokes until a certain timeout period occurs, or if the function returns immediately after determining if the keyboard is blocked or in use.

Value **Explanation**

RETRY Continues to attempt to send keystrokes until they are sent, or until a certain timeout period expired.

NORETRY Returns immediately after determining the keyboard is blocked or in use.

Option 12 The following values enable or disable the trace option of HLLAPI. You can use these values to debug an HLLAPI program. The **TRON** option determines whether the execution of a specified function is traced.

Value	Explanation
TROFF	Turns trace off.
TRON	Turns trace on. When **TRON** is in effect, all executed HLLAPI functions are traced. The trace output data is in the **HCONHLLAPI.TRACE** file in the current subdirectory.

Option 13 The following values affect copy_from_host functions:

- COPY PRESENTATION SPACE (5)
- COPY PRESENTATION SPACE TO STRING (8)
- COPY FIELD TO STRING (34)

Value	Explanation
XLATE	Does not apply for this function.
NO XLATE	EABs are not translated.

Option 14 The value of the **NULLTOBLANK** option affects the following functions:

- COPY PRESENTATION SPACE (5)
- COPY PRESENTATION SPACE TO STRING (8)

Value	Explanation
NULLOK	Do not translate NULLs in the Presentation Space to blanks. This is the default value.
NULLTOBLANK	When **NULLTOBLANK** is in affect, all NULLs in the Presentation Space are converted to spaces when these functions are called.

Additional DBCS Session Options

Option 15 The following values affect the following copy functions:

- COPY PRESENTATION SPACE (5)
- COPY PRESENTATION SPACE TO STRING (8)
- COPY STRING TO PRESENTATION SPACE (15)
- COPY STRING TO FIELD (33)
- COPY FIELD TO STRING (34)

Value	Explanation
EAD	Pass the presentation space data with two attribute characters about DBCS. (You receive three characters for every one that is displayed. You must allocate a buffer three times the size of the presentation space, for example, 3 x 1920 for a Model 2 screen.)
NOEAD	Pass data only (no **EADs**).

Option 16 The following values affect the following copy functions:

- COPY PRESENTATION SPACE (5)
- COPY PRESENTATION SPACE TO STRING (8)
- COPY FIELD TO STRING (34)

Value	Explanation
SPACESO	Both shift-out (SO) and shift-in (SI) control characters are converted to space(X'20'). The size of an allocated buffer must be enough to store these characters.
SO	Each shift-out(SO) and shift-in(SI) control character is converted to x'0E' and X'0F'. The size of an allocated buffer must be enough to store these characters.

NOSO Shift-out (SO) and shift-in (SI) control characters are eliminated from the presentation space data.

Remarks

The SET SESSION PARAMETERS function enables you to change certain default session options. When HLLAPI is loaded, the default values for session options are in effect. Some or all of these values can be changed using the data string parameter. Specified values remain in effect until one of the following occurs:

- A subsequent SET SESSION PARAMETERS function specifies a new value.
- The RESET SYSTEM (21) function is started.
- The application ends.

START HOST NOTIFICATION (23)

Purpose

Determines if the designated host Presentation Space (PS) or Operator Information Area (OIA) has been updated. The asynchronous option is also provided using the returned Queue ID mechanism.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the START HOST NOTIFICATION function:

func Specifies the number of the function called; must be 23 for the START HOST NOTIFICATION function.

apistring Specifies the attributes of the API string. The calling two-character data string can contain:

Byte **Definition**

Position 1 One of the following:

- A specific host PS short session ID
- A blank or null indicating a request against the currently connected host PS

Position 2 Replace with one of the following characters:

`A` Requests asynchronous mode of notification. When A is selected, position 5 through 8 returns the address of the notification queue. You may then wait on the queue. The event selection characters `P`, `O`, and `B` must be placed in position 3.

`P` Asks for notification of PS update only.

`O` Asks for notification of OIA update only.

`B` Asks for notification of both PS and OIA updates.

Position 3 Replace with one of the following characters if position 2 is A:

`P` Asks for notification of PS update only.

`O` Asks for notification of OIA update only.

`B` Asks for notification of both PS and OIA updates.

Position 4 Reserved.

len Specifies the length of the host event buffer (256 is recommended).

ret Does not apply for this function.

Returned Parameters

apistring The following codes are valid:

Positions 5-8 Host notify queue.

ret The following codes are valid:

0 Specifies that the START HOST NOTIFICATION function was successful.

1 Specifies that an invalid host PS was specified.

2 Specifies that an error was made in designating parameters.

9 Specifies that a system error occurred.

Remarks

The START HOST NOTIFICATION function begins the process by which your HLLAPI application program determines if the designated host PS or OIA has been updated. The application does not have to connect to the session to issue this call. However, the issuing application has the responsibility to issue the STOP HOST NOTIFICATION (25) function for the same session. Otherwise, other applications will not be notified from this session.

START HOST NOTIFICATION may be issued against multiple sessions simultaneously. If the application chooses the **A** (asynchronous) option, it may choose to wait on the returned Queue ID to determine when a host event has occurred by issuing a poll command. Whe the poll returns, the QUERY HOST UPDATE (24) function should then be called to determine the type of update that has occurred.

Warning: Use Queue ID only for waiting on events. Use the PAUSE (18) function to query contents and receive queue events.

After using this function, your application program can use the QUERY HOST UPDATE (24) function to determine when a host event has occurred. The QUERY HOST UPDATE(24) function can be used to determine whether PS, OIA, or both, have changed.

Subsequent START HOST NOTIFICATION functions have no effect as long as the options remain the same as the initial START HOST NOTIFICATION functions.

To receive notification of multiple events, the application must use the QUERY HOST UPDATE (24) function after each event notification.

START KEYSTROKE INTERCEPT (50)

Purpose

Enables an HLLAPI application to filter any keystrokes sent to a session by a user.

Prerequisite Calls

This function requires no prerequisite calls to other functions.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the START KEYSTROKE INTERCEPT function:

func Specifies the number of the function called; must be 50 for the START KEYSTROKE INTERCEPT function.

len Does not apply for this function.

ret Does not apply for this function.

apistring Specifies the attributes of the data string; the calling 6 character data string contains:

Byte	Definition
Position 1	One of the following: • The one-character letter short session ID of the PS • A blank or null indicating a function call against the currently connected host PS
Position 2	A code character: • D for AID keystrokes only • L for all keystrokes
Positions 3–6	The data in these positions is ignored by HLLAPI. However, no error occurs if a migrating program has data in these positions. This data is accepted by HLLAPI to provide compatibility with migrating applications.

Returned Parmeters

ret The following codes are valid:

0	Specifies that the START KEYSTROKE INTERCEPT function was successful.
1	Specifies that the PS was invalid.

2 Specifies that an invalid option was specified.

4 Specifies that resource was unavailable; the requested presentation was in use by another application.

9 Specifies that a system error occurred.

Remarks

The START KEYSTROKE INTERCEPT function allows an HLLAPI application to filter any keystrokes sent to a session by a user. The intercepted keystrokes can be:

- Received through the GET KEY (51) function and then sent to the same or another session with the SEND KEY (3) function. Setting the **NORESET** option with the SET SESSION PARAMETERS (9) function increases the performance of the SEND KEY (3) function.
- Accepted and rejected through the POST INTERCEPT STATUS (52) function.
- Replaced by other keystrokes with the SEND KEY (3) function.
- Used to trigger some other process.

If the data string parameter contains the **D** option code, HLLAPI returns only attention identifier (AID) keys to the application program. HLLAPI sends non-AID keys to their intended presentation space (PS).

The START KEYSTROKE INTERCEPT function does not share the PS to which it is connected with other functions. Only one application at a time can trap keystrokes.

Since the CONNECT PRESENTATION SPACE (1) function and START KEYSTROKE INTERCEPT functions share common subsystem functions, successful requests by an application to share either of these functions (1 or 50) can affect the requesting of these functions by other applications.

STOP HOST NOTIFICATION (25)

Purpose

Prevents the QUERY HOST UPDATE (24) function from determining if the designated host Presentation Space (PS) or Operator Information Area (OIA) has been updated.

