AS/400

3270 Device Emulation Support

Version 4

SC41-5408-00

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August Edition (August 1997)

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Contents

Tables

Figures

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About This Book

This book contains the information you need for setting up and starting 3270 device emulation for either binary synchronous communications (BSC) or Systems Network Architecture (SNA) protocols. Device emulation is available for both displays and printers.

For a list of related publications, see the “Bibliography” on page M-1.

Who Should Use This Book

This book is intended for the following users:

- The display station operator using 3270 device emulation
- The system programmer responsible for configuring the system for 3270 device emulation and setting up 3270 printer emulation
- The host system programmer responsible for generating system device configuration on the host system

If you want SNA program interface information, refer to the *SNA Upline Facility Programming* book.

If you want BSC program interface information, refer to the *System/38 3270 Emulation Reference Manual and User's Guide*.

Users of this book may have different goals. The responsibilities and tasks for each type of user, and the applicable chapters in the book, are outlined below.

Display Station Operator

The display station operator should be familiar with operating a 3270 display station. It is assumed that the operator knows how to start communications with the host system and how to sign on to a display station. The operator will typically do the following 3270 emulation tasks:

- Start 3270 emulation on a display
- Start 3270 emulation on a printer
- Run 3270 display station functions using the necessary key sequence for device emulation
- End display or printer emulation

Chapter 8 is intended for display station operators. Chapter 9 provides information for operators of double-byte character set (DBCS) work stations.

System Programmer

The system programmer is expected to be familiar with communications configuration procedures and is responsible for defining device configuration information for 3270 emulation. Chapter 2, Chapter 5, Chapter 6, and all appendixes are intended for system programmers.

Host System Programmer

This book is also intended for the programmer responsible for generating system device configurations on the host system network, who is required to do the following tasks:

- Modify host system programs in order to support 3270 device emulation
- Generate the host system communications network to include system emulation devices

Chapter 3, Chapter 7, Appendix A, and Appendix B are intended for host system programmers.

Prerequisite and Related Information

For information about other AS/400 publications (except Advanced 36), see either of the following:

- The *Publications Reference* book, SC41-5003, in the AS/400 Softcopy Library.
- The *AS/400 Information Directory*, a unique, multimedia interface to a searchable database that contains descriptions of titles available from IBM or from selected other publishers. The *AS/400 Information Directory* is shipped with the OS/400 operating system at no charge.

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`http://www.as400.ibm.com`

Select the Information Desk, and you will be able to access a variety of AS/400 information topics from that page.

Chapter 1. Introduction to 3270 Device Emulation for BSC

3270 emulation for AS/400* **binary synchronous communications (BSC)** allows you to communicate with a host system that supports a 3270 data stream. BSC is a data communications line protocol that uses a standard set of transmission control characters and control character sequences to send binary-coded data over a communications line.

You can connect systems directly to an existing BSC 3270 network, without changing host applications, or to 3270 networks connected to the host system. In the network, the system appears to the host system to be a 3274 Control Unit with attached display stations and printers, as shown in Figure 1-1.

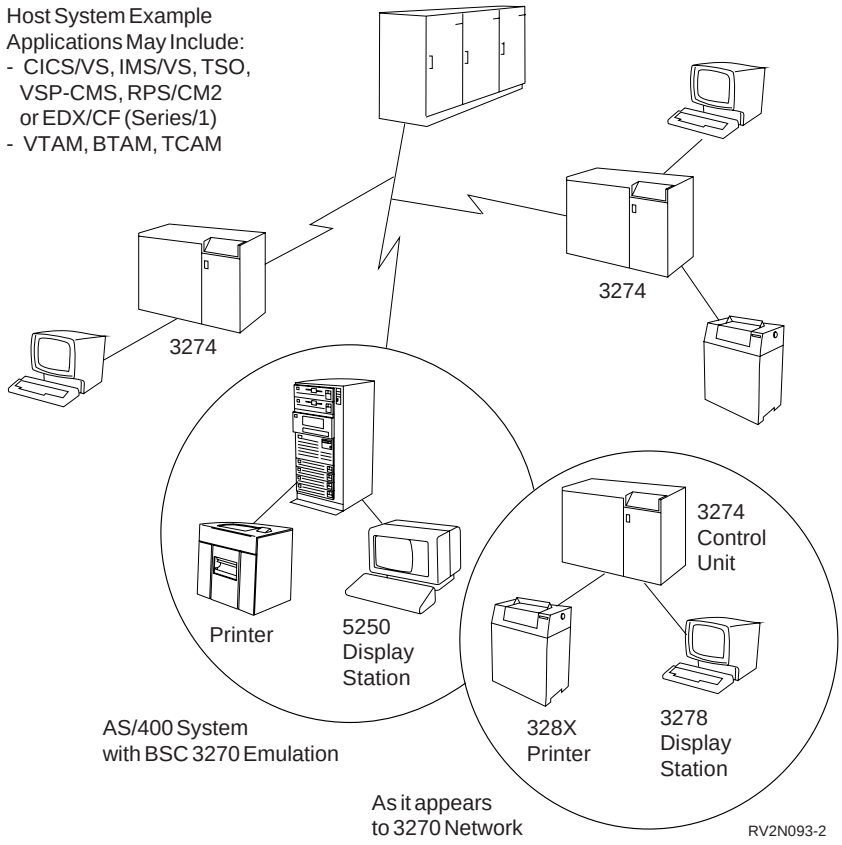


Figure 1-1. BSC 3270 Emulation in a Network

BSC 3270 Emulation Specifications

3270 emulation for BSC can be used with any System/370* or System/390* host system that supports a 3274 Control Unit in a BSC multipoint tributary network using a non-switched line. Both the system and the 3270 devices can be connected into the same multipoint network.

3270 device emulation for BSC supports the following features:

- Emulation on any line attached to the system.
- Any printer that normally attaches to the system can print information received from the host system.
- Display stations and printers that are locally attached to the AS/400 system operate as if they were directly attached to a 3274 Control Unit.
- All 5250 display stations that are used for 3270 display emulation must have either a typewriter keyboard or data entry keyboard.

  Note: The term 5250 display station is used throughout this book to refer to the 3179, 3180 (Model 2), 3196, 3197, 3476, 3477, 3486 (Model BA), 3487 (Models HA, HC, HG, HW), 3488, 5251, 5291, 5292, and any DBCS display configured as a 5555 display station.
- The IBM* Personal Computer can be attached to the system and used for 3270 device emulation for BSC by using one of several 5250 emulation programs. This feature is available through personal computer support of the AS/400 system. (The personal computer is treated as a 5291 display station.)
- All 3270 devices must be connected to the system through 3270 remote attachment support; they cannot be connected locally. Refer to the *Remote Work Station Support* book for more information on remote attachment.

The system and host system requirements and capabilities for 3270 emulation are summarized in Figure 1-2 on page 1-3.

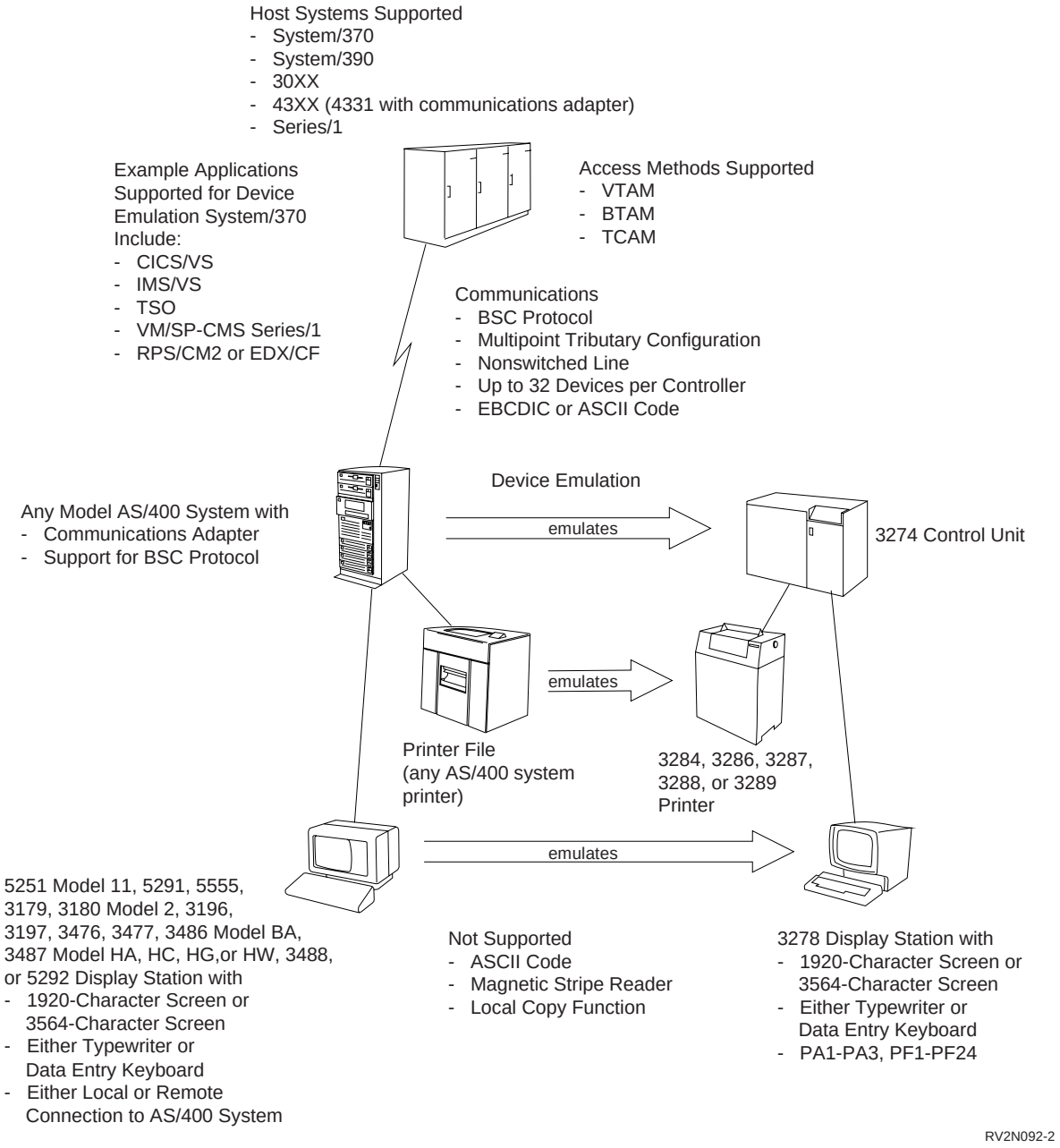


Figure 1-2. Summary of BSC 3270 Emulation Support

BSC Emulation Interfaces

The 3270 emulation for BSC support is provided by two emulation interfaces:

- The 3270 device emulation for BSC interface
- The program interface

Support for both interfaces is included in the Operating System/400* (OS/400*) licensed program. A program interface is available through the System/38 environment. See the *System/38 3270 Emulation Reference Manual and User's Guide* for information on using the program interface.

BSC 3270 Device Emulation Interface

The 3270 device emulation for BSC interface supports both 3278 device emulation and 328x printer emulation.

3270 Device Emulation: 3270 device emulation allows you to use a 5250 display station with host applications as though communicating from a 3278 display station. You start the device emulation session by entering a command at the 5250 display station that requests a 3270 emulation session with the host system. This procedure is described in Chapter 8. The 3270 display emulation translates the data stream between the 5250 display stations and the host system as shown in Figure 1-3.

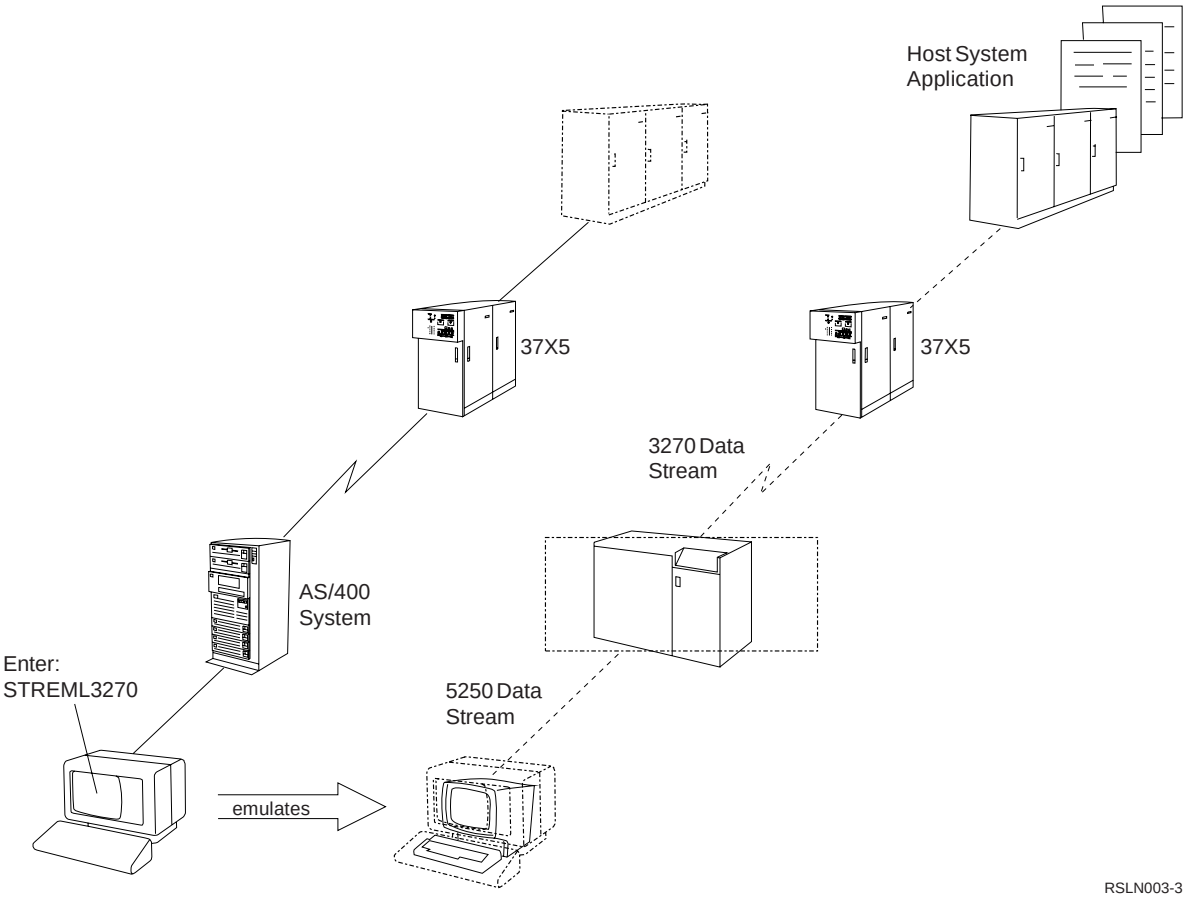


Figure 1-3. 3270 Device Emulation for BSC

Printer Emulation: Printer emulation allows you to start a printing job interactively from a work station, or with a control language (CL) command in a batch or interactive program. During printer emulation, the host system responds as though it is sending data to a 3284, 3286, 3287, 3288, or 3289 printer that is connected to the host system through a 3274 Control Unit. The host system actually writes the data to a printer file, which you can link to any system printer, with or without spooling, as shown in Figure 1-4.

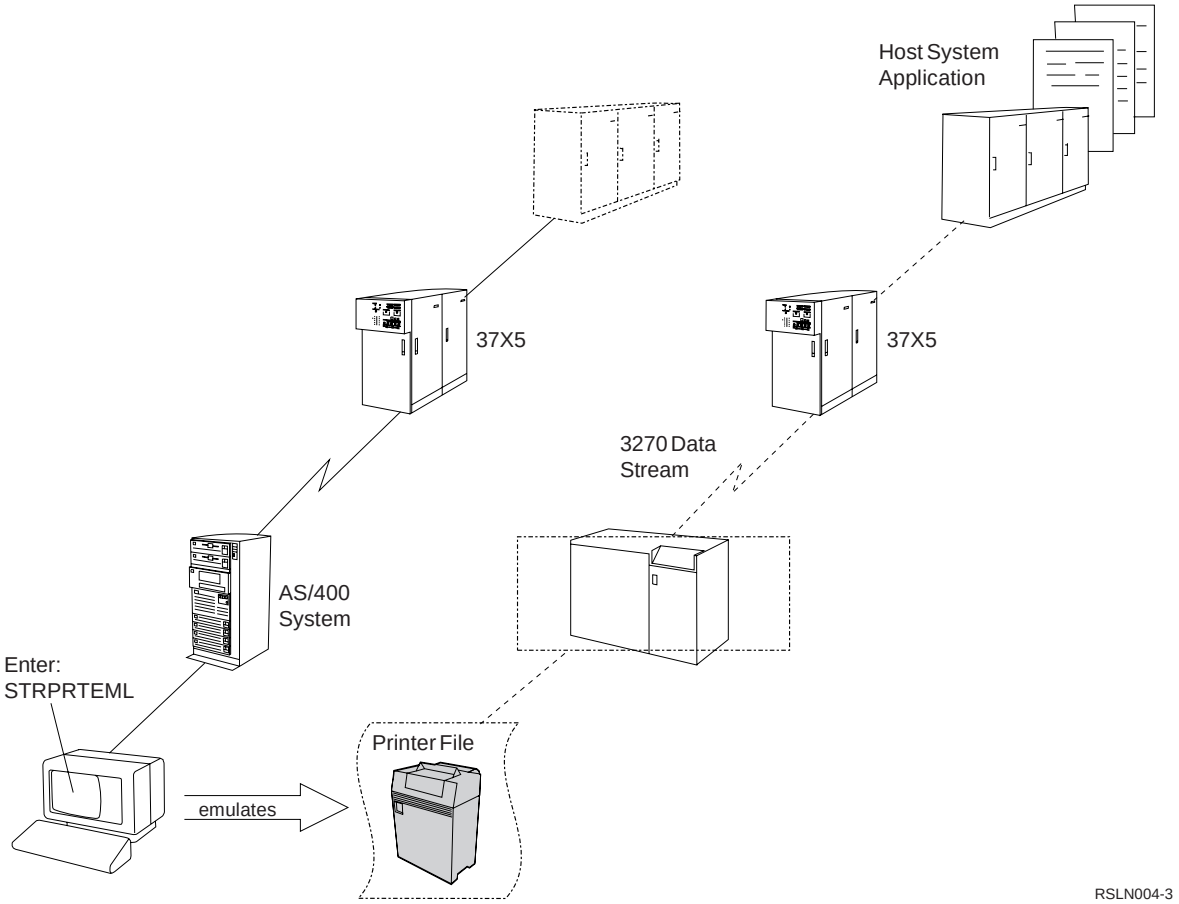


Figure 1-4. 3270 Printer Emulation for BSC

3270 Emulation for BSC Procedures

To use 3270 emulation, you must first create the appropriate communications line, controller, and device descriptions. These procedures are described in Chapter 2. All files, programs, and commands needed for device emulation are supplied with the OS/400 licensed program; no user programming is required.