Prerequisite Calls

This function requires a prerequisite call to the START HOST NOTIFICATION (23) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the STOP HOST NOTIFICATION function:

func	Specifies the number of the function called; must be 25 for the STOP HOST NOTIFICATION function.
apistring	Specifies the attributes of the data string; one-character short session ID of the target PS ID or a blank or a null indicating the connected PS.
len	Does not apply for this function; a length of 1 is implied.
ret	Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0	Specifies that the STOP HOST NOTIFICATION function was successful.
1	Specifies that an invalid host PS was specified.
8	Specifies that no previous START HOST NOTIFICATION (23) function was issued.
9	Specifies that a system error occurred.

Remarks

The STOP HOST NOTIFICATION function prevents the QUERY HOST UPDATE (24) function from determining if the designated host PS or OIA has been updated. This function also prevents the host events for the designated session from affecting the PAUSE (18) function.

This function must be issued by the same application that issued the START HOST NOTIFICATION (23) call. Otherwise, other applications will not be notified from this session.

STOP KEYSTROKE INTERCEPT (53)

Purpose

Ends your application program's ability to intercept keystrokes.

Prerequisite Calls

This function requires a prerequisite call to the START KEYSTROKE INTERCEPT (50) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the STOP KEYSTROKE INTERCEPT function:

func	Specifies the number of the function called; must be 53 for the STOP KEYSTROKE INTERCEPT function.
apistring	Specifies the attributes of the data string; one-character short session ID of the target presentation space (PS) ID or a blank or a null indicating the currently connected PS.
len	Does not apply for this function; a length of 1 is implied.
ret	Does not apply for this function.

Returned Paremeters

ret The following codes are valid:

0	Specifies that the STOP KEYSTROKE INTERCEPT function was successful.
1	Specifies that the host PS was invalid.
8	Specifies that no prior START KEYSTROKE INTERCEPT (50) function was called for this PS.
9	Specifies that a system error occurred.

Remarks

The STOP KEYSTROKE INTERCEPT function ends your application program's ability to intercept keystrokes.

WAIT (4)

Purpose

Checks the status of the host presentation space (PS).

Prerequisite Calls

This function requires a prerequisite call to the CONNECT PRESENTATION SPACE (1) function.

Syntax

hllc *(func, apistring, len, ret)*
int **func;*
char **apistring;*
int **len;*
int **ret;*

Supplied Parameters

Supply the following parameters to invoke the WAIT function:

func	Specifies the number of the function called; must be a 4 for the WAIT function.
apistring	Does not apply for this function.
len	Does not apply for this function.
ret	Does not apply for this function.

Returned Parameters

ret The following codes are valid:

0	Specifies that the keyboard was unlocked and ready for input.
1	Specifies that your application program was not connected to a valid session.
4	Specifies a time-out while still busy (in XCLOCK or XSYSTEM in X) for the 3270 terminal emulation.
5	Specifies that the keyboard is locked.
9	Specifies that a system error occurred.

Remarks

If the controller or host system is busy, the WAIT function causes HLLAPI to wait for a specified time to see if the condition clears. The specified time is determined by options in the SET SESSION PARAMETERS (9) function.

The WAIT function checks the status of the host PS. If the controller or host system is busy, the WAIT function causes HLLAPI to wait for a specified time to see if the condition clears. The WAIT function gives functions such as the SEND KEY (3) function enough time to complete. Use the SET SESSION PARAMETERS (9) function to request the **TWAIT**, **LWAIT,** or the **NWAIT** option. Each option determines a specified amount of time that the WAIT function uses.

When the return code is 0 and the keyboard unlocks, the WAIT function has been executed. However, the original transaction may not have been completed. Use the SEARCH FIELD (30) function, or the SEARCH PRESENTATION SPACE (6) function combined with the WAIT function, to look for expected keyword prompts.

The WAIT function determines if the host Operator Information Area (OIA) is inhibited.

Note: The 3270 terminal emulation sessions wait until a host response occurs; the response is indicated when an XSYSTEM or X is turned off in the OIA.

Sample C HLLAPI Program

This sample program is part of the software offering for the HLLAPI function; it can be found in the **/usr**/**lib**/**hcon**/**hllapi** directory.

```
/******************************************************************
/
/* FILE NAME: SAMPLE.C
*/
/*
*/
/* MODULE NAME= SAMPLE.C
*/
/*
*/
/* DESCRIPTIVE NAME=         C SAMPLE PROGRAM FOR HLLAPI
*/
/*
*/
/*  Displays HLLAPI and session information.
*/
/*  Writes string to host.
*/
/*  Searches for written string on host.
*/
/*  Displays host session screen.
*/
/*
*/
/* COPYRIGHT:      XXXXXXXXX (C) COPYRIGHT IBM CORP.1992
*/
/*                 LICENSED MATERIAL – PROGRAM PROPERTY OF IBM
*/
/*                 ALL RIGHTS RESERVED
*/
/*
*/
/* NOTES=
*/
/*
*/
/*
*/
/*
*/
/*
*/
/*********************-END OF
SPECIFICATIONS-**********************/

/******************************************************************
/
/********************** BEGIN INCLUDE FILES
***********************/
/******************************************************************
/


#include <stdio.h>

#include <string.h>

#include ”hapi_c.h”                    /* Get HLLAPI include file*/
```

```
/******************************************************************
/
/*************************** DEFINES
*****************************/
/******************************************************************
/

#define MAX_DATA_SIZE 1920              /* The maximum data       */
                                        /* size for this          */
                                        /* application.           */
#define EABS 0x80                       /* Extended attribute     */
                                        /* bit.                   */
#define PSS 0x40                        /* Programmed Symbol      */
                                        /* Set bit.               */

/******************************************************************
/
/******************** BEGIN STATIC VARIABLES
*********************/
/******************************************************************
/

unsigned char press_ent_msg[] =
{
   ”\n\nPress ENTER to continue...”
}
;
unsigned char blank_screen[] =  /* Poor mans blank screen */
{
   ”\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n”

}
;
unsigned char dft_sess = NULL;        /* Session to write str     */
                                      /* to and search from       */
unsigned char host_text[] =
{
   ”HLLAPI”                           /* String to send to        */
}                                     /* host and to search for   */
;
unsigned char invis_text[] =
{
   ”INVISIBLE WINDOW WRITE”           /* String to send to host   */
}
;
unsigned char home_key[] =
{
   ”@0”                               /* The Home Key             */
}
;
unsigned char setparm_text[] =
{
   ”NOATTRB NOEAB”                    /* String used for set parms*/
}
;
```

```
/******************* HLLAPI variables
*****************************/

unsigned int hfunc_num;               /* HLLAPI function number   */

unsigned char hdata_str[MAX_DATA_SIZE];/* HLLAPI data str.        */

unsigned int hds_len;                 /* HLLAPI data string len   */

unsigned int hrc;                     /* HLLAPI return code       */
```

```
/******************************************************************
/
/************************** BEGIN CODE
****************************/
/******************************************************************
/

/******************************************************************
/
/* MAIN - Main code calls routines to do real work.
*/
/*
*/
/* INPUT
*/
/*
*/
/* OUTPUT
*/
/*
*/
/*
*/
/******************************************************************
/

 main(){

   int rc;                            /* return code              */
   char key = ’a’ ;                   /* input character          */

   printf(blank_screen);              /* Clear the screen         */
   rc = disp_hllapi_info();           /* Call routine to          */
                                      /* display HLLAPI info      */

   if (rc == 0){
     printf(press_ent_msg);
     fgetc(stdin);                    /* Make user press ENTER    */
     rc = disp_session_info();        /* Call routine to display  */
                                      /* Host session info        */
   }

   if (rc == 0){

     if (dft_sess){                   /* At least 1 sess          */

         printf(blank_screen);        /* Clear the screen.        */
         printf(”Press ENTER to send string ’”);
         printf(host_text);
         printf(”’ to session short name ”);
         fputc(dft_sess,stdout);
         printf (”...”);
         fgetc(stdin);                /*Make user press ENTER     */

         rc = write_str_2_host(host_text);/* Call routine to
write*/
                                      /* string to host session   */
      }
      else
      {
         printf(”NO SESSION CONFIGURED.\n”);
         rc = 1;                      /* Get out of program       */
      }
   }
   if (rc == 0){

      printf(”Press ENTER to search for string ’”);
      printf(host_text);
      printf(”’ on Host Presentation Space...”);
      fgetc(stdin);                   /*Make user press enter     */
      rc = search_str_on_host();      /* Routine to search for    */
                                      /* string on host session   */
   }

   if (rc == 0){
      printf(”Press ENTER to display 1920 bytes of presentation
             space...”);
      fgetc(stdin);                   /*Make user press ENTERCS2C */
      rc = disp_host_scr();           /* Call routine to display  */
                                      /* Host session screen      */
   }

   if (rc == 0){
      fflush(stdin);                  /* Flush input buffer       */
      printf( ”\nSAMPLE PROGRAM DONE. To Exit Program Press
             ENTER...” );
      fgetc(stdin);                   /* Make user press ENTER    */
    }
 }



/******************************************************************
/
/* DISP_HLLAPI_INFO - CALLs HLLAPI QUERY_SYSTEM and then displays
*/
/*                     the requested info.
*/
/*
*/
/*
*/
/******************************************************************
/

int disp_hllapi_info(){

   struct qsys_struct dsp_struct;

   struct qsys_struct * data_ptr;
                                      /* assign pointer          */
                                      /* HLLAPI data string.     */

   unsigned int rc = 0;               /* return code             */
   data_ptr = &dsp_struct;

   hfunc_num = HA_QUERY_SYSTEM;       /* Issue query system      */

   hllc(&hfunc_num, (char * )data_ptr, &hds_len, &hrc);
                                      /* Call HLLAPI             */

   if (hrc == HARC_SUCCESS){          /* If good rc              */

      printf(”                        HLLAPI INFORMATION\n\n”);

      printf(” HLLAPI version         : ”);
      fputc(data_ptr->qsys_hllapi_ver,stdout);

      printf(”\n”);

      printf(” HLLAPI level           : ”);

      fputc(data_ptr->qsys_hllapi_lvl[0],stdout);

      fputc(data_ptr->qsys_hllapi_lvl[1] ,stdout);

      printf(”\n”);

      printf(” HLLAPI release date    : ”);

      wrt_str(data_ptr->qsys_hllapi_date, 6);

      printf(”\n”);

      printf(” HLLAPI hardware base   : ”);

      fputc(data_ptr->qsys_hardware_base,stdout);

      printf(”\n”);

      printf(” HLLAPI CTRL program type : ”);

      fputc(data_ptr->qsys_ctrl_prog_type,stdout);

      printf(” = ”);

      if (data_ptr->qsys_ctrl_prog_type == ’X’){

         printf(”IBM AIX”);
      }

      printf(”\n”);

      printf(” HCON version level     : ”);

      fputc(data_ptr->qsys_ctrl_prog_ver[0],stdout);

      fputc(data_ptr->qsys_ctrl_prog_ver[1],stdout);

      printf(”\n”);

   }

   else {
                                      /* Bad return code         */

      rc = hrc;
      error_hand(hfunc_num, rc);
   }

   return(rc);
}



/******************************************************************
/
/* DISP_SESSION_INFO - CALLs HLLAPI QUERY funtions and then
```

```
*/ /*                     displays the requested session info.
 */
/*
*/
/*
*/
/******************************************************************
/

   int disp_session_info(){           /* Routine to display      */
                                      /* Host session info       */

   struct qses_struct * data_ptr;
                                      /* assign pointer          */
                                      /* HLLAPI data string.     */

   struct qsst_struct sess_stuc;      /* Query Session           */
                                      /* structure.              */

     unsigned int i;                  /* Array index             */
     unsigned int num_sess;           /* Number of session started*/
     unsigned int rc = 0;             /* return code             */
     data_ptr = (_Packed struct qses_struct *)hdata_str;

     printf(”\n\n\n\n\n\n\n\n\n\n\n\n”);

     printf(”                         SESSION INFO\n\n”);

     hfunc_num = HA_QUERY_SESSIONS;   /* Issue query sessions    */

     hds_len = MAX_DATA_SIZE / 12 * 12;/* Make sure len is       */
                                      /* multiple of 12          */

     hllc(&hfunc_num, (char *)data_ptr, &hds_len, &hrc);
                                      /* Call HLLAPI */

     if (hrc == HARC_SUCCESS){        /* If good rc              */

       num_sess = hds_len;       /* Number of sessions started   */

       printf(”Number of configured sessions = %d\n\n\n”,
num_sess);

       for(i = 0;((i < num_sess) && (rc == 0)); i++)
                                   /* LOOP thru queried sessions */

      {
         printf(”Session number : %d\n”,i+1);
         printf(”Session Long name : ”);
         wrt_str(data_ptr[i].qses_longname, 8);

         printf(”\n”);

         printf(”Session Short name : ”);
         wrt_str(&data_ptr[i].qses_shortname, 1);

         printf(”\n”);

         printf(”Session Type : ”);
         wrt_str(&data_ptr[i].qses_sestype, 1);

         printf(” = ”);
         if (data_ptr[i].qses_sestype == ’H’)
         {
            printf(”Host”);

            if (!(dft_sess)){ /* First HOST not set alreaCS2C */

               dft_sess = data_ptr[i].qses_shortname;
                             /* Set the session to write string
to*/
               }
            }
            printf(”\n”);

            printf(”Session PS size : %d\n”
                 ,data_ptr[i].qses_pssize);


           hfunc_num = HA_QUERY_SESSION_STATUS;
                                   /* Issue query session status */

           hds_len = 18;              /* Set length              */

           sess_stuc.qsst_shortname = data_ptr[i].qses_shortname;
                                    /* Set the session short name
*/

           hllc(&hfunc_num, (char *)&sess_stuc, &hds_len, &hrc);

            if (hrc == HARC_SUCCESS){ /* If good rc              */

           printf(”Session PS rows : %d\n”
                ,sess_stuc.qsst_ps_rows);

           printf(”Session PS columns : %d\n”
                ,sess_stuc.qsst_ps_cols);

           printf(”Session type : ”);

           wrt_str(&sess_stuc.qsst_sestype, 1);

           printf(” = ”);
           if (sess_stuc.qsst_sestype == ’D’){

              printf(”DFT display”);
           }

           if (sess_stuc.qsst_sestype == ’S’){

              printf(”SNA T2.1 display”);
           }

           if (sess_stuc.qsst_sestype == ’T’){

             printf(”TCP/IP display”);
           }

           if (sess_stuc.qsst_sestype == ’P’){

            printf(”SNA T2.1 printer”);

           }

           if (sess_stuc.qsst_sestype == ’Q’){
             printf(”DFT non-SNA printer”);
           }
           printf(”\n”);

           printf(press_ent_msg);

           fgetc(stdin);              /* Make user press ENTERCS2C*/
                                      /* ENTER.                 */
      }
      else                            /* Bad return code         */

      {
         rc = hrc;
         error_hand(hfunc_num, rc);
      }
   }
 }

 else                                 /* Bad return code         */

 {
   rc = hrc;
   error_hand(hfunc_num, rc);
 }

 return(rc);

}




/******************************************************************
/
/* WRITE_STR_2_HOST - Connects to first session and writes
*/
/*                    home_key and string to host
*/
/******************************************************************
/

int write_str_2_host(char *in_str)    /* Call routine to         */
                                      /*  write string to host   */
{

   unsigned int rc = 0;               /* return code             */
   hdata_str[0] = dft_sess;        /* Set session id for connect */
   hdata_str[1] = 0x00;


   hfunc_num = HA_CONNECT_PS;         /* Issue Connect           */
                                      /* Presentation Space      */
   hllc(&hfunc_num, (char * )hdata_str, &hds_len, &hrc);
                                      /* Call HLLAPI             */

   if (hrc == HARC_SUCCESS){          /* If good return code     */

    hfunc_num = HA_SENDKEY;           /* Issue sendkey           */

    strcpy(hdata_str, home_key);      /* String to send to Host  */

    hds_len = sizeof(home_key) - 1;   /* Set length of string    */
                                      /* minus null character    */
   hllc(&hfunc_num, (char * )hdata_str, &hds_len, &hrc);
                                      /* Call HLLAPI             */

   if (hrc == HARC_SUCCESS){          /* If good return code     */

      hfunc_num = HA_SENDKEY;         /* Issue sendkey           */

      strcpy(hdata_str,in_str);       /* String to send to Host  */

      hds_len = strlen(in_str);       /* Set length of string    */
                                      /* minus null character    */

      hllc(&hfunc_num, (char * )hdata_str, &hds_len, &hrc);
                                      /* Call HLLAPI             */

      if (hrc == HARC_SUCCESS){       /* If good return code     */

          printf (”Sent String to Host.\n\n\n”);
      }

      else                            /* Bad return code         */
      {
         rc = hrc;                    /* Set return code         */
         error_hand(hfunc_num, rc);
      }
   }
   else
   {

      rc = hrc;                       /* Set return code         */
      error_hand(hfunc_num, rc);
   }
  }
  else
  {

    rc = hrc;                         /* Set return code         */
    error_hand(hfunc_num, rc);
  }
  return(rc);

}
```

```
/******************************************************************
/
/*DISP_HOST_SCR - Displays first 1920 bytes of host screen
*/
/*
*/
/******************************************************************
/

int disp_host_scr()                   /* Routine to display      */
                                      /* host screen             */

}
  unsigned int rc = 0;                /* return code             */

  hfunc_num = HA_SET_SESSION_PARMS;   /* Issue Set sessions Parms*/

  hds_len = sizeof(setparm_text) - 1; /* Copy the first 1920
bytes*/
                                      /* of presentation space   */

  hllc(&hfunc_num, setparm_text, &hds_len, &hrc);
                                      /* Call HLLAPI             */

  if (hrc == HARC_SUCCESS){           /* If good return code     */

    hfunc_num = HA_COPY_PS_TO_STR;    /* Issue Copy PS to string */

    hds_len = MAX_DATA_SIZE;          /* Copy the first 1920 bytes*/
                                      /* of presentation space   */

    hrc = 1;                          /* Set PS position to      */
                                      /* top, left corner        */

    hllc(&hfunc_num, hdata_str, &hds_len, &hrc);
                                      /* Call HLLAPI             */
    if (hrc == HARC_SUCCESS){         /* If good return code     */

      wrt_str(hdata_str, MAX_DATA_SIZE);
                                      /* Write the string        */

    }
    else                              /* Bad return code         */
    {
      rc = hrc;                       /* Set return code         */
      error_hand(hfunc_num, rc);
    }
  }
  else                                /* Bad return code         */
  {
    rc = hrc;                         /* Set return code         */
    error_hand(hfunc_num, rc);
  }
  return(rc);
}
```

```
/*******************************************************************
/
/* WRT_STR - Writes char string to standard output.
*/
/*
*/
/* INPUT
*/
/*
*/
/* OUTPUT
*/
/*
*/
/*******************************************************************
/

wrt_str(text_ptr, x)            /* Prints x number of characters */

unsigned char * text_ptr;       /* Pointer to string to write    */

unsigned int x;                 /* Number of bytes in string     */

{
   unsigned int i;              /* counter                       */

   for (i = 0; i < x; i++)
   {
      fputc(text_ptr[i],stdout);

   }
}



/*******************************************************************
/
/* ERROR_HAND - Error handler.
*/
/*
*/
/*******************************************************************
/

int error_hand(func, rc)              /* Error handler.          */

unsigned int func;
unsigned int rc;
{
   printf(”UNEXPECTED RETURN CODE %d from FUNCTION #%d.”,rc, func);

}
```