To use device emulation, you need to know:

- How to enter the CL commands to start and control display or printer emulation.
- How to use the 5250 display station during a device emulation session.
- How to use the host application with which the session was established. For example, during an IBM Virtual Machine Facility/370 (VM/370) session, you must know how to use the VM/370.

The CL emulation commands and the method for using a 5250 display station during emulation are described in Chapter 8. Considerations about communications with the host system are described in Chapter 3.

Generally, little or no change is required to the following host programs using 3270 device emulation for BSC:

- Customer Information Control System for Virtual Storage (CICS/VS)
- Information Management System for Virtual Storage (IMS/VS)
- Time Sharing Option for Virtual Storage (TSO/VS)
- VM/370-Conversational Monitor System (VM-CMS)
- Real-Time Programming System/Communications Monitor (RPS/CM2)
- Event Driven Executive/Communication Facility (EDX/CF)

No changes are required if you replace existing devices. However, if you add new devices to be used for 3270 emulation, you must identify the devices for the host system. See Chapter 2 for more information.

Example of 3270 Emulation for BSC

Figure 1-5 on page 1-7 shows a 3270 network consisting of a host system located in St. Louis and remote locations that communicate with the host system from Dallas, Kansas City, Chicago, and Denver. All locations use a common set of application programs at the host system. In addition, the Denver location uses programs and data that are not used by the other locations. These special programs and data are stored and run on the system in Denver.

Through 3270 device emulation using BSC, users at the Denver location communicate with the host system applications from 5250 display stations in the same way that users at other locations communicate from 3278 display stations. On occasion, users at Denver who are not familiar with host system applications must inquire into its database. Inquiry is handled by a system application program that interacts with a host system application program through the program interface.

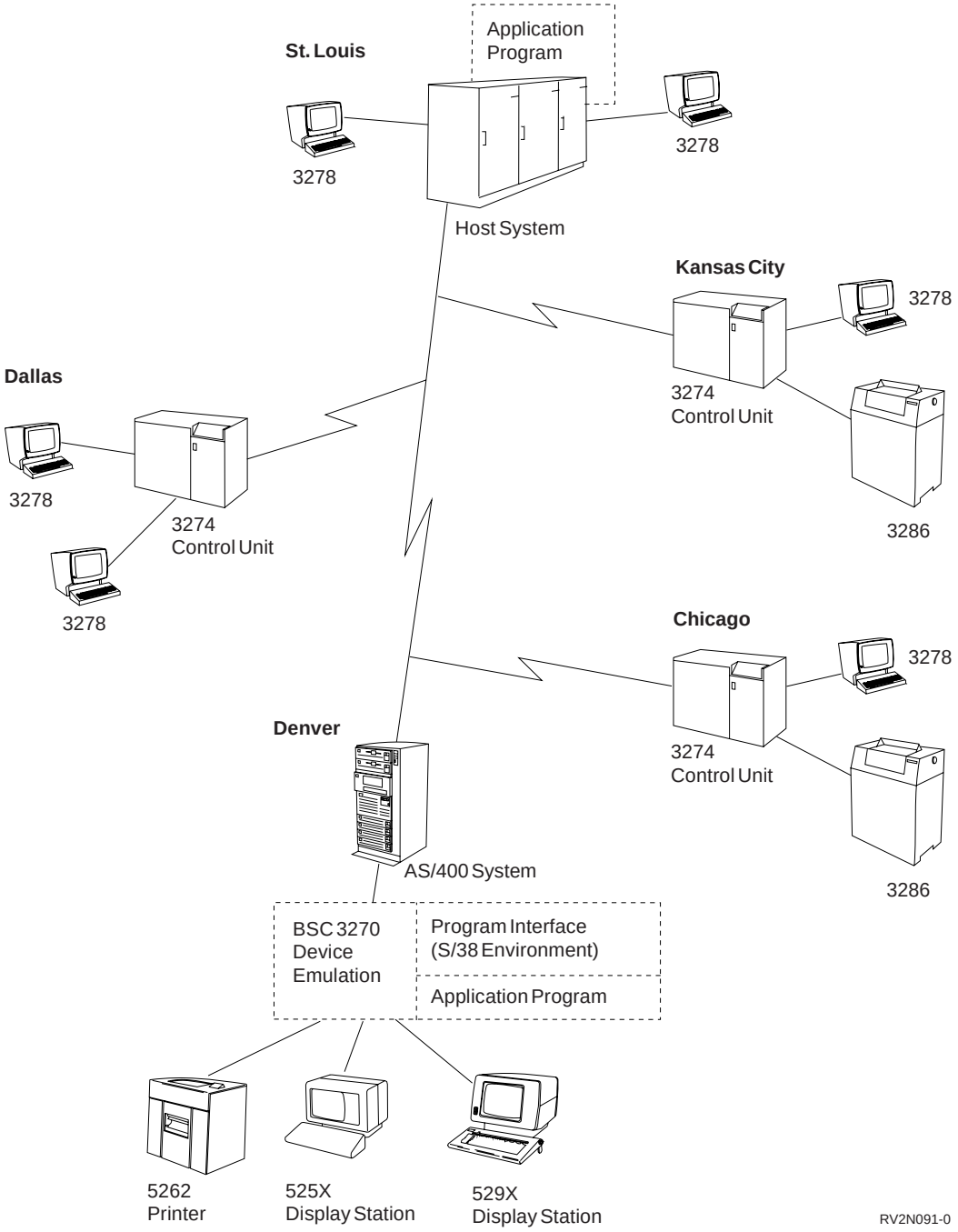


Figure 1-5. Example of 3270 Emulation for BSC

Chapter 2. Configuring 3270 Device Emulation for BSC

When you set up 3270 device emulation for binary synchronous communications (BSC), you must define configuration descriptions for each line, controller and device to be emulated. To configure 3270 device emulation for BSC, go to the AS/400 Main Menu and follow the configuration procedure, or use the appropriate control language (CL) commands.

The following commands allow you to configure a line, controller, or device without using the configuration menu and displays:

- Create Line Description (CRTLINBSC)
- Create Controller Description (CRTCTLBSC)
- Create Device Description (CRTDEVBSC)

After you create the configuration descriptions, you must vary on the line, controller, and device to start 3270 device emulation. The procedures for varying on the emulation line, controller, and device are the same as the procedures for varying on any other system line, controller, and device.

The following topics provide information about only those parameters requiring special attention for each of the three configuration commands. You can use the default values for any parameters that are not described below. A syntax diagram of each command is shown in the *CL Reference* book. Refer to the *Communications Configuration* book for configuration information.

Appendix A provides examples of line, controller, and device configurations created through the displays of the configuration menu.

Creating the Line Description

Use the CRTLINBSC command with the appropriate parameters to create a line description for each line that you use for BSC 3270 emulation.

The key parameters in the CRTLINBSC command are:

LIND

The name of the line description.

Example: `LIND(EMLIN1)`

RSRCNAME

This is the resource name used for communicating over the line specified on the LIND parameter.

Example: `RSRCNAME(LIN011)`

Refer to the *Communications Configuration* book for information about how to define resource names.

APPTYPE

This is the type of application that will use the line. You must specify *EML for BSC 3270 emulation.

Example: `APPTYPE(*EML)`

CNN

This is the type of line connection. You must specify *MPTRIB for BSC 3270 emulation.

Example: `CNN(*MPTRIB)`

STNADR

This is a 2-character station polling address assigned to the AS/400 system in the 3270 BSC tributary network. The station address must be one of the following 32 hexadecimal character combinations:

Station Number	STNADR Code	Station Number	STNADR Code
0	40	16	50
1	C1	17	D1
2	C2	18	D2
3	C3	19	D3
4	C4	20	D4
5	C5	21	D5
6	C6	22	D6
7	C7	23	D7
8	C8	24	D8
9	C9	25	D9
10	4A	26	5A
11	4B	27	5B
12	4C	28	5C
13	4D	29	5D
14	4E	30	5E
15	4F	31	5F

MAXBUFFER

The maximum size of data accepted over the line. You may specify any size, however, for 3270 emulation, at least 5K (5120 bytes) is recommended and 8K (8192 bytes) is the limit.

Example: `MAXBUFFER(8192)`

RCVTMR

This is a receive timer that specifies the time limit during which the host system must respond to the AS/400 system. The RCVTMR value is equivalent to 1/10 of a second. The default is 30 (3 seconds). Normally, the default value is adequate, but if the host system tends to respond slowly, is heavily loaded, or is located at a great distance, you may need to specify a larger value. If the host system does not respond within the specified time interval, the AS/400 system ends emulation with an error message. If this becomes a problem, try increasing the value to 50 (5 seconds).

Example: `RCVTMR(50)`

TEXT

This specifies up to 50 characters that describe the line and its use. This information is often valuable for future reference.

Creating the Controller Description

Use the CRTCTLBSC command with the appropriate parameters to create a controller description. You can create only one controller description for each BSC 3270 emulation line. This controller is not an actual piece of equipment. Instead, it is a definition of the controller address that the host system will poll.

The key parameters in the CRTCTLBSC command are:

CTLD
The name of the controller description.

Example: `CTLD(EMCTL1)`

CNN
This is the type of line connection. You must specify *MPTRIB for BSC 3270 emulation.

Example: `CNN(*MPTRIB)`

LINE
This is the name of the specified line description to which this controller is to be attached.

Example: `LINE(EMLIN1)`

APPTYPE
This is the type of application that will use the controller. You must specify *EML for BSC 3270 emulation.

Example: `APPTYPE(*EML)`

TEXT
This specifies up to 50 characters that describe the controller and its use. This information is often valuable for future reference.

Creating the Device Description

Use the CRTDEVBSC command with the appropriate parameters to create a device description. You can have up to 32 emulation devices connected to each 3270 emulation controller. The device is not an actual piece of equipment like a 5251 display station. Instead, it is a definition of the device address and type with which the host system will communicate. You must create a device description for each device you use for display or printer emulation.

The key parameters in the CRTDEVBSC command are:

DEVD
The name of the device description.

Example: `DEVD(EMDSP40)`

LOCADR
This is a 2-character local location address of the device. The device address must be one of the following 32 hexadecimal character combinations:

LOCADR Code	LOCADR Code
40	50
C1	D1
C2	D2
C3	D3
C4	D4
C5	D5
C6	D6
C7	D7
C8	D8
C9	D9
4A	5A
4B	5B
4C	5C
4D	5D
4E	5E
4F	5F

RMTLOCNAME
This is the name of the remote location. Any name is valid; however, a value identical to the CTL parameter is recommended for 3270 emulation.

Example: `RMTLOCNAME(EMCTL1)`

CTL
This is the name of the controller to which you will connect this emulation device.

Example: `CTL(EMCTL1)`

CNN
This specifies the line connection. The CNN must be *MPTRIB for 3270 emulation.

Example: `CNN(*MPTRIB)`

APPTYPE
This is the type of application that will use the device. You must specify *EML for BSC 3270 emulation.

Example: `APPTYPE(*EML)`

EMLDEV
This specifies the device type. The default is 3278.

Example: `EMLDEV(3278)`

EMLKBD
This specifies whether characters from the emulated keyboard are uppercase only, or uppercase and lowercase. The default is *UPPER. Leave the default if the host system expects to receive uppercase characters. If you specify *LOWER, both uppercase and lowercase characters can be displayed.

Example: `EMLKBD(*LOWER)`

EMLNUMLCK
This indicates when numeric input fields will only allow numeric data on a 5250 keyboard.

Example: `EMLNUMLCK(*NO)`

EMLWRKSTN
This specifies whether the emulation device is restricted to a specific display or printer.

When starting display or printer emulation with a controller or remote location specified, 3270 emulation will select the first available emulation device meeting one of the following conditions:

- The EMLWRKSTN parameter of the emulation device description matches the DSPDEV parameter specified on the STREML3720 command or the PRTDEV parameter specified on the STRPRTEML command.
- The EMLWRKSTN parameter of the emulation device description has the value of *ANY.

Note: If this parameter is specified, it does not assure that the emulation device will be selected by the STREML3270 or STRPRTEML command when using the display station or printer named in the EMLWRKSTN parameter. It assures that no other display station or printer using emulation can use this emulation device.

To assure that the emulation device is selected by the emulation command, create the emulation device descriptions with an EMLWRKSTN value other than *ANY. The emulation device description will appear in the list before any devices with an EMLWRKSTN value of *ANY. The list of emulation devices for a specific controller is defined within the list according to when they are created. The list of emulation devices for a specific location is defined within the list in alphabetical order.

TEXT

This specifies up to 50 characters that describe the device and its use. This information is often valuable for future reference.

Chapter 3. AS/400 System and Host System Considerations for BSC 3270 Device Emulation

This chapter discusses the implications of 3270 emulation on host system applications. Considerations include the status of the line, controller, and devices; performance of multipoint lines; and signals from binary synchronous communications (BSC) 3270 emulation to the host system.

Line, Controller, and Device Status

You must define and vary on the line, controller, and device descriptions used for 3270 device or printer emulation before starting an emulation session. Use the configuration menu or the Vary Configuration (VRYCFG) command to vary on and off these descriptions. See Appendix A for example configuration descriptions.

Effect of Device Emulation on BSC Protocol

User actions, such as requesting a 3270 emulation session, cause a specific sequence of events to occur on the BSC line. Charts in Appendix F show what happens on the line in terms of BSC protocol for both device and printer emulation.

Maximum Number of Sessions

Two limitations on the number of emulation sessions are:

- Maximum number of sessions per line
- Maximum number of sessions accessed by remote location name

The maximum number of sessions per line is limited by the number of emulation device descriptions that can be configured for each line. An emulation device description can be used by only one 3270 device emulation session, printer emulation job, or program interface application at a time. Therefore, because the maximum number of emulation device descriptions for each line is 32, the total of all active 3270 emulation sessions, jobs, and application programs cannot exceed 32 on any given line as shown below.

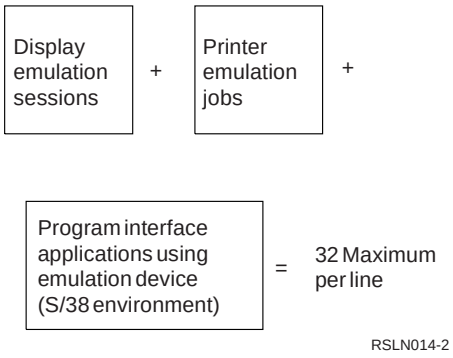


Figure 3-1. Maximum Number of Sessions

Each emulation device description has a remote location name associated with it. The remote location name is a label that can be assigned to more than one device, enabling all the devices with the same remote location name to be identified as a group.

When you specify the remote location name as a parameter on the STREML3270 command, the system searches the alphabetical list of emulation device descriptions that have that remote location name for a device description that is not currently in use. While there is no limit on the number of emulation device descriptions that can have the same remote location name, the system will only search through the first 1016 devices in the list for an available device description to use for an emulation session.

Performance can be significantly affected if many 3270 emulation sessions, jobs, and programs are active at the same time.

Maximum Block Size from the Host System

The system accepts a maximum of 8KB (8192 bytes) from the host system in one transmission block. If the block is greater than 8K, the emulation session fails. You define the maximum block size when you create the BSC line, as described in “Creating the Line Description” on page 2-1.

Test Request

If you start the test request function from a 5250 display station during a 3270 emulation session, the system will send a test request data stream to the host system. This data stream has the same format as the test request read data stream sent by a 3278 display station when you press the System Request key as shown in Figure 3-2 on page 3-2.

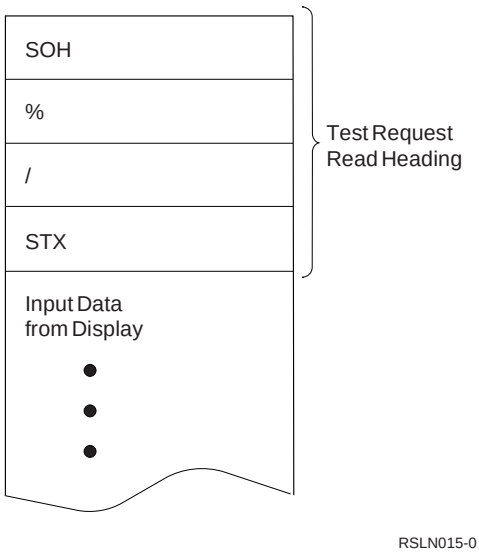


Figure 3-2. Test Request Data Stream Sent to the Host System

If the host system supports online tests from the 3270 test request read data stream, you can use the test request function to check the operation of a display station or printer.

Performance Considerations for Multipoint Lines

If you are using multipoint lines, your system might experience performance degradation under the following circumstances:

- Too many controllers are attached to one line.
- One or more inactive controllers are on the line, and seem active to the host system.

In the first case, performance degradation occurs because the host system is overworked. Each controller on the line must wait its turn to be serviced by the host system. This wait time might be considerable.

In the second case, performance degradation occurs because the host system attempts to poll a controller that was activated by the host system but is powered off or disconnected from the line. In this situation, the host system waits for a reply from the disconnected controller, until an internal host time-out occurs. The host system then polls the next controller on the line.

If several controllers are disconnected from the line, the total wait time can be considerable and this affects the response time of all other controllers on the line. To reduce the problem, contact the host system operator to activate only those controllers that are turned on and connected to the line. This action allows the host system to bypass the inactive controllers and avoid unnecessary waiting and time-outs.

Note: Similar performance problems occur when you use actual 3270 controllers and work stations.

Emulation Start Signal to Host System

A 3270 device end (DE) status message is sent to the host system whenever you start a BSC 3270 emulation session with the STREML3270 or STRPRTEML command. This signal indicates a ready condition when the host system does a specific or general polling list. If the device is a printer, the host system must start the communications by sending data to be printed. For display devices, either the user or the host system can start the conversation (as long as the host system provides a poll). A device must be varied on at the host system before it polls that device or responds to data from a display device during a general polling list.

Emulation End Signal to Host System

When BSC 3270 emulation ends for any reason, normally or abnormally, an intervention required (IR) status is sent to the host system to indicate that the user has turned off the 3270 display station. The host system should be set up to accept this as a forced sign-off. This protects users from accidental security exposures if the user forgets to sign off of the host system before another user starts an emulation session on the same emulation device. Without a forced sign-off by the host system, the second user can finish in the middle of another user's session. Also, if the host system is not set up properly, it may vary off the device that sent the IR status and ignore all later attempts to begin an emulation session with that device.

Chapter 4. Introduction to 3270 Device Emulation for SNA

AS/400 Systems Network Architecture (SNA) device emulation allows you to communicate with applications on System/370 type host systems, without making extensive changes to the host system applications or to the 3270 networks connected to the host systems. You can connect the system into an existing SNA 3270 network. In this network, the system appears to the host system to be a 3274 Control Unit with attached display stations and printers as shown in Figure 4-1.

Note: Virtual Telecommunications Access Method (VTAM*) version 3.1 or later is required for 3270 emulation using SNA.

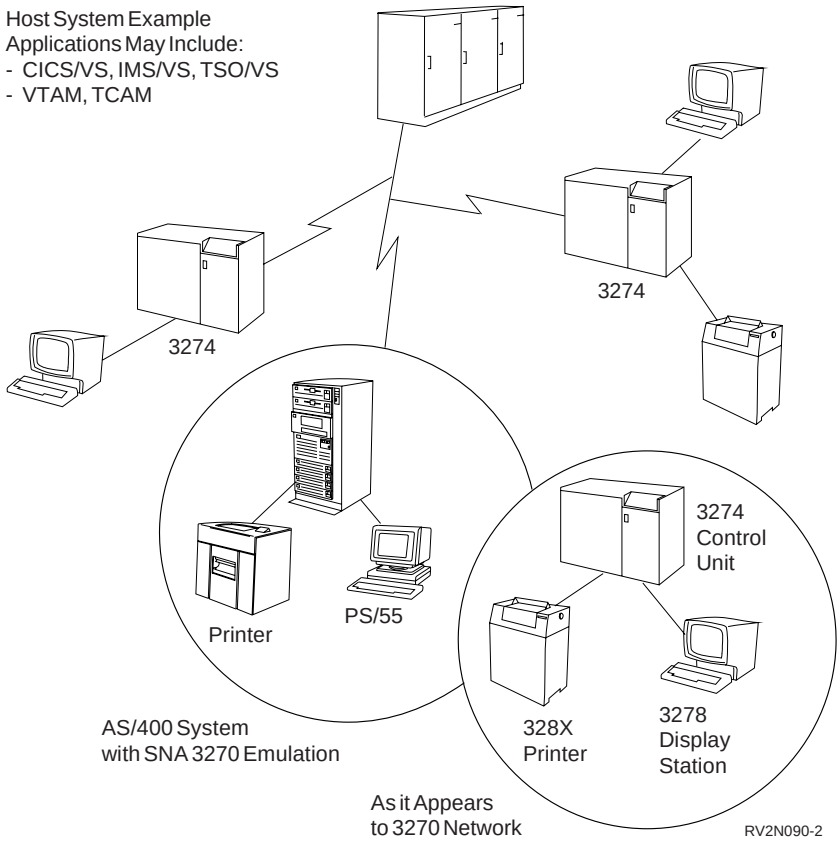


Figure 4-1. 3270 Device Emulation for SNA in a Network

SNA 3270 Emulation Specifications

The system emulates an SNA 3270 controller that operates as a secondary station on a point-to-point line, a switched or nonswitched line, or a multipoint nonswitched line. Display stations and printers that are signed on SNA 3270 emulation operate as if they were directly attached to a 3274 Control Unit. 3270 device emulation for SNA supports the following:

- Emulation on any line attached to the system.
- Any printers attached to the system print information received from the host system. The 3270 emulation session is linked to a printer file, which is linked to a printer device.
- All 3270 printers can be emulated as logical unit (LU) session type 3 printers. The 3287 and 3289 printers can also be emulated as LU-LU session type 1 printers.
- The 5250 display stations that are used for 3270 display emulation must have either a typewriter keyboard or a data entry keyboard. All 3270 display stations are supported as LU session type 2 devices.

  Note: The term 5250 display stations is used throughout this document to refer to the 3179, 3180 (Model 2), 3196, 3197, 3476, 3477, 3486 (Model BA), 3488, 3487 (Models HA, HC, HG, HW), 5251, 5291, 5292, and any DBCS display configured as a 5555 display station.
- A 3270 device emulation for SNA session (type LU-LU session type 1) can share a network with SNA remote job entry (SNA RJE). It can also share a network with advanced program-to-program communications (APPC) or Systems Network Architecture upline facility (SNUF) programs, the distributed host command facility (DHCF), and user application programs of type LU-LU session type 1.
- The IBM Personal Computer can be attached to the system and used for 3270 emulation by using the 5250 emulation feature. (The personal computer is treated as a 5291 Display Station.)

The host system requirements and capabilities for 3270 emulation are summarized in Figure 4-2 on page 4-3.

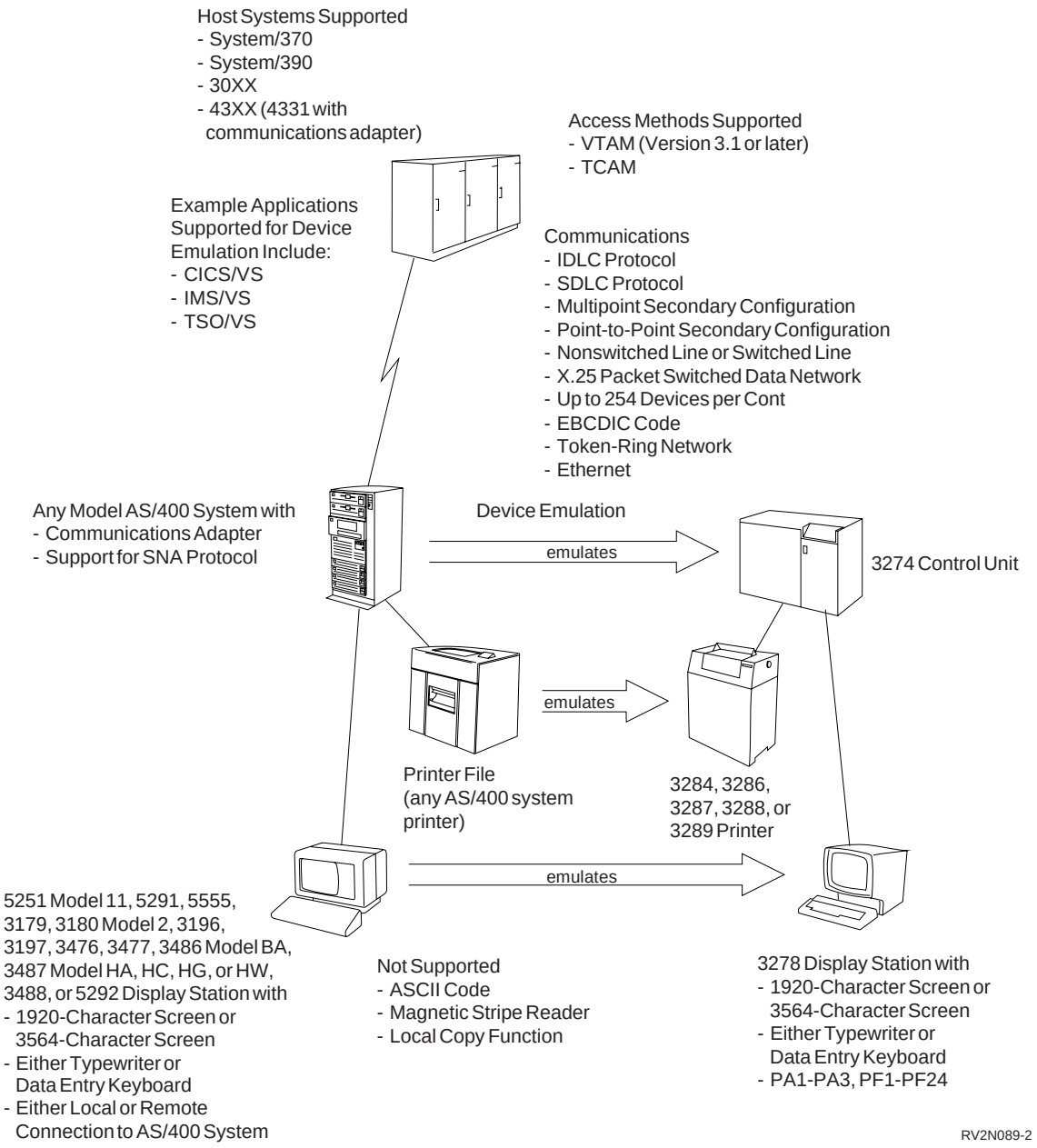


Figure 4-2. Summary of SNA Device Emulation Support

SNA Protocol

The system devices appear as selected 3270 devices when you use SNA protocol. Applications using LU-LU session type 1, SNA remote job entry (SNA RJE), advanced program-to-program communication (APPC), SNA upline facility (SNUF), or distributed host command facility (DHCF) can use the same line to communicate to the host system.

Figure 4-3 shows an example of commonly used SNA protocols to emulate 3270 devices.

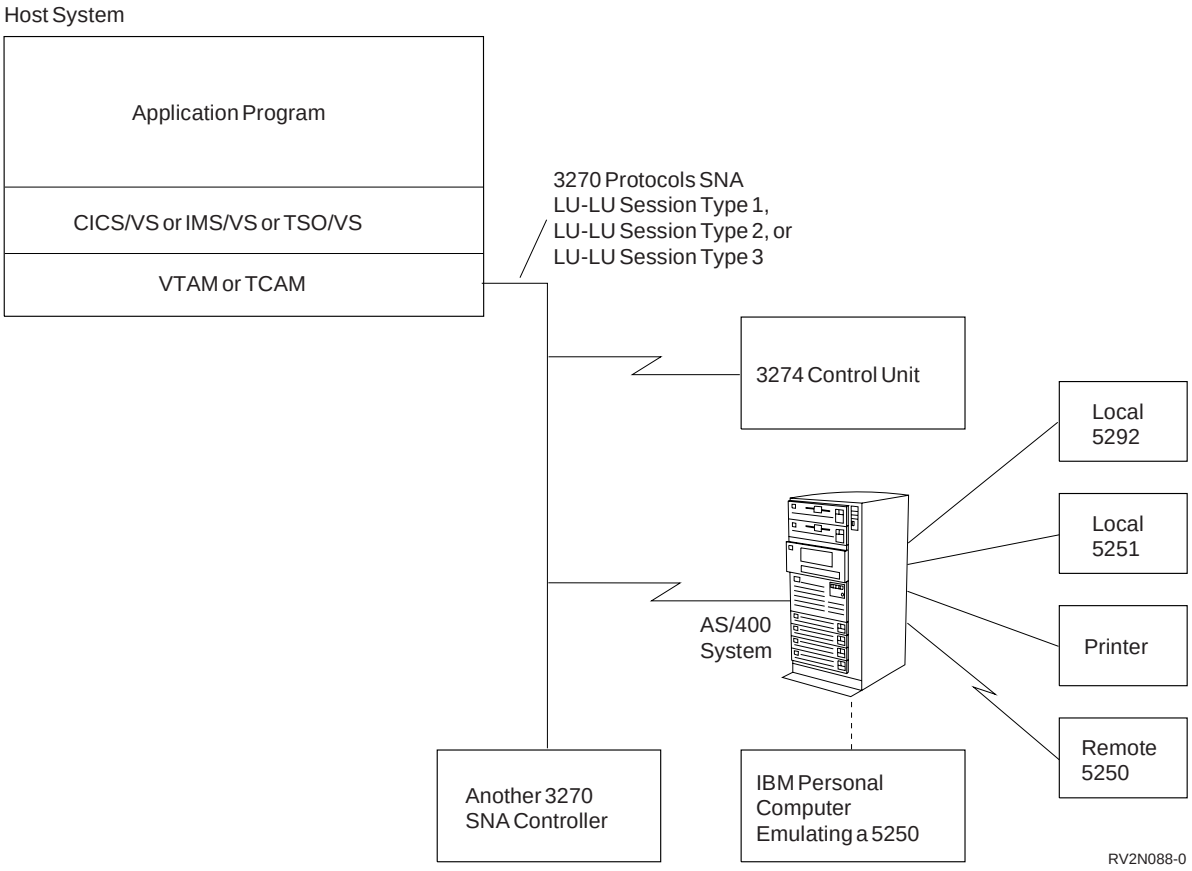


Figure 4-3. SNA Protocol to Emulate 3270 Devices

Shared Communications Links

The AS/400 system and 3270 devices can share the same integrated services digital network (ISDN) data link control (IDLC) link, synchronous data link control (SDLC)/X.25 link, token-ring local area network, or Ethernet network. These devices can support multiple sessions of LU-LU session type 1, LU-LU session type 2, and LU-LU session type 3 3270 emulation, SNA RJE, APPC, SNUF, and DHCF on the same link.

Each communications line can function as a single secondary station. Multiple sessions and logical unit types can operate at one time on the same communications line (secondary station) if the host system parameters allow. See Figure 4-4 for an example of SNA emulation on the same line as other application programs.

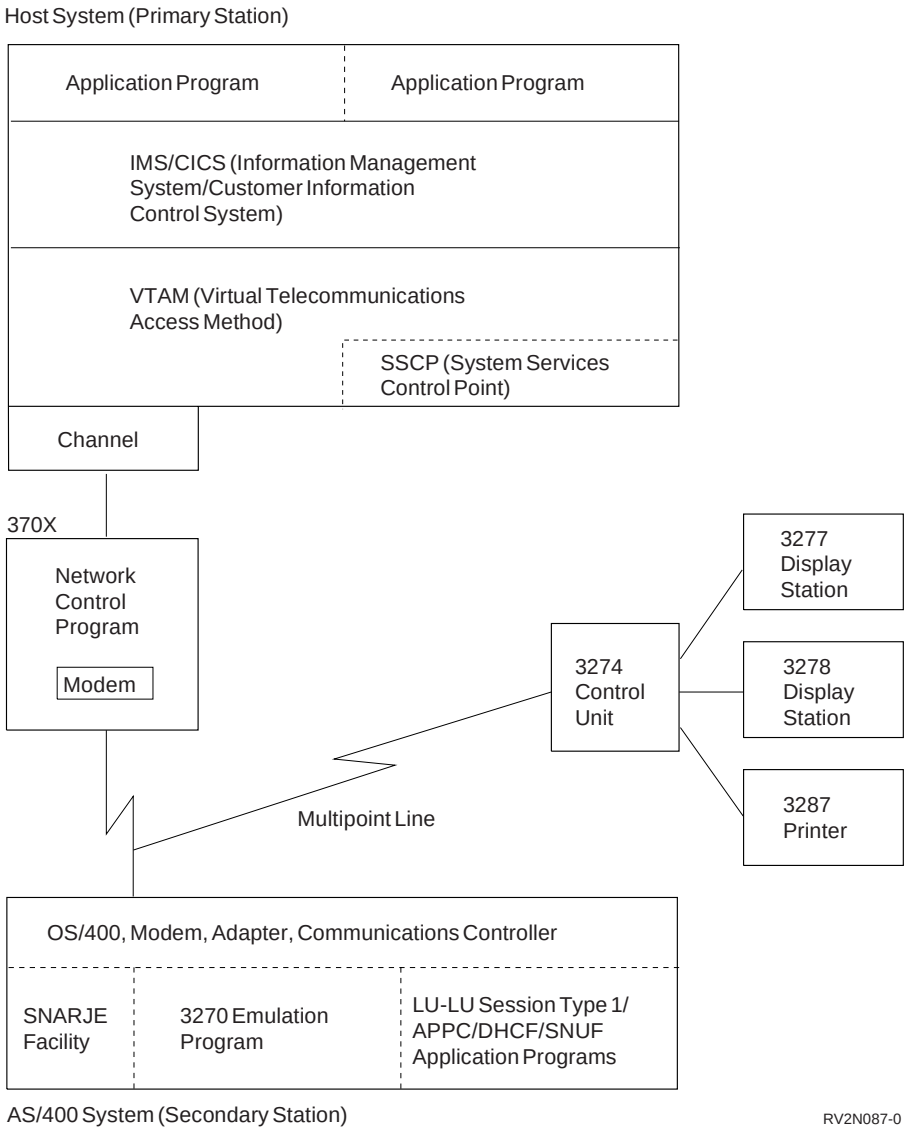


Figure 4-4. 3270 Emulation for SNA with Multiple Application Programs

SNA Emulation Interfaces

The 3270 emulation for SNA support is provided by two emulation interfaces:

- The 3270 device emulation for SNA interface
- The program interface

Support for both interfaces is included in the OS/400 licensed program. For more information about the program interface, refer to the *SNA Upline Facility Programming* book.

3270 Device Emulation

Device emulation allows you to use a 5250 display station directly with a host system application as though you are using a 3278 display station. You start the 3270 emulation session by entering a command at the 5250 display station as described in Chapter 8. The host system responds as though you are using a 3278 Model 2 display station connected through a 3274 Control Unit. The 3270 device emulation translates the data stream between the 5250 display stations and the host system as shown in Figure 4-5.

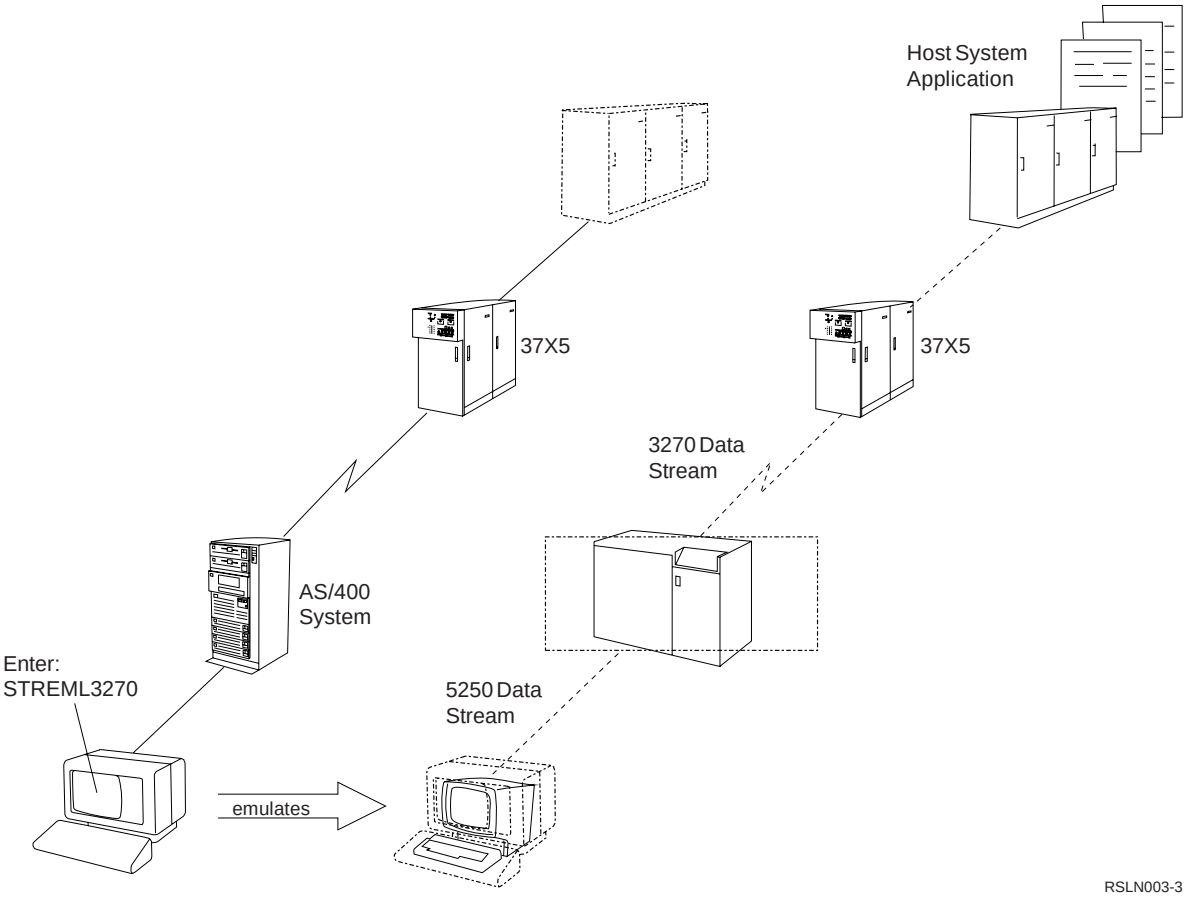


Figure 4-5. Device Emulation for SNA Interface

Printer Emulation

Printer emulation allows you to start a printing job interactively from a work station or with a control language (CL) command in a batch or interactive program. During printer emulation, the host system responds as though it is sending the data to a 3284, 3286, 3287, 3288, or 3289 printer that is connected to the host system through a 3274 Control Unit.