Chapter 5. Programming the Host Connection Program

The Host Connection Program (HCON) emulates a 3278/79 display or a 3286/87 printer attached to System/370 mainframe host. This chapter provides information on programming HCON, including the file transfer process and autolog procedures.

Programming HCON

HCON provides the following programming facilities:

File Transfer Programming Interface
Permits the transfer of files between local system and a mainframe host.

AUTOLOG Procedures
Supplies an automatic logon facility (AUTOLOG) enabling a user to logon and logoff the host using an API application, an implicit file transfer, or the **hconutil** command.

Programming Examples
Illustrates the use of the file transfer, API, and automatic logon facilities.

File Transfer Program Interface

The File Transfer Programming Interface permits the transfer of files between local systems and mainframe hosts. The host operating system can be VM/CMS, MVS/TSO, CICS/VS, VSE/ESA, or VSE/SP with the corresponding version of the 3270 File Transfer Program (**IND$FILE**) installed. The application program can transfer a file from the local system to the host (uploading) or from the host to the local system (downloading). The program interface is a library linked with a user application program that can be written in C, Pascal, or FORTRAN. HCON provides a set of include files or header files that must be included in the user's application program to use the programmatic file transfer. The header files include data structures and constants used by the file transfer function.

The file transfer programming interface consists of library routines that are linked with a user application program written in C, Pascal, or FORTRAN. The file transfer routines are:

fxfer (C), pfxfer (Pascal), ffxfer (FORTRAN)
Initiates a file transfer from within an application program.

cfxfer(C), pcfxfer (Pascal), fcfxfer (FORTRAN)
Returns a completion status of the file transfer request to the program.

Restart Files and Interruptions

When the **fxfer** program, invoked from the command line, is interrupted for some reason (either a user or operating-system generated interruption or a host-generated interruption), a restart file is created. However, when programs using the file transfer program interface are interrupted for some reason, no restart files are created. Also, if restart files do exist due to previous file transfers, the file transfer program interface does not invoke the restart option (available in the **fxfer** command), but the file transfer fails and returns a status code of 202.

Note: The file transfer status code returns are described in the table of "File Transfer Error Codes" on page A-3.

Synchronous and Asynchronous File Transfers

Synchronous and asynchronous file transfers differ in these respects:

- Synchronous file transfers are processed immediately. If a current file transfer has not completed, additional synchronous file transfer requests generate a host connection busy message.
- Asynchronous file transfers are processed in the background. If a current file transfer is not complete, additional asynchronous file transfer requests to the same session are placed in a queue. Each request is processed after the preceding file transfer has completed.
- Do not attempt a synchronous transfer while any other file transfer is being processed.

Security

The file transfer program protects the user and host logons, as well as the integrity of the files. Passwords for any host logon are solicited from the terminal. The password is not displayed on the screen and is not maintained in any file. If a password is maintained in memory for any length of time, it is disguised by the **fxfer** program.

A logical path created by the file transfer program is destroyed when the session is stopped by logging off, the associated queue is emptied, and the time specified in the file transfer wait period within the session profile has expired. If the associated queue is not empty, the logical path is not destroyed until all the queued requests are processed and the specified wait period has expired.

The **fxfer** function does not replace existing files unless the **FXC_REPL** option is specified. This option replaces, or overwrites, the contents of an existing file. If the replace option is not specified and the destination file exists, the function stops with an error condition. It is not necessary to specify the **FXC_REPL** option when uploading to a communication interrupt control program (CICS) host, in which the replace option is the default.

The file transfer program interface includes a file protection mechanism when downloading files to the local system. This ensures the destination file, which exists before the file transfer begins, is not destroyed or altered if the file transfer is interrupted. This protection mechanism is not available when uploading files to the host.

File Transfer Programming Header Files

All file transfer programs use a defined data structure (provided in header files) for each language. File transfer header (include) files are as follows:

/usr/include/fxfer.h
C language file transfer include file with structures and definitions.

/usr/include/fxconst.inc
Pascal language file transfer constants.

/usr/include/fxfer.inc
Pascal language file transfer include file with structures.

/usr/include/fxhfile.inc
Pascal language file transfer invocation include file.

File Transfer Data Structures

The C and Pascal program interfaces for the **fxfer** function use data structures that are defined in header files. The C Program Interface uses the **/usr/include/fxfer.h** file. The Pascal Program Interface uses the **/usr/include/fxfer.inc** file.