The data is written to a printer file that can be linked, with or without spooling, to any system printer. SNA printer emulation interface is shown in Figure 4-6.

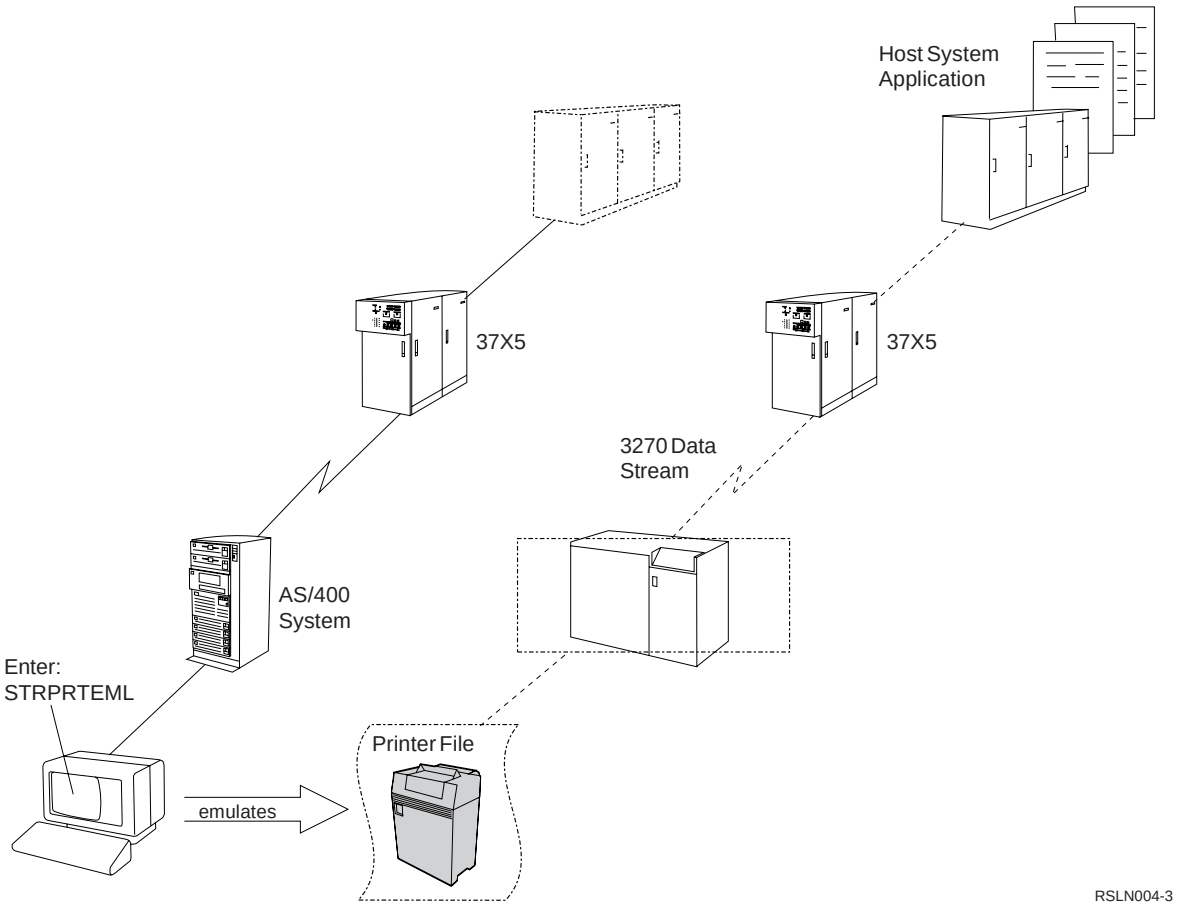


Figure 4-6. SNA Printer Emulation Interface

3270 Emulation for SNA Procedures

To use 3270 emulation, you must first create the appropriate communications line, controller, and emulation device descriptions. These procedures are described in Chapter 5. All the files, programs, and commands needed for device emulation are supplied with the OS/400 program; no user coding is required.

To use device emulation at a 5250 display station you need to know:

- How to enter the CL commands to start and control display or printer emulation
- How to use the 5250 display station during a display emulation session
- How to use the host system applications

Chapter 8 describes the CL emulation commands and the method for using a 5250 display station during emulation. Chapter 7 describes considerations about communicating with host system applications.

Generally, little or no change is required to the following host system programs for using them with SNA 3270 device emulation:

- Customer Information Control System for Virtual Storage (CICS/VS)
- Information Management System for Virtual Storage (IMS/VS)
- Time Sharing Options for Virtual Storage (TSO/VS)

No change is required if you are replacing existing devices. If you are adding new devices, you need to identify the devices to be emulated to the host system.

Example of 3270 Emulation for SNA

The following example shows a 3270 network with a host system in Sacramento, and remote locations that communicate with the host system from Denver, San Francisco, Chicago, and Dallas. All locations use a common set of application programs at the host system. In addition, the Dallas location uses programs and data that are not used by the other locations.

Through 3270 device emulation for SNA, users at the Dallas location communicate with the host system applications from 5250 display stations in the same way that users at other locations communicate from 3278 display stations.

The system device emulation can share the SNA network with other 3270s, the DHCF, and an APPC, SNUF, or RJE application. Figure 4-7 on page 4-9 illustrates this example.

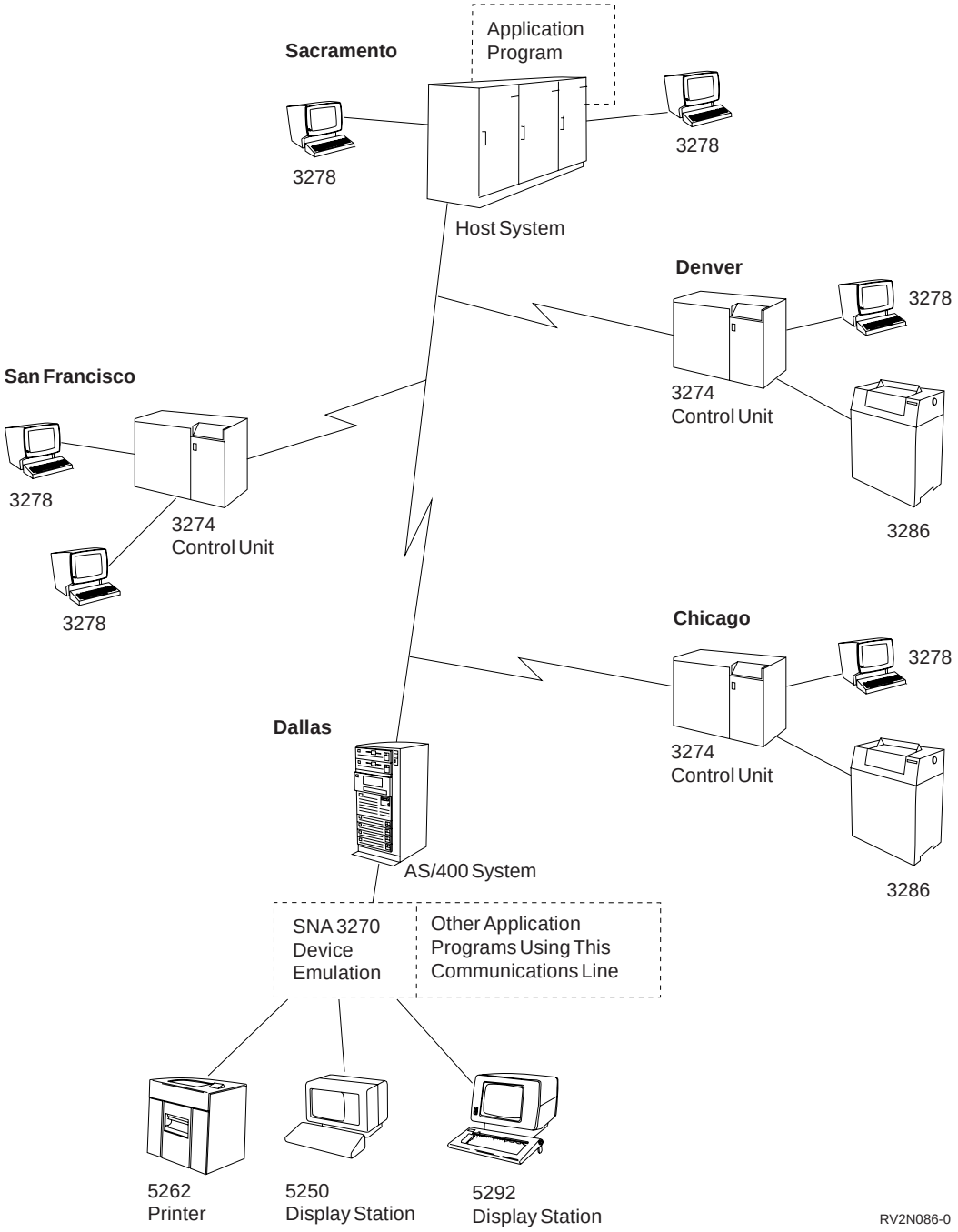


Figure 4-7. Example of 3270 Emulation for SNA

Chapter 5. Configuring 3270 Device Emulation for SNA

When you set up 3270 device emulation for Systems Network Architecture (SNA), you must define configuration descriptions for each line, controller, and device to be emulated. To set up SNA 3270 device emulation, go to the AS/400 Main Menu and follow the configuration procedure, or use the appropriate control language (CL) commands.

The following commands allow you to configure a line, controller, or device without using the configuration menu and displays:

- Create Line Description (Ethernet) (CRTLINETH)
- Create Line Description for IDLC (CRTLINIDLC)
- Create Line Description (SDLC) (CRTLINSDLC)
- Create Line Description (Token-Ring Network) (CRTLINTRN)
- Create Line Description (X.25) (CRTLINX25)
- Create Controller Description (SNA Host) (CRTCTLHOST)
- Create Device Description (SNA Host) (CRTDEVHOST)

Note: Your AS/400 system may be connected to an Ethernet network, and the remote host system to a token-ring network. If the two local area networks (LANs) are connected by an 8209 LAN bridge, you can communicate between the two systems using 3270 device emulation for SNA.

After you create the configuration descriptions, you must vary on the line, controller, and device to start 3270 device emulation. The procedures for varying on the emulation line, controller, and device are the same as the procedures for varying on any other system line, controller, and device.

The following topics provide information about only those parameters requiring special attention for each of the configuration commands. You can use the default values for any parameter not described below. A syntax diagram of each command is shown in the *CL Reference* book. Refer to the *Communications Configuration* book for configuration information.

Appendix B provides examples of line, controller, and device configurations created through the displays of the configuration menu.

Creating the Line Description

Use the appropriate command and parameters to create a line description for each line that you use for 3270 device emulation.

Creating an IDLC Line Description (CRTLINIDLC)

Use the CRTLINIDLC command to create a line description for IDLC (integrated services digital network (ISDN) data link control) lines. If you are using an ISDN, a connection list and network interface description also need to be created and defined. The *ISDN Support* book contains information about configuring an ISDN network. The key parameters in the CRTLINIDLC command (assuming a nonswitched line) are:

LIND

The name of the line description.

Example: `LIND(EMLIN2)`

CNN

This indicates if the line is switched or not. Specify that the line is nonswitched for this example.

Example: `CNN(*NONSWT)`

NWI

This is the name of the network interface description to which this line is attached. Before you can create the line description, you must create the network interface description.

Example: `NWI(EMNWI)`

NWICHLNBR

This is the number of the nonswitched channel identified in the Channel entries (CHLENTRY) parameter of the EMNWI network interface description.

Example: `NWICHLNBR(1)`

TEXT

This specifies up to 50 characters that describe the line and its use. This information is often valuable for future reference.

Creating an SDLC Line Description (CRTLINSDLC)

Use the CRTLINSDLC command to create a line description for SDLC (synchronous data link control) lines. The key parameters in the CRTLINSDLC command are:

LIND

The name of the line description.

Example: `LIND(EMLIN2)`

RSRCNAME

This is the resource name used for communicating over the line specified on the LIND parameter.

Example: `RSRCNAME(LIN012)`

Refer to the *Communications Configuration* book for information about how to define resource names.

ROLE
This is the type of line: primary, secondary, or negotiable. You may specify *SEC (secondary) for 3270 device emulation.

```
ROLE(*SEC)
```

TEXT
This specifies up to 50 characters that describe the line and its use. This information is often valuable for future reference.

Creating an X.25 Line Description

Use the CRTLINX25 command to create a line description for X.25 lines. The key parameters in the CRTLINX25 command are:

LIND
The name of the line description.

Example: `LIND(EMLIN2)`

RSRCNAME
This is the resource name used for communicating over the line specified on the LIND parameter.

Example: `RSRCNAME(LIN012)`

LGLCHLE
This specifies the entries for each of the logical channels provided for this X25 line. The number of entries is the number of logical channels subscribed to from the network provider. You can specify a maximum of 32 entries (containing four subfields each). There are no restrictions about the numbers of permanent virtual circuits (PVC) or switched virtual circuits (SVC) contained within the group.

Example: `LGLCHLE(001 *SVCBOTH)`

NETADR
This specifies the address of the X25 controller.

Example: `NETADR(61200051)`

CNNINIT
This specifies the initial connection of the line: *LOCAL, *REMOTE, or *WAIT.

Example: `CNNINIT(*LOCAL)`

TEXT
This specifies up to 50 characters that describe the line and its use. This information is often valuable for future reference.

Creating a Line Description for a Token-Ring Network

Use the CRTLINTRN command to create a line description for a token-ring network. The key parameters in the CRTLINTRN command are:

LIND
The name of the line description.

Example: `LIND(EMLIN2)`

RSRCNAME
This is the resource name used for communicating over the line specified on the LIND parameter.

Example: `RSRCNAME(LIN012)`

TEXT
This specifies up to 50 characters that describe the line and its use. This information is often valuable for future reference.

Creating a Line Description for an Ethernet Network

Use the CRTLINETH command to create a line description for an Ethernet network. The key parameters in the CRTLINETH command are:

LIND
The name of the line description.

Example: `LIND(EMLIN2)`

RSRCNAME
This is the resource name used for communicating over the line specified on the LIND parameter.

Example: `RSRCNAME(LIN012)`

TEXT
This specifies up to 50 characters that describe the line and its use. This information is often valuable for future reference.

Creating the Controller Description

Use the CRTCTLHOST command with the appropriate parameters to create a controller description. This controller is not an actual piece of equipment. Rather, it is a definition of the controller address the host system will poll.

The key parameters in the CRTCTLHOST command are:

CTLD
The name of the controller description.

Example: `CTLD(EMCTL2)`

LINKTYPE
This is the type of SNA line connection: *LAN, *SDLC, *TRLAN, or *X25.

Example: `LINKTYPE(*SDLC)`

LINE
This is the name of the specified line description to which this controller is to be attached.

Example: `LINE(EMLIN2)`

STNADR
This is a 2-character station address assigned to the AS/400 system in the 3270 SNA network. The station address must be any hexadecimal number between hex 01 and hex FE.

Example: `STNADR(C1)`

TEXT
This specifies up to 50 characters that describe the controller and its use. This information is often valuable for future reference.

Creating the Device Description

Use the CRTDEVHOST command with the appropriate parameters to create a device description. The device is not an actual piece of equipment like a 5251 display station. Rather, it is a definition of the device address and type with which the host system will communicate. You must create a device description for each device used in display or printer emulation.

The key parameters in the CRTDEVHOST command are:

DEVD
The name of the device description.

Example: `DEVD(EMDSP02)`

LOCADR
This is a 2-character local location address of the device. The device address must be a value from hex 01 to hex FE. The value should match the LOCADR parameter in the host system NCP generation.

Example: `LOCADR(02)`

RMTLOCNAME
This is the name of the remote location. Any name is valid; however, a value identical to the CTL parameter is recommended for 3270 device emulation.

Example: `RMTLOCNAME(EMCTL2)`

CTL
This is the name of the controller to which you will connect this emulation device.

Example: `CTL(EMCTL2)`

APPTYPE
This is the type of application that will use the device. You must specify *EML for SNA 3270 emulation:

Example: `APPTYPE(*EML)`

EMLDEV
This specifies the device type. Use a value of 3278 for display emulation, or a value of 3284, 3286, 3287, 3288, or 3289 for printer emulation. The default is 3278.

Example: `EMLDEV(3278)`

EMLKBD
This specifies whether characters from the emulated keyboard are uppercase only, or uppercase and lowercase. The default is *UPPER. Leave the default if the host system expects to receive uppercase characters. If you specify *LOWER, both uppercase and lowercase characters can be displayed.

Example: `EMLKBD(*LOWER)`

EMLNUMLCK
This indicates when numeric input fields will only allow numeric data on a 5250 keyboard.

Example: `EMLNUMLCK(*NO)`

EMLWRKSTN
This specifies whether the emulation device is restricted to a specific display or printer.

When starting display or printer emulation with a controller or remote location specified, 3270 emulation will select the first available emulation device meeting one of the following conditions:

- The EMLWRKSTN parameter of the emulation device description matches the DSPDEV parameter specified on the STREML3720 command or the PRTDEV parameter specified on the STRPRTEML command.
- The EMLWRKSTN parameter of the emulation device description has the value of *ANY.

Note: If this parameter is specified, it does not ensure that the emulation device will be selected by the STREML3270 or STRPRTEML command when using the display station or printer named in the EMLWRKSTN parameter. It ensures that no other display station or printer using emulation can use this emulation device.

To ensure that the emulation device is selected by the emulation command, create the emulation device descriptions with an EMLWRKSTN value other than *ANY. The emulation device descriptions will appear in the list before any devices with an EMLWRKSTN value of *ANY. The list of emulation devices for a specific controller is defined within the list according to when they are created. The list of emulation devices for a specific location is defined within the list in alphabetical order.