Note: The FORTRAN Program Interface does not use include files. Check the syntax provided by the **fxfer** and **cfxfer** functions to determine how to handle the FORTRAN implementation.

HCON Programming Examples

HCON includes program examples that illustrate the use of the application program interface (API), automatic logon, and file transfer programming facilities. Program examples fall into the following categories:

File Transfer Program
File transfer programming examples illustrate the use of the **fxfer** function.

AUTOLOG Provide samples of AUTOLOG scripts. The **/usr/lib/hcon** directory contains the sample AUTOLOG scripts: **SYStso**, **SYSvm1**, and **SYSvm2**. The **logform** file displays how the script looks when invoked by the **genprof** command.

File Transfer Programming Examples

File transfer programming examples are provided only in the documentation and are for illustrative purposes only. The program examples illustrating the use of the file transfer programming interface are:

cname Example C program illustrating the file transfer process using the file transfer program interface.

pname Example Pascal program illustrating the file transfer process using the file transfer program interface.

fname Example FORTRAN program illustrating the file transfer process using the file transfer program interface.

Compiling Example Programs

For information about how to debug, compile, and link HCON programming applications, refer to “Compiling a File Transfer Program” on page 5-12.

VM/CMS File Transfer Program Example

The following program illustrates the file transfer process using the file transfer program interface on VM/CMS. To upload the file to an MVS/TSO host, the host option flag **FXC_CMS** must be changed to **FXC_TSO** and the host file name must be in MVS/TSO format. To upload the file to a CICS host, the host option flag **FXC_CMS** must be changed to **FXC_CICS**, and the file name must be in CICS format. To upload the file to a VSE host, the host option flag **FXC_CMS** must be changed to **FXC_VSE**, and the file name must be in VSE format.

```
/************************************************************
Program Name : cname – transfers a file using the file
                       transfer Program Interface
Module Name  : cname.c
Description  : The following program uploads a file from the
               operating system to the VM/CMS host.The file is
               translated from ASCII to EBCDIC using the
               translation tables of the language specified in
               the session profile.   The file overwrites the
               host file, if it exists. The transfer is performed
               via manual logon;  that is, the user must
               establish a host session by logging on to the host
               and running the application from the e789
               subshell.
*************************************************************/


#include <stdio.h>
#include <sys/types.h>
#include <fxfer.h>
#include <memory.h>
#include <time.h>
main()
{
     extern  char*malloc();
     extern  void free();
     extern  void exit();
     extern  unsigned int sleep();
     struct fxc *xfer;
     struct fxs sxfer;
     timer_t tmptime;
     char *c_time;
     register int LOOP;  /* indicates status not available yet */

     LOOP = 0;
     xfer = (struct fxc *) malloc (1024);
     xfer->fxc_src = ”samplefile”;  /* Sys file to be uploaded */
     xfer->fxc_dst = ”test file a”; /* VM/CMS Host file name  */

     /***********************************************************
                       Set the transfer flags
     ***********************************************************/
     xfer->fxc_opts.f_flags = 0;
     xfer->fxc_opts.f_flags | = FXC_UP;   /* Upload file flag */
     xfer->fxc_opts.f_flags | = FXC_TNL;  /* Translate--EBCDIC */
     xfer->fxc_opts.f_flags | = FXC_REPL; /* Replace host file if
                                                  it exists   */
     xfer->fxc_opts.f_flags | = FXC_QUEUE;/* Transfer file,
                                               asynchronously  */
     xfer->fxc_opts.f_flags | = FXC_VAR;  /* Variable host record
                                                 format   */
     xfer->fxc_opts.f_flags | = FXC_CMS;  /* VM/CMS host      */
     xfer->fxc_opts.f_logonid = (char *)0;    /* Explicit  file
                                               transfer      */
     xfer->fxc_opts.f_inputfld = (char *)0;   /* VSE and CICS
                                               input field   */
     xfer->fxc_opts.aix_codepg = (char *)0;   /* Alternate aix
                                               codeset       */
     xfer->fxc_opts.f_lrecl = 132;            /* Logical record
                                                  length      */

/* from subshell of an  already logged on emulator session */

     if ( fxfer(xfer,(void *)0) == 0) {     /* Send file transfer
                                                    request   */
       for (;;) {
          switch(cfxfer(&sxfer)) {          /* Check status   */
            case -1:
                   LOOP = 0;
                   printf(”Status file not available due to\n”);
                   printf(” status file I/O error\n”);
/* Check the $HOME/hconerrors file for possible cause of error */
                   break;
            case 0:
                   LOOP = 0;
                   printf(”Source file:%s\n”, sxfer.fxs_src);
                   printf(”Destination file:%s\n”,
                                               sxfer.fxs_dst);
                   printf(”Byte Count:%d\n”, sxfer.fxs_bytcnt);
                   printf(”MSG No:%d\n”, sxfer.fxs_stat);
                   printf(”ERROR if any:%d\n”, sxfer.fxs_errno);
                   printf (“Destination file creation time:%s\n”,
                                               sxfer.fxs_ctime);
                   break;

            case -2:
                   LOOP = 1;
                   sleep(15);
                   printf(”Status not available yet\n”);
                   break;
           }
           if ( !LOOP  ) {
                 break;
           }
     }
  }

  free(xfer);
  exit(1);
}
```

FORTRAN File Transfer Program Example

The following programming example shows the downloading procedure for the TSO file, **test.file**.

```
C SAMPLE PROGRAM ”sample fname”
C THIS FORTRAN PROGRAM WILL DOWNLOAD THE TSO FILE test.file TO
C THE AIX TEXT FILE /tmp/testfile.  THE FILE WILL BE TRANSLATED
C AND REPLACED ON THE OPERATING SYSTEM IF IT
C ALREADY EXISTS.  WE WILL BE INVOKING
C THE FILE TRANSFER TO SESSION a.
        INTEGER FCFXFER
        EXTERNAL FCFXFER
        INTEGER FFXFER
        EXTERNAL FFXFER
        CHARACTER*60 SRC
        CHARACTER*60 DST
        CHARACTER*60 SRCF
        CHARACTER*60 DSTF
        CHARACTER*25 LOGID
        CHARACTER*20 COMM
        CHARACTER*60 TIME
        CHARACTER*64 INPUTFLD
        CHARACTER*16 AIXCODESET
        INTEGER BYTCNT,STAT,ERRNO
        INTEGER FLAGS,RECL,BLKSIZE,SPACE,INCR,UNIT,RC1,RC2
 5      FORMAT (”-----------------------------------------”)
 6      FORMAT (”FXFER RETURN CODE  =”,1X, I4)
 7      FORMAT (”CFXER RETURN CODE  =”,1X, I4)
 8      FORMAT (”SOURCE FILE      =”,1X, A)
 9      FORMAT (”DESTINATION FILE =”,1X, A)
 10     FORMAT (”BYTE COUNT       =”,1X, I10)
 11     FORMAT (”TIME             =”,1X, A)
 12     FORMAT (”STAT             =”,1X, I10)
 13     FORMAT (”ERRNO            =”,1X, I10)
        DSTF = ’/tmp/testfile’//CHAR(0)
        SRCF = ’test.file’//CHAR(0)
        LOGID = CHAR(0)
        INPUTFLD = CHAR(0)
        AIXCODESET = CHAR(0)
        SRC = CHAR(0)
        DST = CHAR(0)
        RECL = 0
        BLKSIZE = 0
        SPACE = 0
C  THESE FLAGS REPRESENT TSO(1024) + REPLACE(16) + TRANSLATE(4)
C  + DOWNLOAD(2)
        FLAGS = 1046
C  WE WANT TO RUN THE FILE TRANSFER TO SESSION a.
        COMM = ’a’//CHAR(0)
        RC1 = FFXFER(SRCF,DSTF,LOGID,FLAGS,RECL,BLKSIZE,SPACE,
     + INCR,UNIT,INPUTFLD,AIXCODESET,COMM)
        WRITE(6,6) RC1
        RC2 = FCFXFER(SRC,DST,BYTCNT,STAT,ERRNO,TIME)
        WRITE(6,7) RC2
        WRITE(6,5)
        WRITE(6,8) SRC
        WRITE(6,9) DST
        WRITE(6,10) BYTCNT
        WRITE(6,11) TIME
        WRITE(6,12) STAT
        WRITE(6,13) ERRNO
        WRITE(6,5)
22      STOP
23      END
```

Pascal File Transfer Program Example

The following programming example displays how to use the **pfxfer** function to upload the binary file, **bin_file**, to a TSO host.

```
{***************************************************************}
{                                                               }
{ This Pascal program uses the File transfer pfxfer function to }
{ upload the binary file bin_file to a TSO host.  The program   }
{ will prompt the user for a session profile to do the file     }
{ transfer and will use the AUTOLOG script SYStso2 to logon to  }
{ the host id johndoe with trace and time=10 being set.         }
{***************************************************************}
program pname;

const

%include /usr/include/fxconst.inc

type

%include /usr/include/fxfer.inc
%include /usr/include/fxhfile.inc

var

        strc2   : fxs;
        strc1   : fxc;
        source, destin: stringptr;
        profid  : stringptr;
        login   : stringptr;
        inputfld: stringptr;
        aixcodepg: stringptr;
        rtval1  : integer;
        rtval2  : integer;
```

```
begin
        new(source, 256);
        new(destin, 256);
        new(profid, 256);
        new(login, 102);
        new(inputfld, 64);
        source@ := '/bin_file';
        destin@ := 'binfile';
{   Prompt the user for the session profile to use
       }
        writeln('Enter a profile id: ');
        readln(profid@);
{   Set login Host user id to johndoe, Autolog profile to SYStso2
       }
{   turn trace on, and set time to 10 seconds.
       }
        login@ := 'johndoe,tso2,trace,time=10';
        inputfld := char(0);
        aixcodepg := char(0);
        strc1.fxc_opts.f_logonid := login;
{   Set the options to upload to a TSO host
       }
        strcl.fxc_opts.f_inputfld := inputfld;
        strcl.fxc_opts.f_aix_codepg := aixcodepg;
        strc1.fxc_opts.f_flags := FXC_UP + FXC_TSO;
        strc1.fxc_src := source;
        strc1.fxc_dst := destin;
        strc1.fxc_opts.f_lrecl := 0;
        rtval1 := pfxfer(strc1,profid);
        writeln('pfxfer return   = ',rtval1);
        rtval2 := pcfxfer(strc2);
        writeln('pcfxfer return  = ',rtval2);
        writeln('------------------------------------------------')
;
        writeln('Source file      = ',strc2.fxs_src@);
        writeln('Destination file = ',strc2.fxs_dst@);
        writeln('Byte count       = ',strc2.fxs_bytcnt);
        writeln('Time             = ',strc2.fxs_ctime@);
        writeln('Stats            = ',strc2.fxs_stat);
        writeln('Errno            = ',strc2.fxs_errno);
        writeln('------------------------------------------------')
;
        writeln;
end.
```

HCON Programming References

HCON programming references include functions, header files, status codes, example programs, and management files.

File Transfer Program

The file transfer program interface facilitates the transfer of files between a local system and a mainframe host.

Functions

cfxfer Checks the status of the programmatic file transfer.

fxfer Initiates a file transfer from within a program.

Header Files

/usr/include/fxfer.h
Contains file transfer include file with structures and definitions for C.

/usr/include/fxconst.inc
Contains Pascal file transfer constants.

/usr/include/fxfer.inc
Contains Pascal file transfer include file with structures.

/usr/include/fxhfile.inc
Contains Pascal file transfer invocation include file.

Program Examples

cname Example C language program illustrating a file transfer using the file transfer program interface.

pname Example Pascal language program illustrating a file transfer using the file transfer program interface.

fname Example FORTRAN language program illustrating a file transfer using the file transfer program interface.

Compiling a File Transfer Program

This article describes how to compile a File Transfer Program.

Prerequisites

1. The HCON program and messages must be installed and configured on your system.
2. The specific computer language compiler the file transfer program was written in (Pascal, FORTRAN, or C) must be installed on your system.

Note: Any and all HCON file transfers of API and HLLAPI programs, requiring any type of compilation, must have the –l iconv follow any of the following libraries the customer is compliling with:

- **–l fxfer**
- **–l g3270**
- **–l g3270f**
- **–l g3270p**
- **–l hllapi**

Procedure

Procedures for compiling a file transfer program are outlined in the following sections.

Compiling a C Program

The following example illustrates how to compile a C program and link it with the file transfer library:

```
cc –o cname cname.c –l fxfer –l iconv
```

where `cname` is the C program executable code and `cname.c` is the actual C file transfer program. The C file transfer program is linked with the **libfxfer.a** library.

Compiling a FORTRAN Program

The following example illustrates how to compile a FORTRAN program and link it with the file transfer library:

```
xlf –v fname.f –o fname –l fxfer –l iconv
```

where `fname.f` is the name of the FORTRAN file transfer program and `fname` is the name of the FORTRAN executable program.

Compiling a Pascal Program

The following example illustrates how to compile a Pascal program and link it with the file transfer library:

```
xlp –v pname.pas –o pname –l fxfer –l iconv
```

where `pname.pas` is the Pascal file transfer program and `pname` is the Pascal executable code.

Appendix A. HLLAPI Return Codes

This appendix describes the standard return codes for HLLAPI.

Return Codes Overview

Check the return codes for all HLLAPI function calls as a prerequisite for continuing your program. Return codes provide the following types of information:

- If the return code is successful, the program should continue.
- If the return code is unsuccessful, the program returns a system code error. Common causes for a system error are:
  - 3270 terminal emulation session ending while an application is running.
  - Internal HLLAPI resource application error.

A 3270 terminal emulation session is allowed to end while your program is running. This action can cause HLLAPI to return a system error. Your program can recover by calling the RESET SYSTEM (21) function. This function allows HLLAPI to reinitialize to its starting state.

Description of Standard Return Codes

The following standard return codes are used by most of the functions. However, these standard return codes can have slightly different interpretations when used with individual functions. The return codes that are specific to individual functions are discussed only in the individual function description. Refer to each individual function for a complete explanation of its return codes.

The following standard return codes are explained so that you can use a common error-handling routine in your HLLAPI program.

Standard Return Codes

Return Code	Explanation
0	Either the function was successfully executed, or there were no host updates since the last call was issued.
1	Either the presentation space short session ID was invalid, or the application is not connected.
2	A parameter error occurred.
4	The execution of the function was inhibited because the target presentation space was busy. For example, X or XSYSTEM is displayed in the OIA for the 3270 terminal emulation.
5	The execution of the function was inhibited for some reason other than the reasons stated in return code 4.
6	A data error occurred due to specification of an invalid parameter (for example, a length error causing truncation).
7	The specified presentation space position was invalid.
8	No prerequisite function was issued.
9	A system error occurred.
10	The function number is not supported by the emulation program.

Standard Return Codes	
Return Code	**Explanation**
11	The resource that you requested is unavailable (for example, too many attempts have been made to connect to the same presentation space (PS) or another application is connected to the PS).
20	Invalid keystroke caused by ESC= option.
21	OIA was updated.
22	PS was updated.
23	Both OIA and PS were updated.
24	Either the string was not found, or the presentation space is unformatted.
25	Keystrokes were not available on input queue.
26	A host event occurred. See QUERY HOST UPDATE (24) for details.
28	Field length was 0.
31	Keystroke queue overflow. Keystrokes were lost.