Example: `EMLWRKSTN(DSP01)`

TEXT
This specifies up to 50 characters that describe the device and its use. This information is often valuable for future reference.

Chapter 6. Configuring Your Environment

To configure a session for emulated devices, you can use the Add Emulation Configuration Entry (ADDEMLCFGE) command, the Change Emulation Configuration Entry (CHGEMLCFGE) command, or the Remove Emulation Configuration Entry (RMVEMLCFGE) command. These commands allow you to tailor your environment to match the host system.

Adding the Configuration Entry

Use the ADDEMLCFGE command with the appropriate parameters to add a configuration entry for an emulation session.

```
                    Add Configuration Entry (ADDEMLCFGE)

Type choices, press Enter.

Configuration entry  . . . . . _________     Name, QEMDFTCFGE
Debug job  . . . . . . . . . .  *NOTRACE     *NOTRACE, *TRACE
Handle signals . . . . . . . .  *SAVE__      *SAVE, *IGNORE
Handle attributes  . . . . . .  *IGNORE      *IGNORE, *REJECT
Maximum screen size  . . . . .  *DEVD        *DEVD, *MOD2, *MOD5
VLIC trace . . . . . . . . . .  *NOTRACE     *NOTRACE, *TRACE
Start printer TRCJOB . . . . .  *NOTRACE     *NOTRACE, *TRACE
Initial screen . . . . . . . .  *YES         *YES, *NO
Gridline . . . . . . . . . . .  *NO_         *NO, *YES
Graphic DBCS . . . . . . . . .  *NO_         *NO, *YES
Printout formatting  . . . . .  *NO_         *NO, *YES
Clear processing . . . . . . .  *RETRY_      *RETRY, *IGNORE



                                                                  Bottom

F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

The key parameters of the ADDEMLCFGE command are:

EMLCFGE

The emulation configuration entry parameter identifies a group of information. When this parameter is specified on the STRPRTEML or STREML3270 command, the information helps define the 3270 emulation session.

Consult your system support before using this parameter on the STRPRTEML and STREML3270 commands. *NONE is the default.

QEMDFTCFGE is the default configuration entry. The default can be changed, but it cannot be deleted.

The information associated with the QEMDFTCFGE entry is used to define the data stream translation API sessions, if appropriate.

EMLDBGJOB

This parameter is evaluated when an emulation configuration entry is specified on the STRPRTEML command and TRCJOB is running for the printer emulation session. If the entry is specified for a display session or printer session for which TRCJOB is not running, then the parameter is ignored.

If you specify *TRACE for the EMLDBGJOB parameter in the emulation configuration entry and use the STRPRTEML command, additional information is printed in the trace job (TRCJOB) of the 3270 printer session. The EMLSTR parameter on the same emulation configuration entry may be used to start the TRCJOB.

The printing of this additional information has a small performance impact.

*NOTRACE is the default if no EMLCFGE entry is specified.

EMLSIG

The handle signal parameter is used if the problem documentation indicates that the host is sending multiple signals without waiting for the 3270 emulation session to return the change direction indicator. This results in the emulation session receiving a signal when it does not have the change direction indicator.

If you specify *SAVE, the 3270 emulation session remembers the signal and returns the change direction indicator when it receives the change direction indicator.

If you specify *IGNORE, the 3270 emulation session disregards signals received when the session does not have the change direction indicator.

The change direction indicator controls whether the host or the AS/400 is permitted to send data during a 3270 display emulation session. If the host wants to send data to the AS/400 and does not have change direction indicator, then a signal is sent.

*SAVE is the default if no EMLCFGE entry is specified.

EMLATR

The handle attributes parameter specifies how the 3270 emulation job responds to an incorrect character attribute or attribute value that is received during a single-byte character set (SBCS) session.

If you specify *IGNORE, 3270 emulation ignores unsupported character attributes it receives (on SBCS systems) and continues processing.

If you specify *REJECT, the host receives a negative response when the data stream contains an invalid attribute. This may prevent the screen from displaying.

*IGNORE is the default if no EMLCFGE entry is specified.

EMLMAXSCR

The maximum screen size parameter is used to restrict the size of the screen displayed.

*DEVD checks the device capability of the device being used. *MOD2 is a 24 x 80 display and *MOD5 is a 27 x 132 display.

If you specify *MOD5, and the emulation session is running on a device that is only capable of *MOD2, the parameter is ignored.

This parameter is used only for display emulation.

*DEVD is the default if no EMLCFGE entry is specified.

EMLTRC

The VLIC trace parameter is used only with the data stream translation API. It has no effect on printer or display emulation.

This parameter is only evaluated on the QEMDFTCFGE configuration entry. It has no effect when specified on any other configuration entry.

The 3270 emulation trace points appear in the VLIC trace when you specify *TRACE under all of the following conditions:

- The data stream translation API is in use
- A VLIC source/sink trace is running
- A trace job is running on the job using the API

This parameter affects only the data stream translation API sessions.

*NOTRACE is the default if no EMLCFGE entry is specified.

EMLSTR

The start printer TRCJOB parameter is used only for printer emulation.

A TRCJOB automatically starts on the printer emulation job if you specify *TRACE for the EMLSTR parameter on the EMLCFGE entry specified on the STRPRTEML command. The TRCJOB ends when the emulation job ends.

Use this parameter when debugging printer emulation jobs. You can use the EMLDBGJOB parameter in conjunction with this parameter to obtain additional information from the TRCJOB output.

TRCJOB has a small performance impact.

*NOTRACE is the default if no EMLCFGE entry is specified.

EMLINLSCN

The initial screen parameter is used only for display emulation.

If you specify *NO, the 3270 emulation initialization screen does not appear. The user sees a blank screen instead of the initialization screen.

*YES is the default if no EMLCFGE entry is specified.

EMLGRDLIN

This parameter is used only during DBCS sessions.

A 5250 hardware restriction requires that you have 4 usable bytes in the upper left-hand corner of your screen. You cannot display or change the data in these bytes if the screen also contains gridlines.

You can choose to not display the gridlines. When you do so, the data in the upper left 4 bytes is accessible.

If you specify *YES, gridlines are not displayed. The first four characters of the screen are available for use.

*NO is the default if no EMLCFGE entry is specified. The gridlines are displayed, regardless of the restriction.

EMLDBCS

A 5250 hardware restriction prevents character attributes from being used to define characters in an input field.

This option can be set when the host application using character attributes specifies an entire field as pure.

If the field is input and the first character of the field is pure, 3270 emulation assumes the entire field is pure and uses the extended field attributes to define the field as DBCS-graphic.

This option should not be used if only part of the field is defined as pure. Because this can result in DBCS data being displayed as SBCS or SBCS data displayed as DBCS, usage of this option is not recommended.

*NO is the default if no EMLCFGE entry is specified.

EMLPRTFMT

If you specify this parameter on a configuration record that is used by a printer emulation session, the 3270 printer emulation session uses the values in the command, rather than the values in the printer file, for the number of lines and columns.

This parameter is used until a Set Horizontal Format or a Set Vertical Format command is received from the host.

Only the SCS printer sessions are affected by this parameter.

*NO is the default if no EMLCFGE entry is specified.

EMLSNACLR

The SNA clear processing parameter is used only for display emulation. The EMLSNACLR parameter is evaluated to determine the correct recovery procedure when a communications GET fails with a CPF5163 after a SNA clear command has been received.

If *RETRY is specified, 3270 emulation will attempt to get the data sent by the host system one more time. *RETRY is the default if no EMLCFGE entry is specified.

If you specify *IGNORE, 3270 emulation will not attempt to get the data again.

Consult your system support personnel before using this parameter.

Changing the Configuration Entry

Use the Change Emulation Configuration Entry (CHGEMLCFGE) command to change various configuration options for the emulation session.

The following example shows the values being changed.

```
                    Change Configuration Entry(CHGEMLCFGE)

Type choices, press Enter.

Configuration entry  . . . . . _________   NAME, QEMDFTCFGE
Debug job  . . . . . . . . . . *SAME___    *SAME, *NOTRACE, *TRACE
Handle signals . . . . . . . . *SAME__     *SAME, *SAVE, *IGNORE
Handle attributes  . . . . . . *SAME__     *SAME, *IGNORE, *REJECT
maximum screen size  . . . . . *SAME       *SAME, *DEVD, *MOD2, *MOD5
VLIC trace . . . . . . . . . . *SAME___    *SAME, *NOTRACE, *TRACE
Start printer TRCJOB . . . . . *SAME___    *SAME, *NOTRACE, *TRACE
Initial screen . . . . . . . . *SAME       *SAME, *YES, *NO
Gridline . . . . . . . . . . . *SAME       *SAME, *NO, *YES
Graphic DBCS . . . . . . . . . *SAME       *SAME, *NO, *YES
Printout formatting  . . . . . *SAME       *SAME, *NO, *YES
Clear processing . . . . . . . *SAME__     *SAME, *RETRY, *IGNORE




                                                                  Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Removing the Configuration Entry

Use the Remove Emulation Configuration Entry (RMVEMLCFGE) command to remove existing configuration entries from the configuration file.

You cannot remove the QEMDFTCFGE entry.

```
                    Remove configuration entry (RMVEMLCFGE)

Type choices, press Enter.

Configuration entry  . . . . . .                Name









                                                                  Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Using the STREML3270 and STRPRTEML Commands

The EMLCFGE parameter allows you to indicate which configuration entry you want to use for each session. *NONE is the default, which indicates that no configuration entry is used. If you specify a configuration entry that uses defaults for all of the values, you get the same effect as you would if you specify *NONE.

Chapter 7. AS/400 System and Host System Considerations for SNA 3270 Device Emulation

Complete host system generation before using 3270 emulation. Examples of host system generation are shown in Appendix B. Additional information on host system generation can be found in the *Communications Configuration* book.

Line, Controller, and Device Status

The line description, controller description, and device description for 3270 device emulation using SNA must be varied on at both the host system and the AS/400 system before you enter either of the following commands:

- The Start 3270 Display Emulation (STREML3270) command to start a display emulation session
- The Start Printer Emulation (STRPRTEML) command to start printer emulation

See Appendix B for example configuration descriptions.

Maximum Number of Sessions

Two limitations on the number of emulation sessions are:

- Maximum number of sessions per host controller
- Maximum number of sessions accessed by remote location name

An emulation device description can be used by only one 3270 device emulation session or printer emulation session at a time. The maximum number of emulation device descriptions is 254 for each host controller connected to the host system line, so the total of all active 3270 emulation sessions cannot exceed 254 on one controller, as shown in Figure 7-1.

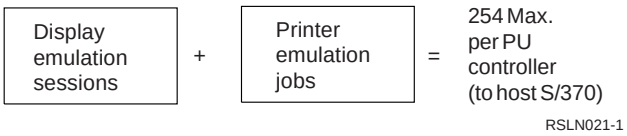


Figure 7-1. Maximum Number of SNA Emulation Sessions

Each emulation device description has a remote location name associated with it. The remote location name is a label that can be assigned to more than one device, enabling all the devices with the same remote location name to be identified as a group.

When you specify the remote location name as a parameter on the STREML3270 or STRPRTEML command, the system searches the alphabetical list of emulation device descriptions that have that remote location name for a device description that is not currently in use. While there is no limit on the number of emulation device descriptions that can have the same remote location name, the system will only search through the first 1016 devices in the list for an available device description to use for an emulation session.

Performance can be significantly affected if too many 3270 emulation sessions, jobs, and programs are active at the same time.

Maximum Block Size from the Host System

The system accepts a maximum of 12K (12288 bytes) from the host system in one transmission block. If the block is greater than 12K, the emulation session fails.

VTAM Unformatted System Service Definition Table

USSTAB specifies the name of the unformatted system service (USS) definition table within VTAM. Message 0 (MSG0) and message 10 (MSG10) must not exceed 4K (4096 bytes) and must not contain device control characters.

LU-LU Session Type 1 Support Restrictions

An SNA BIND command on an LU-LU session type 1 from the host system is rejected unless the printer device is defined as EMLDEVTYP(3287) or EMLDEVTYP(3289). Emulation ends if a BIND command is sent with an incorrect display screen size.

SNA 3270 emulation sends a negative response to the host system, a message CPF8516 to the user, and ends emulation when the following BIND parameters are not valid:

- Primary LU send end bracket (byte 4, bit 7)
- Function management header usage (byte 6, bit 1)
- Secondary LU type (byte 14)
- Session screen size (byte 24) LU (The valid values for these parameters can be found in Appendix C.)

An actual 3274 Control Unit sends a negative response, hex 0821, to the host system when it receives any of the BIND parameters listed above.

Maximum Path Information Unit and Request or Response Unit Sizes

The AS/400 system allows five maximum path information unit (PIU) sizes at the station level: 265, 521, 1033, 1994, and 2057 characters. However, the 3274 Control Unit allows a maximum PIU size of 265 characters. The maximum PIU size should match the PIU size specified by the host system. The PIU size determines the link frame size.

The system allows a request or response unit (RU) size of up to 4096 characters. If the RU size exceeds the PIU size, the system divides the information. The maximum RU size for both primary and secondary logical units is determined by the SNA BIND or the maximum request or response unit length (MAXLENRU) parameter of the CRTDEVHOST command. The maximum RU size is used if it is specified in the BIND command; otherwise, the MAXLENRU parameter of the CRTDEVHOST command is used as the default. The host configuration determines the values that appear in the BIND it sends.

Performance Considerations When Using the WAITRSP Parameter

If *YES is specified on the WAITRSP parameter of the STREML3270 command, response time is affected. *YES requires more processing time and system response time is slower.

Performance Considerations for Multipoint Lines

If you are using multipoint lines, your system might experience performance degradation under the following circumstances:

- Too many controllers are attached to one line.
- One or more inactive controllers are on the line, and the host system thinks they are active.

The performance degradation occurs in the first case because the host system is overworked. Each controller on the line must wait its turn to be serviced by the host system. This wait time might be considerable.

In the second case, performance degradation occurs because the host system attempts to poll a controller that was activated by the host system but which has since been powered off or disconnected from the line. In this situation, the host system waits for a reply from the disconnected controller until an internal host time-out occurs. The host system then polls the next controller on the line.

If several of the controllers are disconnected from the line, the total wait time can be considerable and will affect the response time of other controllers on the line. To reduce this problem, contact the host system operator to have the host system only activate controllers that are powered on and connected to the line. This action lets the host system bypass the inactive controllers and avoids unnecessary waits and time-outs.

Note: Similar performance problems occur when you use actual 3270 controllers and work stations.

Emulation Start Signal to Host System

When you start an SNA 3270 emulation session with the STREML3270 command or STRPRTEML command, the system sends an SNA NOTIFY to the host system to indicate that you turned on the 3270 device. The code for the SNA NOTIFY at the time of starting appears as hex 8106200C 06030001000000.

For printer devices, the host system must then send an SNA BIND followed by a Start Data Traffic (SDT).

For display devices, the host system may be set up to immediately attach the device to a host system application. The host system may wait for you to send a LOGON command using the system services control point-secondary logical unit (SSCP-SLU) system connection to request a specific application. In either case, the host system must then send an SNA BIND followed by the SDT command to complete the connection.

Emulation End Signal to Host System

When you end an emulation session, the AS/400 system sends an SNA NOTIFY command to the host system indicating that you turned off the 3270 device. The code for the SNA NOTIFY command appears as hex 8106200C 06010001000000 under any of the following circumstances:

- User powers off the display station
- User ends SNA emulation with option 99 on the Select 3270 Emulation Option for SNA menu
- 3270 emulation ends normally due to the conditions specified on the ENDCOND parameter
- 3270 emulation ends abnormally
- System ends abnormally

The host system should be set up to accept this as a forced sign-off. This protects you from accidental security exposure if you forget to sign off of the host system before another user starts an emulation session using the same emulation device. The second user may end up in the middle of another user's session if there is not a forced sign-off by the host system. If the host system is not set up properly it may vary off the device, making it unusable. If you would like more information about security considerations when setting up host systems, see the *Security – Basic* and the *Security – Reference* books.

If the emulation device received an SNA BIND command but it specified UNBIND, the system sends an SNA UNBIND command to the host system prior to sending the NOTIFY command. If the emulation device specified RSHUTD, the system sends an SNA RSHUTD command to the host system prior to sending the NOTIFY command. The RSHUTD command causes the host system to send an UNBIND command to the AS/400 system. The AS/400 system sends a response to the RSHUTD command and then sends the NOTIFY command.

Note: When ending 3270 emulation, the AS/400 system sends an SNA NOTIFY command. The host system sends a response to the SNA NOTIFY. 3270 emulation returns the display station to the display that was shown prior to starting 3270 emulation. If the host system sends any data other than a response to the SNA NOTIFY, a negative response with a hexadecimal code of 08450000 (SNA Sense Data) is sent to the host system, and an error message of CPI5906 to the AS/400 system operator.

See Appendix C for other 3270 emulation BIND values.

Chapter 8. Operating 3270 Device Emulation for BSC and SNA

To successfully operate 3270 device emulation for binary synchronous communications (BSC) or Systems Network Architecture (SNA) protocols, you must start a display or printer emulation session and attend to the special requirements of the devices you are emulating. This chapter discusses how to start and end various types of emulation sessions, and provides information for printer and display emulation. The information in this chapter applies to both BSC and SNA protocols unless otherwise indicated.

Running 3270 Device Emulation

After configuring the system for emulated devices, you can run 3270 device emulation interactively or as a batch job for both display and printer devices.

Display Emulation in an Interactive Job

You can run 3270 display emulation interactively from any 5250 display station when the network configuration is complete and the configuration is varied on. To use interactive 3270 device emulation from a display station, you must do the following:

- Sign on the system at the 5250 display station.
- Enter the Start 3270 Display Emulation (STREML3270) command.
- Handle error messages.
- Operate the emulation session as you would from a 3270 display station, noting the keyboard differences between the 3270 and 5250 display stations as described in “Using a Display Station During an Emulation Session” on page 8-6.
- End 3270 emulation.

Display Emulation in a Batch Job

You can also run display emulation from a batch job when the network is configured and the display station is varied on. The batch job can acquire control of any 5250 display station that is not signed on and that has not been acquired by another job. To use 3270 display emulation in a batch job, you must do the following:

- Handle error messages.
- Operate the emulation session as you would from a 3270 display station, noting the keyboard differences between the 3270 and 5250 display stations as described in “Using a Display Station During an Emulation Session” on page 8-6.
- End 3270 emulation.

Figure 8-1 on page 8-2 provides an overview of display station emulation.

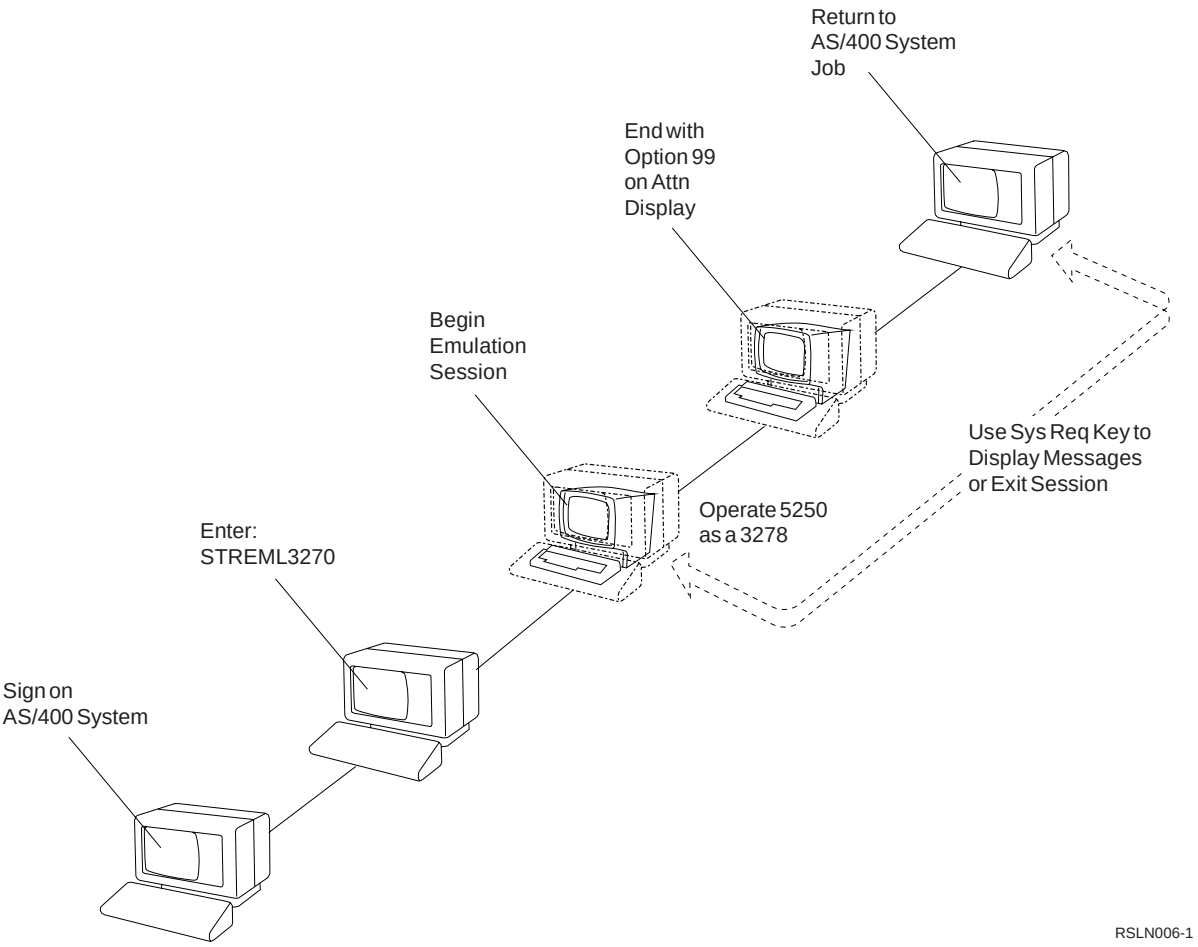


Figure 8-1. Display Station Emulation

Printer Emulation

When the device emulation network configuration is complete and the configuration is varied on, you can run 3270 printer emulation by doing the following:

- Enter the Start Printer Emulation (STRPRTEML) command, either at a work station or in a batch job.
- Enter the Eject Emulation Output (EJTEMLOUT) command to print data received from the host system without ending the emulation session.
- SNA only: Enter the Emulate Printer Key (EMLPRTKEY) command to emulate the 3287 or 3289 PA1 or PA2 keys.
- Enter the End Printer Emulation (ENDPRTEML) command to end printer emulation.

Each of these tasks is described in detail later in this chapter. Figure 8-2 on page 8-3 provides an overview of printer emulation.

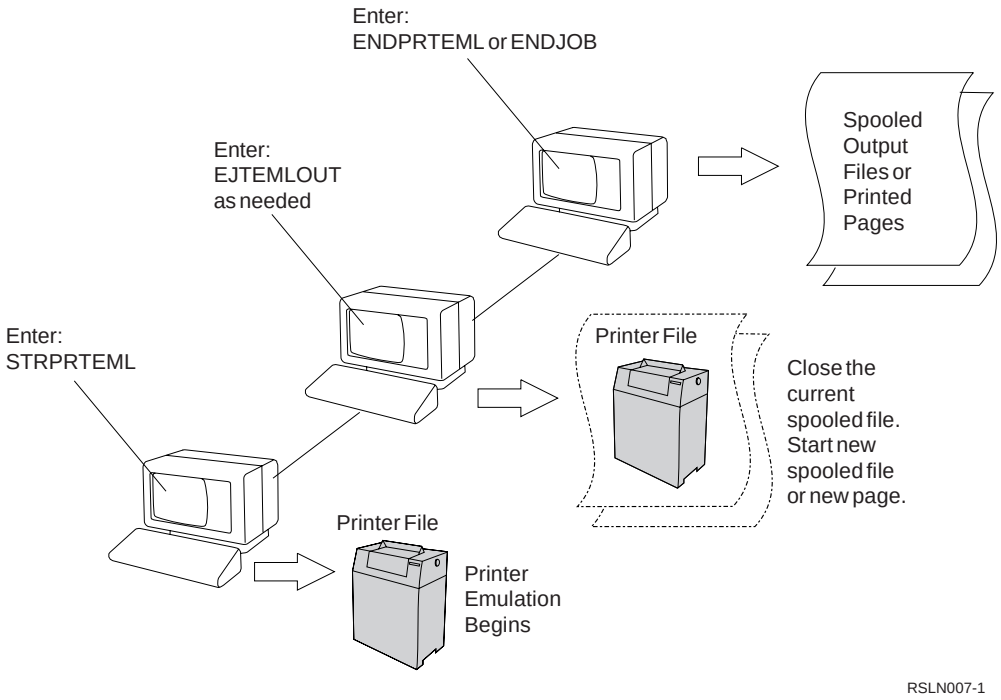


Figure 8-2. Printer Emulation

Running Display Station Emulation

You can start an emulation session on an active or an inactive display station. An active display station is varied on and signed on. An inactive display station is varied on but has not been signed on.

Starting an Emulation Session on an Active Display Station

You can start an emulation session on an active display station in one of the following ways:

- Type the STREML3270 command on the Command Entry display and press F4 to receive prompting displays.
- Type the STREML3270 command on the Command Entry display with the appropriate parameters and press the Enter key. Emulation begins immediately. You do not receive prompting displays.
- Use the menu access to 3270 device emulation.
- Embed the STREML3270 command in a control language (CL) program.
- Place the STREML3270 command in the user profile sign-on program to automatically start an emulation session when you sign on to your work station.

Notes:

1. If you do not enter the STREML3270 command correctly, you will receive error messages. These messages have a message identification (ID) of CPF85xx.
2. If you embed the STREML3270 command in a CL program or in your sign-on program, you must ensure that the program handles errors. This is particularly important for the sign-on program because if that program ends in error, your interactive session will end.

See the *CL Reference* book for additional information about using command syntax and parameters. You can also use the online help information for additional syntax information.

When you type the STREML3270 command and press F4 (Prompt), the following Start 3270 Display Emulation display appears:

```
                    Start 3270 Display Emulation (STREML3270)

Type choices, press Enter.

Emulation controller, or . . . .  __________    Name
Emulation device, or . . . . . .  __________    Name
Emulation location . . . . . . .  __________    Name
Display device, batch only . . .  *CURRENT      Name, *CURRENT
Page Up (Roll Down) key  . . . .  *PA2          *PA2, *PA1, *PA3, *NONE...
Page Down (Roll Up) key  . . . .  *PA1          *PA1, *PA2, *PA3, *NONE...
Test Request key . . . . . . . .  *DFT         *DFT, *CLEAR, *ERASEINP
Cursor Select key  . . . . . . .  *NONE         *NONE, *F1, *F2, *F3, *F4...

                                                                      Bottom
F3=Exit    F4=Prompt    F5=Refresh    F10=Additional parameters    F12=Cancel
F13=How to use this display         F24=More keys
```

Figure 8-3. Start 3270 Display Emulation (STREML3270) Display

Whichever method you use to start emulation, STREML3270 links the display station with the specified 3270 display device description and puts the display station into an emulation session. During an emulation session, the display station appears as a 3278 display station to the host system.

When you start an emulation session, an initialization display appears for several seconds and informs you that emulation is in progress. It also tells you how to display the Select 3270 Emulation Option menu and lists the functions that can be performed from that menu. Depending on the value you choose for the attention emulation menu (ATNEMLMNU) parameter on the STREML3270 command, you will see one of two 3270 emulation initialization displays, as follows.

Note: If you specify *NO on the EMLINLSCN parameter, the following displays do not appear.

- If you specify the default value *YES for the ATNEMLMNU parameter, the following 3270 emulation initialization display appears.

```
                              3270 Emulation



                  3270 emulation initialization in progress.

                  Press either the system request key sequence
                  and select option 12 or press the Attn key
                  to do the following:

                   o  Display help
                   o  Display emulation options
                   o  End 3270 emulation
```

- If you specify *NO for the ATNEMLMNU parameter on the STREML3270 command, you are shown the following 3270 emulation initialization display.

```
                              3270 Emulation



                  3270 emulation initialization in progress.

                  Press the system request key sequence and
                  select option 12 to do the following:

                   o  Display help
                   o  Display emulation options
                   o  End 3270 emulation
```

Starting an Emulation Session on an Inactive Display Station

You can start an emulation session on an inactive display station by placing the STREML3270 command with the display device (DSPDEV) parameter in a batch job that is either a CL program or an input stream. See Appendix G for an example program that runs emulation as a batch job.

The emulation support acquires the display station specified on the DSPDEV parameter and links the display station to a 3270 display device description. During the emulation session, the display station appears as a 3278 display device to the host system. You can run host system commands directly without having to run any AS/400 system commands.

Note: If you do not enter the STREML3270 command correctly, you will receive error messages. These messages have a message ID of CPF85xx.

STREML3270 Example

The following example shows how to place a work station into an emulation session using the first available device description on controller EMCTL1. In addition, it assigns the F7 function to the Page Up key and the F8 function to the Page Down key:

```
STREML3270   EMLCTL(EMCTL1)  PAGEUP(*F7)  PAGEDOWN(*F8)
```

If you are running SNA communications, you can also issue the STREML3270 command with the LOGON parameter to specify logon text that is sent immediately to the host system so that you are automatically connected to an application. You start the STREML3270 command and enter the required password to access the host application.

Note: 3270 emulation for BSC does not support the LOGON parameter.

Here is an example using the LOGON parameter:

```
STREML3270 EMLDEV(EMDSP01)
           LOGON('LOGON APPLID(HOST)
           DATA(JONES) LOGMODE(D4A32785)')
```

In this example, the user, JONES, requests the start of a 3270 display emulation session (STREML3270) at the emulation device EMDSP01. JONES also wants to access applications written for a model 5 display station (27 x 132) on the HOST system. When the command is entered, the next display shown asks JONES for a password to the HOST system. The LOGMODE specifies that this command is issued from a model 5 display station (27 x 132) using a screen size of 27 x 132 screen.

Note: In this example, the value used for the LOGMODE parameter is D4A32785. You can use any logmode that supports a 27 x 132 display station.

Specifying 3270 Emulation Time-Out

When you enter the STREML3270 command, the host system may not always be active to the 3270 device. To prevent this from delaying the job, the emulation program only waits for a response from the host system for a specified amount of time. To specify this time limit on the STREML3270 command, use the INZWAIT (time-out wait for host) parameter. (Press F10, Additional Parameters, to display the INZWAIT parameter.) If you do not specify a time limit, the program uses a default time of 120 seconds. If the host system does not send the first display within the specified time limit, the emulation session ends and message CPF8508 is sent to the requester.

Note: The INZWAIT value is only used for the first read from the host system.

On some host systems no display is sent. You must run the 3270 system request function, then type the data, and transmit it using the Enter key.

Operating Considerations

Once the emulation session is started, your display station is under control of the host system application. You receive the same displays, and enter data as you would on any other 3270 device on the network.

BSC Operating Considerations: BSC protocol is time-dependent. Therefore, you must consider the demand on system resources when planning to use 3270 device emulation. If the demand is so heavy that device emulation is unable to process the data within the time-out period specified by the host system, the host system may drop the line or session.

SNA Operating Considerations: The following considerations apply to running 3270 device emulation under SNA protocol:

Handling DACTLU: When the host system sends a Deactivate Logical Unit (DACTLU) command to your 3270 display emulation session, one of the following can occur:

- If you are using electronic customer support (ECS), the display emulation session ends immediately.
- If you entered the STREML3270 command and specified the value *DACTLU for the ENDCOND (end emulation conditions) parameter, the display emulation session ends immediately. Message CPF85EB is sent to the requester.
- If you entered the STREML3270 command and specified a value other than *DACTLU for the ENDCOND parameter, the display emulation session remains active for the time specified on the INZWAIT parameter, but no longer than five minutes. 3270 display emulation tries to start the session every two seconds while it remains active. If an Activate Logical Unit (ACTLU) command is received from the host during this time, then the session is restarted. If not, the session ends and message CPF8508 is sent to the requester.

Operations Run during AS/400 System Connection: The operations run during a system connection are the same as those run when a 3278 display station is connected to an SNA network.

Each message from the host system on the system services control point-secondary logical unit (SSCP-SLU) flow displays at the current cursor address. A new line (NL) control code causes the remainder of the current line to become null, unless the current buffer address is at the beginning of a line. Consecutive NLs do not insert nulls in each new line. The message wraps to the top of the display if the last line is written and additional characters remain in the message. The cursor is placed into the position next to the last character when the message is written. If you are using a 27 x 132 capable display, then each message sent from the host on the SSCP-SLU flow displays in maximum screen size mode. If a message that was created for a 24 x 80 capable device has data that appears in row 2, column 1, it appears in row 1, column 81, when displayed on the 27 x 132 capable display. To prevent this data shift, specify one of the following:

- EMLCFGE entry with *MOD2 specified for the EMLMAXSCN parameter. This forces all subsequent screens to a 24 x 80 size.
- Insert an NL before each line of message data. This ensures that the message appears correctly regardless of the display's screen size.

The only valid AID keys accepted for messages to the host system are Enter, Clear, Erase EOF, and Erase Input. These keys operate as they normally do. The PF and PA keys are rejected during a system connection. The messages to the host system consist of data characters only, with a maximum length of 256 characters. Data contained in the first 256 display positions (including and following the initial cursor address) or to the end of the display is sent to the host system. Nulls are not included in this data.

Changing the SNA Connection: You can simulate the 3270 System Request key by pressing the 5250 Test Request key or by selecting option 7 from the Select 3270 Emulation Option for SNA menu. The 5250 Test Request key clears the host system's display screen and changes the

SNA connection. Press the 5250 Test Request key from the Select 3270 Emulation Option for SNA menu to immediately update the connection status. If the host system sent new data to your 3270 session while you were viewing the Options display or other help information, you cannot use the Test Request key, and the connection status is not changed. You must return to the host system display to see the new data before the Test Request key becomes active again.

Ending a Display Emulation Session

If you end the emulation session in any of the following ways, the emulation session appears to the host system as if the 3278 were powered off:

- Press the System Request key sequence and select option 12, or press the Attn key if you specified *YES for the ATNEMLMNU (attention emulation menu) parameter on the STREML3270 command. When the Select 3270 Emulation Option menu is displayed, select option 99. This is the normal way to end display emulation. The system display is restored to the display shown when you first requested the emulation session.
- Press the System Request key sequence and select option 2 (Cancel previous request) from the System Request Menu to end the emulation session. You return to the system display that was shown when you requested the emulation session.
- Use the Hold Communications Device (HLDCMNDEV) command with the OPTION parameter value *IMMED to specify the emulation device.
- End the job in which you requested emulation. Either the system operator can end the job, or you can end the job from another display station. The Sign-On display reappears when the job ends. Use either of the following methods to end a job:
  - Press the System Request key and select option 90 to sign off from the System Request Menu.
  - Cancel the job in which emulation is running from an active display station.
  - Turn off the power of the 5250 display. When the power for the 5250 is turned on again, the system Sign-on display is shown.

  If you are running 3270 emulation under SNA, an additional option is:
  - Type the STREML3270 command and specify one or more of the allowed values for the end emulation conditions (ENDCOND) parameter. You can specify *DACTLU or *UNBIND so that the 3270 display emulation session ends if the host sends an SNA DACTLU or UNBIND command.

Using a Display Station During an Emulation Session

When you use a display station during emulation, you need to be aware of the keyboard and display differences between 5250 and 3270 devices. You also need to understand how 3270 device emulation affects such factors as the availability of various system functions, the maximum number of input fields on a display, and error messages. This information, including 3278 and 5250-type keyboard diagrams and a summary of 3278 and 5250 functional differences, is presented in Appendix L.

Select 3270 Emulation Option Menu

To display the Select 3270 Emulation Options menu during an emulation session you can:

- Press the Attn key if you specified *YES for the ATNEMLMNU (attention emulation menu) parameter on the STREML3270 command.
- Press the System Request key sequence and select option 12 from the System Request menu.