File Transfer Error Codes

This table describes the standard return codes for the SEND FILE and RECEIVE FILE functions of HLLAPI.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
200	The file transfer program cannot attach to the HCON shared memory.	Check that the HCON resource manager is running.
201	The file transfer program received no response from the HCON resource manager (**hcondmn**) about the session profile.	Check that the resource manager is running, check to make sure the session profile specified exists and is valid, or use local problem reporting procedures.
202	A **RESTART** file exists. The file transfer is stopped. A programmatic file transfer cannot run while a **RESTART** file exists.	Remove the **RESTART** file (**i_fxfer.r** or **x_fxfer.r**) before trying to run the programmatic file transfer.
203	Cannot get information about the **RESTART** file. The **stat()** system call error number is (**fxs_errno**).	Check path name and permissions or use local problem reporting procedures.
209	Cannot get the path name of the current working directory.	Check path name and permissions, or use local problem reporting procedures.
210	Two options that cannot be set together have been specified.	Check the flag options for the setting of similar or mutually exclusive options.
211	An incorrect option has been specified with the CMS host operating system.	
213	The file transfer program cannot properly connect to the HCON resources.	Check that the resource manager is running, be sure the session profile exists and is valid, or use local problem reporting procedures.
214	The file transfer program cannot communicate with the HCON resource manager.	Check that the HCON resource manager is running or use local problem reporting procedures.
215	Return code (**fxs_errno**) from the HCON resource manager is not correct.	Check that the HCON resource manager is running, check that the session is available, or use local problem reporting procedures.
216	An incorrect option has been specified with the CICS/VS or VSE host operating system.	
217	The specified CMS host file name is not correct.	Check the specified CMS file name for a missing file type.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
218	An incorrect option has been specified with the CICS/VS or VSE host operating system. The **FXC_FIXED** option (**–F** flag) and **FXC_VAR** option (**–V** flag) are only valid if the **FXC_TNL** option (**–t** flag) or the **FXC_TCRLF** option (**–T** flag) is specified.	
219	The destination file already exists.	Specify the **FXC_REPL** option (**–r** flag) or give a different destination file name.
220	The specified TSO host file name is not correct.	Check the TSO file name either includes an open parentheses or is not enclosed by both open and closed parentheses.
221	This user cannot run the **dfxfer** file transfer background process.	Check for the **dfxfer** process in /**usr**/**bin**, check permissions, or use local problem reporting procedures.
222	The **HOME** environment variable is not defined.	Set the **HOME** environment variable to your **HOME** directory.
223	An incorrect option has been specified with the CICS or VSE host operating system. The **FXC_LRECL** option (**–L** flag) is only valid if the **FXC_FIXED** option (**–F** flag) is specified.	
225	Either the host link address is busy, the host link address does not exist, or there are some remaining messages on the message queues.	If the host link address is busy, try again later. If the host link address is not busy, restart the emulator and try the file transfer again or use local problem reporting procedures.
226	The host operating system specified is invalid.	Specify TSO, CMS, CICS, or VSE.
227	An incorrect option has been specified with the CICS or VSE host operating system. The **FXC_APPEND** option (**–a** flag) is only valid during a download.	
229	The **f_inputfld** value (**–I** flag) can be set only when issuing a file transfer to a CICS or VSE host operating system.	
230	The file transfer process cannot get information about the specified file name.	Check that the specified file name exists and has the correct permissions.
253	Cannot create another **dfxfer** process at this time. The **fork** system call error number is (**fxs_errno**).	Check that there is a valid **dfxfer** process in the directories of the **PATH** environment variable or use local problem reporting procedures.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
259	Cannot send an interrupt signal to kill the **dfxfer** file transfer daemon background process. The **kill** system call error number is (**fxs_errno**).	Kill the **dfxfer** file transfer daemon process by issuing a **kill –9** command to the **dfxfer** process on the command line or use local problem reporting procedures.
265	Transfer Status: The file transfer request was cancelled. Diagnostics: An error occurred while trying to create the file transfer buffer shared segment ID.	Try the file transfer again or use local problem reporting procedures.
266	Transfer Status: The file transfer request was cancelled. Diagnostics: An error occurred while trying to attach to the file transfer buffer shared segment ID.	Try the file transfer again or use local problem reporting procedures.
271	Cannot initialize the **e789x** emulator server process.	Check that there is a valid **e789x** program in the directories of the **PATH** environment variable or use local problem reporting procedures.
273	Cannot initialize the **e789x** emulator server process. The emulator server process ended abnormally.	Check that there is a valid **e789x** program in the directories of the **PATH** environment variable, retry the file transfer, or use local problem reporting procedures.
274	A session profile identifier was not specified or the **SNAME** environment variable is not set to a valid session profile.	Specify a valid session profile for the session profile parameter or set the **SNAME** environment variable to a valid session profile name.
276	Transfer Status: The file transfer request was cancelled. Diagnostics: An error was detected while trying to send the **IND$FILE** command to the host.	Check that the control unit is running, check that all connections are up, or use local problem reporting procedures.
277	Transfer Status: The file transfer request was cancelled. Diagnostics: There was an error sending the file transfer request to the host.	Check that the control unit is running or use local problem reporting procedures.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
279	Transfer Status: The file transfer request was cancelled. Diagnostics: The CICS or VSE file name specified is missing, is invalid, or the host disk has read-only access.	Specify a valid data set name, or talk with the host system administrator to get write permissions on the specified disk.
280	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The wrong host operating system has been specified either on the command line or in the session profile.	Retry the file transfer specifying the correct operating system.
281	The file transfer completed with no errors.	The host file records are segmented.
282	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: There is not enough disk space available on the host.	Delete some useless files on your host disk or ask the host system administrator for more disk space.
283	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The request code was not correct.	Retry the file transfer using correct request codes or use local problem reporting procedures.
284	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: A specified flag is not correct, the specified host file does not exist on the host, or the host operating system is incorrect.	Retry the file transfer using correct flags for the specified host operating system, retry the file transfer using an existing host file, or specify the correct host operating system.
285	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: There is an error reading from or writing to the host disk, the specified partitioned data set is full, or the specified partitioned data set member does not exist.	Make sure that the host disk you are transferring to or from exists, is valid, and can be written to or read from, increase the size of the specified partitioned data set, or specify an existing partition data set member.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
286	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: A host option specified is invalid for this particular host operating system.	Retry the file transfer specifying the correct host operating system or the correct flag value.
287	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: Cannot write a file to the host.	Check to make sure that the host disk you are transferring to exists, is valid, and has write permissions.
288	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: Cannot read a file from the host.	Check to make sure that the host disk you are transferring from exists, is valid, and the file you are attempting to download from the host exists.
289	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The TSO data set name specified is missing, already exists, or the host disk has read-only access.	Specify a data set name that is valid or talk with the host system administrator to get write permissions on the specified host disk.
290	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The **–S** flag was specified incorrectly.	Refer to the help menu by entering **fxfer –h** for the correct usage of the **–S** flag.
291	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: Do not specify the flags specified with a Partitioned Data Set.	
292	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: Specify only one of tracks, cylinders, or avblocks when specifying the **–S** flag.	

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
293	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The CMS file identifier is missing or not correct.	Specify all CMS file identifiers correctly.
294	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The CMS file specified as the source file does not exist on the host.	
295	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The CMS disk has read permissions only.	Talk with the host system administrator to get write permissions on the specified disk.
296	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: Either the CMS disk is not accessible or the file already exists.	Try to upload the file using the **–r** flag to replace the existing file on the host or talk to the host system administrator.
297	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The CMS disk is full.	Delete some useless files on your host disk or ask the host system administrator for more disk space.
298	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: Invalid options specified without the **–a** flag.	Specify the **FXC_APPEND** option (**–a** flag) to do the file transfer specified.
299	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: Specify **–r** flag to replace the file.	The specified file already exists on the host, the user must specify the **FXC_REPL** option (**–r** flag) to replace it.
300	Transfer Status: The file transfer completed with no errors.	