```
                              System Request
                                                        System:   RCHASTND
Select one of the following:

     1. Display sign on for alternative job
     2. End previous request
     3. Display current job
     4. Display messages
     5. Send a message
     6. Display system operator messages
     7. Display work station user

1    12. Display 3270 emulation options menu

     80. Disconnect job

     90. Sign off

                                                                      Bottom
Selection
     -
F3=Exit   F12=Cancel
```

1 Option 12 on the System Request menu is not displayed if the 3270 emulation session was suspended at the time the System Request key sequence was pressed. The session could be suspended for one of the following reasons:

- A break message is displayed.
- The Select 3270 Emulation Option menu is displayed already.
- The Attn key was pressed previously and an Attention-key-handling program currently controls the display.

The System Request key method can be used regardless of the value specified for the ATNEMLMNU parameter.

The Select 3270 Emulation Option menu enables you to do a variety of operations during your 3270 display emulation

session. You are presented with a slightly different menu, depending on whether your emulation session is running under BSC or SNA protocol. The menus, and the status conditions and supported options presented on each of them, are discussed in the following sections.

3270 Emulation Options for BSC

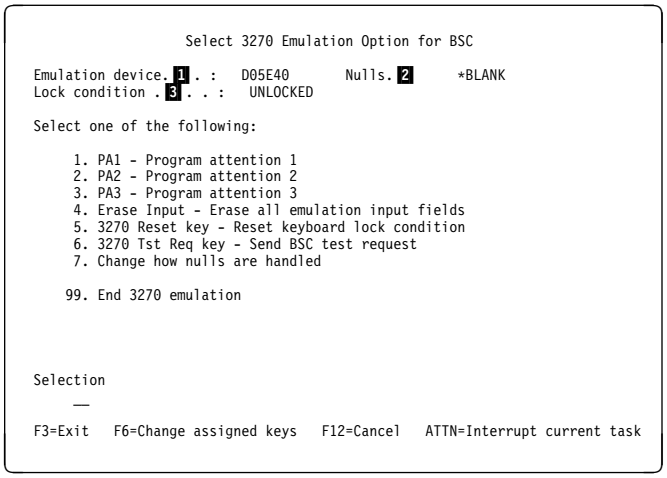


Figure 8-4. Select 3270 Emulation Option for BSC Menu

Status Conditions: As shown in Figure 8-4, the following are the displayed fields and their status conditions:

1 *Emulation device*. This is the name of the device you selected for communicating to the BSC host system.

2 *Nulls*. This describes how nulls within the 3270 data stream are currently handled before returning the data to the host system. The possible settings are:

Setting	Description
*BLANK	Beginning and embedded nulls are changed to blanks.
*REMOVE	Beginning and embedded nulls are removed.

3 *Lock condition*. This shows the current lock condition of the emulation display keyboard. The following three lock conditions are possible:

State	Description
UNLOCKED	The keyboard is unlocked and you can enter data on the display.
X-SYSTEM	The keyboard is locked. Select option 5 (3270 Reset key) to unlock the keyboard.
X-CLOCK	The keyboard is locked. You cannot enter data on the display or unlock the keyboard. The host system unlocks the keyboard.

Supported Options: You can also type one of the supported options in the Selection field and press the Enter key to call the option. The following options are supported on this menu:

- Option 1 resumes your 3270 display emulation session and sends a Program Attention 1 (PA1) identifier to the host system.
- Option 2 resumes your 3270 display emulation session and sends a Program Attention 2 (PA2) identifier to the host system.
- Option 3 resumes your 3270 display emulation session and sends a Program Attention 3 (PA3) identifier to the host system.
- Option 4 resumes your 3270 display emulation session and erases the contents of all input fields on the display. (See note 6 on page L-10 for restrictions on the use of the 5250 Erase Input key.) If the keyboard was locked when you called the Select 3270 Emulation Option for BSC menu to be displayed, this option has no effect.
- Option 5 resumes your 3270 display emulation session and unlocks the keyboard if the lock condition is X-SYSTEM. The lock condition is changed from X-SYSTEM to UNLOCKED. This option does not change either an UNLOCKED or X-CLOCK lock condition.
- Option 6 resumes your 3270 display emulation session and sends a 3270 BSC Test Request to the host system.
- Option 7 resumes your 3270 display emulation session and switches between the nulls handling settings of *BLANK and *REMOVE.
- Option 99 ends emulation and returns you to the display from which emulation was started.

3270 Emulation Options for SNA

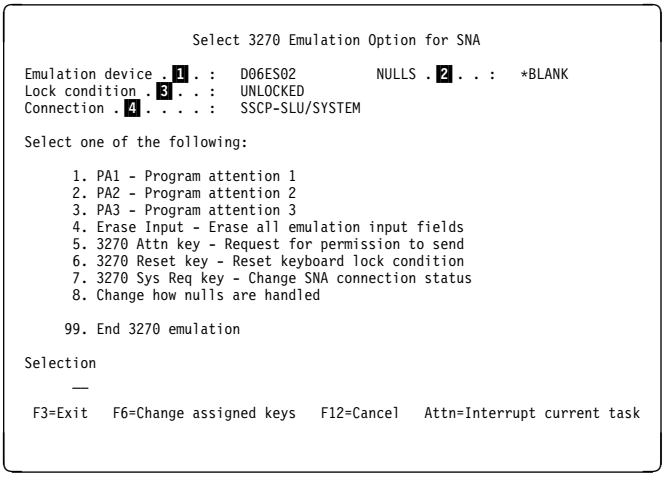


Figure 8-5. Select 3270 Emulation Option for SNA Menu

Status Conditions: As shown in Figure 8-5, the following are the displayed fields and their status conditions:

1 *Emulation device*. This is the name of the device you selected for communicating to the SNA host system.

2 *Nulls*. This describes how nulls within the 3270 data stream are currently handled before returning the data to the host system. The possible settings are:

Setting	Description
*BLANK	Beginning and embedded nulls are changed to blanks
*REMOVE	Beginning and embedded nulls are removed

3 *Lock condition*. This shows the current lock condition of the emulation display keyboard. The following three lock conditions are possible:

State	Description
UNLOCKED	The keyboard is unlocked and you can enter data on the display.
X-SYSTEM	The keyboard is locked. Select option 6 (3270 Reset key) to unlock the keyboard.
X-CLOCK	The keyboard is locked. You cannot enter data or unlock the keyboard. Select option 5 (3270 Attn key) to request the host system to unlock the keyboard.

4 *Connection.* This field shows your SNA connection status. This connection status is equivalent to that shown in the lower left corner of the display screen of the 3278 or 3279 display station. The status of the connection can be any of the following:

Unowned/?

The unowned connection status is shown by a **?** in the lower left corner of a 3278 or 3279 display station. This connection means that no job connection has been established and that the system does not know what application you want to communicate with.

If the host system is not set up to automatically establish a connection to a specific application, this is the first type of connection status you see. You must press the 5250 Test Request key or select option 7 to establish a system connection and then log on to request a specific job application such as time-sharing option (TSO).

SSCP-SLU/System

On a 3278 or 3279 display station, the system services control point-secondary logical unit (SSCP-SLU) system connection status is indicated by the stick-figure symbol,  .

This type of connection means you are communicating directly with the host system. It is required to log on, or to request that the system connect you to a specific application (such as TSO or CICS). You can establish a system connection from an unowned connection or from a job connection by pressing the 5250 Test Request key or selecting option 7.

PLU-SLU/Job

On a 3278 or 3279 display station, the primary logical unit-secondary logical unit (PLU-SLU) job connection status is indicated by a box, ■ . The host system establishes the session by sending an SNA BIND command. This type of connection must be established before you can communicate with a host system application. This is the first type of connection status you see if your host system is set up to automatically establish a connection to a specific application. Additional information about the PLU-SLU/job connection can be found in the *3274 Information Display System/3274 Control Unit Description and Programmer's Guide*.

Supported Options: You can also type one of the supported options in the Selection field and press the Enter key to call the option. The following options are supported on this menu:

- Option 1 resumes your 3270 display emulation session and sends a Program Attention 1 (PA1) identifier to the host system.
- Option 2 resumes your 3270 display emulation session and sends a Program Attention 2 (PA2) identifier to the host system.
- Option 3 resumes your 3270 display emulation session and sends a Program Attention 3 (PA3) identifier to the host system.

- Option 4 resumes your 3270 display emulation session and erases the contents of all input fields on the display. (See note 6 on page L-10 for restrictions on use of the 5250 Erase Input key.) If the keyboard was locked when you called the Select 3270 Emulation Option for SNA menu to be displayed, this option has no effect.
- Option 5 resumes your 3270 display emulation session and sends a request to the host system for permission to send.
- Option 6 resumes your 3270 display emulation session and unlocks the keyboard if the lock condition is X-SYSTEM. The lock condition is changed from X-SYSTEM to UNLOCKED. This option does not change either an UNLOCKED or X-CLOCK lock condition.
- Option 7 resumes your 3270 display emulation session and switches to the appropriate SNA connection. Table 8-1 shows the connection state after selecting option 7.

Table 8-1. Connection State

Current Connection State	Connection State Result after Selecting Option 7
Unowned/?	SSCP-SLU/System
SSCP-SLU/System	Unowned/? if the connection state before the current state was Unowned/?
SSCP-SLU/System	PLU-SLU/Job if the connection state before the current state was PLU-SLU/Job
PLU-SLU/Job	SCP-SLU/System

- Option 8 resumes your 3270 display emulation session and switches between the nulls handling settings of *BLANK and *REMOVE.
- Option 99 ends emulation and returns you to the display from which emulation was started.

Function Keys Supported

The following keys are supported on the BSC and SNA Select 3270 Emulation Option menus:

F1 (Help)
Displays general help for 3270 display emulation and specific help for this menu.

F3 (Exit)
Resumes your 3270 display emulation session.

F6 (Change assigned keys)
Displays the Change Assigned Keys for 3270 Emulation display as follows:

```
                  Change Assigned Keys for 3270 Emulation

Type in the key functions to be simulated, press Enter

Page Up (Roll Down) key . . . .    *PA2       *NONE, *F1-*F24, *PA1-*PA3
                                              *CLEAR, *ERASEINP, *CSRSLT
Page Down (Roll Up) key . . . .    *PA1       *NONE, *F1-*F24, *PA1-*PA3
                                              *CLEAR, *ERASEINP, *CSRSLT
Test Request key  . . . . . .      *DFT       *DFT, *CLEAR, *ERASEINP
Cursor Select key . . . . . .      *NONE      *NONE, *F1-*F24

    Valid keys to simulate are:

       *F1       *F7       *F13       *F19       *PA1
       *F2       *F8       *F14       *F20       *PA2
       *F3       *F9       *F15       *F21       *PA3
       *F4       *F10      *F16       *F22       *CLEAR
       *F5       *F11      *F17       *F23       *ERASEINP
       *F6       *F12      *F18       *F24       *CSRSLT


 F3=Exit  F12=Cancel   Attn=Interrupt current task
 (C) COPYRIGHT IBM CORP. 1980, 1991.
```

Figure 8-6. Change Assigned Keys for 3270 Emulation Display

The Change Assigned Keys for 3270 Emulation display allows you to change the assignment of the Page Up (Roll Down), Page Down (Roll Up), Test Request, and Cursor Select keys on the display. The keys that can be simulated are shown on the lower portion of the display. The current assignment of Page Up (Roll Down), Page Down (Roll Up), Test Request, and Cursor Select keys is also shown. To change the assignment of a key, type the chosen key function and press the Enter key.

F12 (Cancel)
Resumes your 3270 display emulation session.

Attn (Interrupt current task)
Calls an attention program that is currently set for your job. This program could be set in various ways such as with the Set Attention Program (SETATNPGM) command.

Enter
Resumes your 3270 display emulation session when the Selection field is blank.

Help
Displays general help for 3270 display emulation and specific help for this menu.

System Functions Available during Emulation

During an emulation session, you can use the Attn key, Print key, or System Request key functions as described below.

Attn Key: Depending on which communications protocol your system uses, the BSC or SNA Select 3270 Emulation Option menu is displayed if you specify *YES for the ATNEMLMNU (attention emulation menu) parameter on the Start 3270 display emulation (STREML3270) command and then press the Attn key during the emulation session. You can then press the Attn key again to call an attention program that is currently set for your job.

The Attention program that is currently set for your job is called if you specify *NO for the ATNEMLMNU parameter on the STREML3270 command and then press the Attn key during the emulation session. You may find that specifying this value is very useful especially if your Attention program is used to switch between group jobs.

Note: You can still display the Select 3270 Emulation Option menu by pressing the System Request key sequence and selecting option 12.

Print Key: Press the 5250 Print key to start the normal print function and produce a printed copy of the display. Press the Reset key to return to the emulation session.

System Request Key: Press the System Request key to suspend an emulation session and return to the system mode. The session remains active and returns to you after the system request is complete.

The 5250 system request support is not available when emulation is requested in a batch job that uses the DSPDEV parameter.

You must press an AID key (such as the Enter key or a function key) within a limited time period, or the host system can drop the session (and probably the line). If you return from system request and see an AS/400 display instead of a host system application display, vary off the line, the controller, and the device, then vary them back on. Contact the host system operator to vary on the line again before you enter the STREML3270 command to start a new session.

When the System Request menu is displayed, the host system can attempt to communicate with the emulation session several times before giving up. When this occurs, other emulation sessions appear as pending while waiting to be serviced by the host system. When returning from the System Request menu, the emulation session may also appear pending while the host system catches up with the backlog activity.

Recognizing Error Messages

Several types of error messages may be displayed when you are using 3270 device emulation:

- Keyboard messages: These are key entry errors and appear as blinking 4-digit numbers on the lower left corner of the display. Press the Help key to obtain more information about the message. See the *System Operation* book if you cannot correct the error.
- System messages: These messages are from the AS/400 system and include the emulation messages.
- Messages from the host system: For information on messages sent from the host system, see the host system documentation.

Verifying Operations through Online Test (BSC only)

If the host system supports the 3270 Test Request feature, you can use the test request function during a 3270 emulation session at a 5250 display station to check the operation of the following:

- Any 5250 display station with an active 3270 emulation session
- Any system printer used to print from an emulation output file during a 3270 printer emulation job

To run test request, press the Attn key and select option 6 (3270 TESTREQ). The 3270 data stream for a test request contains only data. Unlike a normal data stream, this data stream does not contain the address of the display device or the location of the cursor.

The 3270 test request function works differently for a remote display device than for a local display device. The difference depends on how the host system polls the device. The host system can do a **general poll** or a **specific poll**.

If the host system does a general poll (without addressing a specific device), the test request data stream is transmitted, but the host system cannot determine which display device sent the data. The display device's keyboard locks when you press the Test Request key, and the host system might not send a response to unlock it. Press the 5250 Attn key and select option 5 (3270 Reset key) to unlock the keyboard.

When the host system does a specific poll, it addresses a specific display device and knows which device sent the test request. In this case, the host system can process the test request data stream normally.

The inability to determine which device sent data can also occur on an actual 3270 display device operating on a remote line. To recover, press the Reset key. In either case, there is no direct way for the host system to do the test request function for a remote device. The host system can end the test request because it does not know which display device sent it; but the 3270 emulation session remains active.

Before attempting to use the Test Request key, refer to *A Guide to Using the Test Request Feature on the IBM 3270 Information Display Systems; 3271, 3272, 3275, 3277, 3284, 3286, and 3288*.

Running Printer Emulation

To operate printer emulation on the system, you must:

- Start the printer emulation job using the Start Printer Emulation (STRPRTEML) command.
- Control printing using the Eject Emulation Output (EJTEMLOUT) command.

- SNA only: Use the Emulate Printer Key (EMLPRTKEY) command to emulate the 3287 or 3289 PA1 or PA2 keys.
- End the printer emulation job when printing is complete by using the End Printer Emulation (ENDPRTEML) command.

Note: BSC printer emulation only supports LU session type 3 3270 data stream compatibility (DSC) data. SNA printer emulation supports both LU session type 3 3270 DSC data and LU session type 1 data, which is SNA character string (SCS) data.

Starting a Printer Emulation Job

You can start 3270 printer emulation in the following ways:

- Enter the Start Printer Emulation (STRPRTEML) command interactively from a display station.
- Place the STRPRTEML command in a batch or interactive program.

Note: If you do not enter the STRPRTEML command correctly, you receive error messages. These messages have a message ID of CPF85xx. All STRPRTEML parameters apply to both BSC and SNA protocols except ENDBKTEJT, OPNPRTF, and ENDCOND. These parameters are supported for SNA only.

Printer emulation begins immediately when you enter the STRPRTEML command with the appropriate parameters. However, you can also start printer emulation through prompting displays by typing STRPRTEML and pressing F4. The first display you receive is the Start Printer Emulation display. From this display, you must select one emulation controller, device, or location for printer emulation.

```
                    Start Printer Emulation (STRPRTEML)

Type choices, press Enter.

Emulation controller, or . . . .  __________    Name
Emulation device, or . . . . . .  __________    Name
Emulation location . . . . . .    ________      Name
Print device . . . . . . . . . .  __________    Name
Job name . . . . . . . . . . . .  *EMLDEV       Name, *EMLDEV
End Bracket eject  . . . . . .    *NO           *NO, *YES
Printer file . . . . . . . . . .  QPEMPRTF      Name
  Library  . . . . . . . . . . .    *LIBL       Name, *LIBL, *CURLIB
Timeout wait eject:
  Minutes  . . . . . . . . . . .  *NONE         0-99, *NONE, *IMMED
  Seconds  . . . . . . . . . . .  _____         0-59
Defer printing spool output  . .  *PRTFILE      *PRTFILE, *YES, *NO
Spool output . . . . . . . . . .  *PRTFILE      *PRTFILE, *YES, *NO



                                                                  Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Figure 8-7. Start Printer Emulation (STRPRTEML) display

The STRPRTEML command can start printer emulation in the current job or in a batch job that emulates a 3270 printer. The batch job attributes and job queue are determined from the job description. The job uses the requester's user profile to start emulation.

Note: If you designate the printer job to run in a batch program, the default queue is QBATCH. QBATCH is defined to allow only one job to run at a time.

To allow your job to run, one of the following actions may be necessary:

- Change the job queue to another queue
- Change the maximum number of jobs allowed in the QBATCH queue

STRPRTEML Examples: The following example shows how to start a printer emulation job using a CL command. This example job uses the printer emulation device described by the EMLDEV parameter, and the IBM-supplied printer file, QPEMPRTF. All messages are sent to the work station message queue:

```
STRPRTEML   EMLDEV(EMPRT01)
```

The following example starts printer emulation in the current job by accepting data from the printer emulation device (EMPRT01) and writing the data to the IBM-supplied printer file, QPEMPRTF. The request is active until the session is ended.

```
STRPRTEML  EMLDEV(EMPRT01)  SBMJOB(*NO)
```

Printer Operating Considerations

Printer emulation prints records sent from the host system under the format described in the printer file. This continues until emulation is ended through the ENDPRTEML command or the emulation job is canceled. The following affect how the records are printed:

- Attributes of the printer file
- Type of printer being used
- Printer file overrides from the STRPRTEML command
- Print orders received from host system

Creating a Printer File: The printer file you use for 3270 emulation is the same as any other printer file on the system. You can use the Create Printer File (CRTPRTF) command to create your own printer file with unique attributes, or you can use the default printer file (QPEMPRTF) that is shipped with the system, which is specified as follows:

```
CRTPRTF   FILE(QSYS/QPEMPRTF)
    PAGESIZE(66 132)
    OVRFLW(66)
    LPI(6)
    CPI(10)
    SCHEDULE(*FILEEND)
    CTLCHAR(*NONE)
    MAXRCDS(*NOMAX)
    LVLCHK(*NO)
    FILESEP(1)
    TEXT('3270 Emulation Default Printer File')
```

To use your own printer file, specify the name of your printer file for the PRTFILE parameter on the STRPRTEML

command. Your printer file should be large enough to receive the data from the host system. The printer file size is specified on the PAGESIZE parameter.

Override Printer File (OVRPRTF) Command: The Override Printer File (OVRPRTF) command can be used to override current values in the printer file. If you run the STRPRTEML command and an override is in effect, the values specified on the STRPRTEML command take precedence over those specified with OVRPRTF. It is suggested that the following printer file parameters not be overridden with the OVRPRTF command, but with parameters on the STRPRTEML command, as described below:

PAGESIZE(width)
Override using the NUMCOL parameter on the STRPRTEML command.