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
301	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The host error message was not recognizable.	Check to make sure the host file transfer utility **(IND$FILE** or its equivalent**)** you are using is correct and up to date. Or use local problem reporting procedures.
302	**Warning:** The **dfxfer** file transfer daemon process attempts to send file transfer complete acknowledgement to the **fxfer** front end process failed. The **msgsnd()** system call error number is (f**xs_errno**).	The **fxfer** front-end process was either removed or the emulator session was terminated.
303	Transfer Status: The file transfer request was cancelled. Diagnostics: A message sent by the **fxfer** front-end process to the **dfxfer** file transfer background process failed. The **msgrcv()** system call error number is (**fxs_errno**).	Make sure that neither the **fxfer** nor the **dfxfer** processes were interrupted. Or use local problem reporting procedures.
304	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot read from the source file for uploading. The **read()** system call error number is (**fxs_errno**).	Check path name and permissions, try again later, or use local problem reporting procedures.
305	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot open the source file for uploading. The **open()** system call error number is (**fxs_errno**).	Check path name and permissions, or use local problem reporting procedures.
306	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot close the uploaded source file. The **close()** system call error number is (**fxs_errno**).	Check path name and permissions or use local problem reporting procedures.
307	Transfer Status: The file transfer request was cancelled. Diagnostics: The specified source file is empty.	Files with zero bytes cannot be transferred.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
309	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot write to the destination file. The **write()** system call error number is (**fxs_errno**).	Check path name and permissions, try again later, or use local problem reporting procedures.
310	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot open the temporary replace file for downloading. The **open()** system call error number is (**fxs_errno**).	Check path name and permissions, do not use the **–r** flag, or use local problem reporting procedures.
311	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot open the destination file for download. The **open()** system call error number is (**fxs_errno**).	Check path name and permissions or use local problem reporting procedures.
312	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot close the destination file. The **close()** system call error number is (**fxs_errno**).	Check path name and permissions or use local problem reporting procedures.
313	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot delete the original destination file. The **unlink()** system call error number is (**fxs_errno**).	Check path name and permissions, try to download to a different file name without using the **–r** flag, or use local problem reporting procedures.
314	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot link the **replace** file to the destination file. The **link()** system call error number is (**fxs_errno**).	Check path name and permissions, try to download to to a different file name without using the **–r** flag, or use local problem reporting procedures.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
315	Transfer Status: The file transfer completed with one warning. **Warning:** Cannot delete the temporary **replace** file name. The **unlink()** system call error number is (**fxs_errno**).	Check path name and permissions, try to download to a different file name without using the **–r** flag, or use local problem reporting procedures.
316	Diagnostics: Cannot open the diagnostics output file that contains the status information. The **open()** system call error number is (**fxs_errno**).	Check path name and permissions or use local problem reporting procedures.
318	Transfer Status: The file transfer request was cancelled. No **RESTART** file was created. Diagnostics: There was an error in the **RESTART** file input or output operation. A system call error occurred. The error number is (**fxs_errno**).	Check path name and permissions or use local problem reporting procedures.
319	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot log on to the host. The AUTOLOG program return code is (**fxs_errno**).	Use the **tlog** command to make sure that the AUTOLOG script used to log on to the host is correct.
320	Transfer Status: The file transfer completed with one warning. **Warning:** Could not get the destination file creation time.	Check permissions or use local problem reporting procedures.
323	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot receive a message through the **fxfer** message queue. The **msgrcv()** system call error number is (**fxs_errno**).	Ensure the HCON resource manager has not been removed; check that the **fxfer** and/or**dfxfer** processes have not been removed; check that the message queue in question has not been removed; or use local problem reporting procedures.
325	Transfer Status: The file transfer did not complete. Diagnostics: The connection with the host is lost and no recovery for an explicit file transfer is available.	Check that the coaxial cable is still connected or use local problem reporting procedures.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
326	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot send a message through the **fxfer** message queue. The **msgsnd()** system call error number is (**fxs_errno**).	Check to make sure that the HCON resource manager has not been removed; check that the **fxfer** and/or **dfxfer** processes have not been removed; check that the ipcs message queue in question has not been removed; or use local problem reporting procedures.
327	Transfer Status: The file transfer did not complete. Diagnostics: The connection with the host is lost. Cannot recover in the specified recovery time.	Check that the coaxial cable is connected, check that the control unit is running, or use local problem reporting procedures.
328	Transfer Status: The file transfer did not complete. Diagnostics: An error specific to the VSE host environment has occurred.	If in explicit mode, refer to the VSE host file transfer handbook or contact a VSE host administrator. If running in implicit mode, attempt to recreate the problem following the instructions for explicit mode.
330	Transfer Status: The file transfer request was cancelled. Diagnostics: The session is busy at this time.	Try again later or use local problem reporting procedures.
331	Transfer Status: The file transfer request was cancelled. Diagnostics: An error was received while trying to receive a message from the emulator server.	Check that the emulator server session was not deleted, that the HCON resource manager (**hcondmn**) is still running, and that the **ipcs** message queue has not been deleted, or use local problem reporting procedures.
333	Transfer Status: The file transfer request was cancelled. Diagnostics: The file transfer received an interrupt signal.	A **RESTART** file should be created that will allow the user to restart the interrupted file transfer.
334	Transfer Status: An error occurred during the file transfer. Diagnostics: A system call failed. The system call error number is (**fxs_errno**).	Check path name and permissions and try the file transfer again. Or use local problem reporting procedures.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
335	Transfer Status: The file transfer request was cancelled. Diagnostics: A bad message queue input was sent to the emulator server.	Try the file transfer again or use local problem reporting procedures.
336	Transfer Status: The file transfer request was canceled. Diagnostics: The file transfer was interrupted due to an attention key or system request key. A **RESTART** file should have been created that will allow the user to restart the interrupted file transfer.	Restart the file transfer.
338	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot get the status of the file transfer message queue. The **msgctl()** system call error number is (**fxs_errno**).	Make sure that the HCON resource manager has not been removed; check that the **fxfer** and **dfxfer** processes have not been removed; check that the ipcs message queue in question has not been removed; or use local problem reporting procedures.
339	Transfer Status: The file transfer request was cancelled. Diagnostics: The **dfxfer** file transfer background process queue was removed. The system call error number is (**fxs_errno**).	The user removed either the emulator server session or the HCON resource manager before the file transfer had completed or before the file transfer wait time had run out.
340	Transfer Status: The file transfer request was cancelled. Diagnostics: An interrupt was received while the file transfer **fxfer** process was receiving a message from the **dfxfer** file transfer background process. The interrupt is not of a known type. The system call error number is (**fxs_errno**).	The user removed either the emulator server session or the HCON resource manager before the file transfer had completed or before the file transfer wait time had run out.
343	Restart Status: The **RESTART** file was created.	
344	Restart Status: Cannot create the **RESTART** file. There was an input or output error.	Check path name and permissions or use local problem reporting procedures.

File Transfer Error Codes		
Error Code	**Error Description**	**User Response**
345	Transfer Status: The file transfer request was cancelled. Diagnostics: Cannot initialize the **e789x** emulator process. The **fork()** system call error number is **n**.	Check for the **e789x** process in /**usr**/**bin**; check permissions; try again later; or use local problem reporting procedures.
347	Transfer Status: The file transfer request was cancelled. Diagnostics: The file transfer timed out.	If this is the user's first time to run a file transfer, make sure that the **PSERVIC** value has been changed on the host and that **VTAM** has been recycled. Check to make sure that the host is set in extended mode; check that the control unit is not down; check that the host file transfer program variable within the session profile is valid; or use local problem reporting procedures.
349	The connection to the host is lost. Trying to recover the connection.	
350	The system queue is full.	All file transfer requests are cancelled. Increase the system queue value or use local problem reporting procedures. Too many asynchronous file transfer requests may have been queued up also.
352	A message sent to the **dfxfer** file transfer background process has been interrupted. The **dfxfer** file transfer background process may have been deleted, the HCON resource manager may have been removed, or the file transfer message queue may have been removed.	Try the file transfer again or use local problem reporting procedures.
367	The host operating system specified is not valid. This code only applies to the DBCS environment.	Specify TSO, CMS, or CICS.
368	Transfer Status: The file transfer request was cancelled by the host. Diagnostics: The host (APVUFILE) detected an error during the file transfer operation. This code only applies to the DBCS environment.	Refer to the help menu by entering **fxfer –h** for the correct usage of flags or talk with the host system administrator.

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Utiliser les marques de découpe pour obtenir les étiquettes.
Use the cut marks to get the labels.

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