PAGESIZE(length)
Override using the NUMLIN parameter on the STRPRTEML command.

OVRFLW
Do not override. The value of OVRFLW should match the value of the PAGESIZE(length) parameter.

LPI
Override using the LPI parameter on the STRPRTEML command.

SCHEDULE
Override using the DFRPRTOUT parameter on the STRPRTEML command.

CTLCHAR
Do not override. The value must be *NONE.

DEV
Override using the PRTDEV parameter on the STRPRTEML command.

SPOOL
Override using the SPOOL parameter on the STRPRTEML command.

BSC Functional Differences: Host system printer support and AS/400 3270 printer emulation support differ in the following ways:

Page length
The page length value for the printed output is determined by the switch setting on the 3287 printer. For 3270 printer emulation, the value is determined depending on the following:

- If *PRTFILE is specified for the NUMLIN parameter on the STRPRTEML command, then the PAGESIZE(length) printer file value is used.
- If a value is specified for the NUMLIN parameter on the STRPRTEML command, then the specified value is used.
- The default page length for printer emulation is found in the printer file used. To emulate a 3287 printer with the switches set to 01, the printer file must specify a page length of 1.

Page width
The page width value for the printed output is determined by the switch setting on the 3287 printer. For 3270 printer emulation, the value is determined depending on the following:

- If *PRTFILE is specified for the NUMCOL parameter on the STRPRTEML command, then the PAGESIZE(width) printer file value is used.
- If a value is specified for the NUMCOL parameter on the STRPRTEML command, then the specified value is used.

Lines per inch
The lines per inch (LPI) value for the printed output is determined by the switch setting on the 3287 printer. For 3270 printer emulation, the value is determined depending on the following:

- If *PRTFILE is specified for the LPI parameter on the STRPRTEML command, then the LPI printer file value is used.
- If a value is specified for the LPI parameter on the STRPRTEML command, then the specified value is used.

Characters per inch
The characters per inch (CPI) value for the printed output for emulated printers is 10 and is not switchable. For 3270 printer emulation, numerous CPI settings are allowed depending on the AS/400 printer. The CPI value used for the output is determined by the value specified for the CPI printer file parameter.

SNA Functional Differences: Host system printer support and AS/400 3270 printer emulation support differ in the following ways:

Page length
The page length value for the printed output is determined by the switch setting on the 3287 printer until overridden by the SCS Set Vertical Format (SVF) command sent from the host system. For 3270 printer emulation, the value is determined depending on the following:

- If *PRTFILE is specified for the NUMLIN parameter on the STRPRTEML command, then the PAGESIZE(length) printer file value is used until overridden by the SVF command sent from the host system.
- If a value is specified for the NUMLIN parameter on the STRPRTEML command, then the specified value is used until overridden by the SVF command sent from the host system.

Page width
The page width value for the printed output is determined by the switch setting on the 3287 printer until overridden by the SCS Set Horizontal Format (SHF) command sent from the host system. For 3270 printer emulation, the value is determined depending on the following:

- If *PRTFILE is specified for the NUMCOL parameter on the STRPRTEML command, then the PAGESIZE(width)

printer file value is used until overridden by the SHF command sent from the host system.

- If a value is specified for the NUMCOL parameter on the STRPRTEML command, then the specified value is used until overridden by the SHF command sent from the host system.

Lines per inch
The lines per inch (LPI) value for the printed output is determined by the switch setting on the 3287 printer until overridden by the SCS Set Line Density (SLD) command sent from the host system. For 3270 printer emulation, the value is determined depending on the following:

- If *PRTFILE is specified for the LPI parameter and *IMMED is specified for the OPNPRTF parameter on the STRPRTEML command, then the LPI printer file value is used for the duration of the session.
- If a value is specified for the LPI parameter and *IMMED is specified for the OPNPRTF parameter on the STRPRTEML command, then the specified value is used for the duration of the session.
- If *PRTFILE is specified for the LPI parameter and *RCVDTA is specified for the OPNPRTF parameter on the STRPRTEML command, then the LPI printer file value is used until overridden by the SLD command sent from the host system.
- If a value is specified for the LPI parameter and *RCVDTA is specified for the OPNPRTF parameter on the STRPRTEML command, then the specified value is used for the duration of the session.

Characters per inch
The characters per inch (CPI) value for the printed output for emulated printers is 10 and is not switchable. For 3270 printer emulation, numerous CPI settings are allowed depending on the AS/400 printer. The CPI value used for the output is determined by the value specified for the CPI printer file parameter.

3270 DSC print orders

- The AS/400 system supports the form feed (FF) and carriage return (CR) print orders for all 3270 printers emulated. (The 3287 supports both the FF and CR print orders; the 3288 supports only the FF print order.)
- The AS/400 system does not support the suppress index (SI) print order for the 3288 printer.

SCS printer control code differences

- Vertical tabs set by the SVF code need not be in order when a 3287 or 3289 printer is emulated.
- Graphic escape (GE) code is not supported and is rejected.
- See Appendix K for information on Set Attribute (SA) Code support.
- The bell (BEL) code is ignored.

SNA Deactivate Logical Unit
When the host system sends an SNA Deactivate Logical Unit (DACTLU) command to your 3270 printer emulation session, one of the following can occur:

- If you entered the STRPRTEML command and specified the value *DACTLU for the ENDCOND (end emulation conditions) parameter, the printer emulation session ends immediately. Message CPF85EB is sent to the requester.
- If you entered the STRPRTEML command and specified a value other than *DACTLU for the ENDCOND parameter, the printer emulation session remains active until ended. 3270 printer emulation tries to start the session every thirty seconds while it remains active. If an Activate Logical Unit (ACTLU) command is received from the host during this time, the session is restarted. The session can be ended with any of the methods described in “Ending Printer Emulation without Ending Job” on page 8-16.

Controlling SNA Printer Emulation with PA Keys

For the most part, the parameters that you specify on the STRPRTEML command control your 3270 printer emulation session. However, under SNA protocol, additional control is provided through the emulation of Program Attention functions.

Host System Request for PA Key (SNA Only): In an actual 3270 environment, a display station operator or the host system operator can control a print session using the PA1 or PA2 keys. The host system can send a request for a PA key directly to the 3287 printer, which sounds an audible alarm to alert the operator to press the appropriate PA key. The 3287 printer has a physical PA1 and PA2 key and the operator can then press the correct key in response.

Under SNA protocol, these functions can be emulated when the host system has bound the session to the printer as a logical unit-to-logical unit (LU-LU) session type 1. If the host system sends a request for a PA key response, then inquiry message CPF8584 is sent to the message queue specified on the MSGQ parameter for the STRPRTEML command. Depending on the delivery mode (DLVRY) of the message queue, the message may or may not appear at a display station. An operator can receive the message and then respond to it by typing a 1 to emulate pressing the PA1 key, or a 2 to emulate pressing the PA2 key. This response is then sent to the host system. If you specify *NONE for the MSGQ parameter for the STRPRTEML command, the default reply is automatically sent in response to message CPF8584. The default reply for CPF8584 is 1 for PA1. You can change this default reply using the CHGMSGD command.

Operator Request for PA Key (SNA Only): The Emulate Printer Key (EMLPRTKEY) command can also send a PA1 or PA2 key request or response for the specified printer to the host system. The printer emulation routine prints a complete transmission block from the host system before performing this request. The host system must send a change of direction or an end bracket before the PA key is sent.

Note: Any error messages that occur as a result of entering the EMLPRTKEY command incorrectly have a message ID of CPF85XX.

When you enter the EMLPRTKEY command, you see the following display:

```
                    Emulate Printer Keys (EMLPRTKEY)

Type choices, press Enter.

Emulation device, or . . . . . _________   Name
Emulation location . . . . . _________   Name
Print device . . . . . _________   Name
Emulated printer key . . . . . *PA1        *PA1, *PA2
```

EMLPRTKEY Example: The command in the following example sends a PA2 key request to the host system for the printer emulation device EMPRT01.

```
EMLPRTKEY EMLDEV(EMPRT01) PAKEY(*PA2)
```

Ejecting and Printing Output during a Printer Emulation Session

You can eject printer emulation output from the printer file before ending the emulation session. When the output is ejected, the printer file is closed and the data last received from the host system is written to the spooled file or printer. A form feed is then done, causing an eject to the next page.

If you allow the open printer file (OPNPRTF) parameter on the STRPRTEML command to default to *IMMED, another printer file is opened immediately so more data can be received.

If you specify *RCVDTA on the STRPRTEML command (SNA only), another printer file is opened when additional data is received from the host system.

Emulation output can be ejected in one of the following ways:

STRPRTEML TIMOUTEJT(mm ss)

Type the STRPRTEML command and specify, in minutes and seconds, a time-out interval for the time-out wait eject (TIMOUTEJT) parameter. The emulation output is automatically forced out if the printer file contains host system data and no new data was received from the host system within the specified time-out wait interval.

Note: The time-out wait interval does not take affect until data is first received from the host system.

EJTEMLOUT

Type the Eject Emulation Output (EJTEMLOUT) command with its associated parameters, or type the command and then press F4 (Prompt) to use the prompt display for the command. The Eject Emulation Output display appears. From this display, you can specify a device or location and printer from which printer output is to be ejected.

```
                    Eject Emulation Output (EJTEMLOUT)

Type choices, press Enter.

Emulation device, or . . . . . _________   Name
Emulation location . . . . . _________   Name
Print device . . . . . _________   Name
```

Note: If this command is issued and the printer file is empty, then a message is sent to the requester of the command and the eject request is not done.

The following two options apply if you are running 3270 emulation under SNA protocol:

STRPRTEML OPNPRTF(*RCVDTA)

Type the STRPRTEML command and specify *RCVDTA for the OPNPRTF parameter. Also specify *PRTFILE for one or more of the following three parameters: NUMCOL, NUMLIN, and LPI. *RCVDTA specified for OPNPRTF and *PRTFILE specified for one of the printer control parameters indicate to use the associated printer control value if sent from the host system. The following list shows the STRPRTEML printer control parameter followed by the associated host printer control value:

- NUMCOL(*PRTFILE) - Use the Set Horizontal Format (SHF) value if sent from the host system
- NUMLIN(*PRTFILE) - Use the Set Vertical Format (SVF) value if sent from the host system
- LPI(*PRTFILE) - Use the Set Line Density (SLD) value if sent from the host system

  Note: The passed values from the host only apply for LU session type 1 data.

The current emulation output, if any, is forced out when a printer control value is received from the host system in this 3270 printer emulation environment. When more print data is received from the host system, another printer file is opened using the printer control value(s) that were previously passed from the host system.

SNA only: STRPRTEML ENDBKTEJT(*YES)

Type the STRPRTEML command and specify *YES for the end bracket eject (ENDBKTEJT) parameter. The emulation output is automatically forced out when an SNA end bracket (EB) is received from the host system.

Note: The output is ejected only if the open printer file contains host system data.

The specified spool output (SPOOL) and defer printing spool output (DFRPRTOUT) parameters on the STRPRTEML command, in conjunction with the current SPOOL and SCHEDULE printer file values, determine how the emulation

output is printed. (These printer file values can be shown using the DSPFD command.) Table 8-2 on page 8-15 shows the SPOOL and DFRPRTOUT parameter combinations and also the resultant printer file values that are used to control the output:

Table 8-2. STRPRTEML Command Parameters

SPOOL	DFRPRTOUT	Printer File Result Used to Control How Emulation Output is Printed
*PRTFILE	*PRTFILE	Current SPOOL and SCHEDULE values are used
*NO	N/A	SPOOL(*NO) is used and SCHEDULE value does not apply
*YES	*PRTFILE	SPOOL(*YES) and current SCHEDULE value are used
*YES	*YES	SPOOL(*YES) and SCHEDULE(*FILEEND) values are used
*YES	*NO	SPOOL(*YES) and SCHEDULE(*IMMED) values are used

The following SPOOL and SCHEDULE printer file parameters show the possible values and their effect on the printer file.

- SPOOL(*NO): The SCHEDULE parameter does not apply when SPOOL(*NO) is specified. Data is printed as soon as a full page of data is received from the host. If a full page has not been received yet and the output is ejected, then the partial page of data is printed.
- SPOOL(*YES): Data is spooled as soon as a full page of data is received from the host. If a full page of data has not been received yet and the output is ejected, then the partial page of data is spooled and the spooled file is closed and ready to print.

The SCHEDULE parameter applies only if SPOOL(*YES) is specified. The following SCHEDULE parameters show the effect on how the spooled data is printed. The descriptions assume that a writer is active to the output queue that contains the 3270 printer emulation spooled file and that the spooled files are not held.

- SCHEDULE(*IMMED): Data is printed as soon as a full page of data is spooled or if a spooled file is closed. When the spooled file is closed, it becomes ready (RDY status) and all the data in the spooled file is printed.
- SCHEDULE(*FILEEND): Data is printed only if the spooled file is closed. When the spooled file is closed, it becomes ready (RDY status) and all the data within the spooled file is printed.
- SCHEDULE(*JOBEND): Data is printed only when the job ends. When the job ends, the currently active spooled file will be closed. When the spooled file is closed, it becomes ready (RDY status) and all the data within the spooled file is printed.

  Note: If you specified SBMJOB(*NO) on the STRPRTEML command using this SCHEDULE value, the output does not print until you sign off the display.

Examples

STRPRTEML with TIMOUTEJT
The following example automatically forces data received from the host system to be written to the printer file when no new data is received from the host system during the specified time-out wait interval.

```
STRPRTEML  EMLDEV(EMPRT01) TIMOUTEJT(1 20)
```

If the host system sent printer data to the emulation device EMPRT01 and then the host system did not send any new data for 1 minute and 20 seconds, the emulation output would be ejected.

Note: The TIMOUTEJT value can be specified in minutes and seconds.

EJTEMLOUT
The following example forces data received from the host system to be written to a printer file in the emulation job using the device EMPRT01.

```
EJTEMLOUT EMLDEV(EMPRT01)
```

Examples for SNA only

STRPRTEML with ENDBKTEJT
The following example forces data received from the host system to be written to a printer file whenever an SNA end bracket is received.

```
STRPRTEML EMLDEV(EMPRT01) ENDBKTEJT(*YES)
```

STRPRTEML with OPNPRTF, NUMLIN, NUMCOL, and LPI
The command in the following example starts a 3270 printer emulation session using the emulation device EMPRT01. It specifies that the printer file is to be opened only after data is received from the host to avoid tying up the printer needlessly. The printer control values (SHF and SVF) are used to control the page size if they are sent from the host system. The SLD value is not used if sent from the host system because the user chose a value of 4.

```
STRPRTEML EMLDEV(EMPRT01)
          OPNPRTF(*RCVDTA)
          NUMLIN(*PRTFILE)
          NUMCOL(*PRTFILE)
          LPI(4)
```

Ending Printer Emulation

You can end printer emulation in two ways; the first way ends printer emulation and ends the job, the second way ends the printer emulation session only. Both methods are discussed in the following sections.

Ending Printer Emulation and Ending Job: You can end a 3270 printer emulation session and the job with any of the following methods:

- Type the ENDJOB command and specify the qualified job name for the 3270 printer emulation job.

  If you specify SBMJOB (*YES) on the STRPRTEML command, then the qualified job name is the name derived from the STRPRTEML JOB parameter.

  If you specify SBMJOB (*NO) on the STRPRTEML command, then the qualified job name is the name of the job that issued the STRPRTEML command.

- If you specified *YES for the submit job (SBMJOB) parameter on the STRPRTEML command, a batch 3270 printer emulation job is submitted. Any of the methods described in "Ending Printer Emulation without Ending Job" that are used to end a batch job will end both the 3270 printer emulation session as well as the job.

Ending Printer Emulation without Ending Job: You can end a 3270 printer emulation session without ending the job as follows:

- Type the End Printer Emulation (ENDPRTEML) command and specify either the emulation device (EMLDEV) parameter, or the emulation location (EMLLOC) parameter and a printer device (PRTDEV) parameter to end the 3270 printer emulation session.

  The ENDPRTEML command does not always take effect immediately. The request is delayed if one of the following conditions exist:

  – You are printing a transmission block from the host system.

  – You are waiting for a printer error to be cleared (for example, a paper jam).

  – You are waiting for error recovery to the host system or work station printer device to complete.

  – The job is being held (HLDJOB).

  The end printer emulation request takes effect when the condition is cleared, then the printer emulation request ends.

Note: If you do not enter the ENDPRTEML command correctly, you receive error messages. These messages have a message ID of CPF85xx.

You can end printer emulation through the prompting displays by typing ENDPRTEML and pressing F4. The End Printer Emulation display appears. From this display you can specify the device, or location and printer for which printer emulation is to be ended.

```
                End Printer Emulation (ENDPRTEML)

Type choices, press Enter.

Emulation device, or . . . . . _________   Name
Emulation location . . . . . _________   Name
Print device . . . . . _________   Name
```

Note: If a CL program started the STRPRTEML command with SBMJOB(*NO) and was ended with one of the methods described in this section, additional requests in the job following the STRPRTEML command will be processed.

If you start a batch print job using the STRPRTEML SBMJOB(*YES) command, then the ENDPRTEML command ends a batch job. The command closes the file to the host system, then writes the last data received from the host system to the spooled file or printer by closing the printer file.

When running under SNA protocol, the following method also applies:

- Type the STRPRTEML command and specify one or more of the allowed values for the end emulation conditions (ENDCOND) parameter. The allowed values are *DACTLU, *ENDBKT and *UNBIND. The 3270 printer emulation session will end automatically if the host system sends an SNA command that matches one of the specified ENDCOND values. The SNA commands are Deactivate Logical Unit (DACTLU), end bracket (EB), and Unbind respectively.

Examples

ENDPRTEML
The following example ends the printer emulation session that is using the emulation device EMPRT01.

```
ENDPRTEML EMLDEV(EMPRT01)
```

Example for SNA only

STRPRTEML with ENDCOND
The following example starts a printer emulation session that will automatically end when the host system sends an SNA DACTLU or UNBIND command.

```
STRPRTEML EMLDEV(EMPRT01) ENDCOND(*DACTLU *UNBIND)
```

Chapter 9. DBCS Support with 3270 Device Emulation

This chapter discusses the conditions necessary to obtain double-byte character set (DBCS) processing on workstations and printers using Systems Network Architecture (SNA) 3270 device emulation. It addresses the following:

- How DBCS processing on a 3270 emulation device and a standard 3270 device differ.
- Restrictions on DBCS support with 3270 emulation.

DBCS processing is available for host-dependent 5250 type DBCS-capable devices through Systems Network Architecture (SNA) 3270 device emulation, which is described in Chapter 4. When the AS/400 system is connected into an SNA 3270 network, the AS/400 system appears to the System/370 host system to be a 3274 Control Unit with attached display stations and printers as shown in Figure 9-1.

Note: Virtual Telecommunications Access Method (VTAM*) Version 3.1 or later is required for 3270 emulation using SNA. 3270 device emulation supports any DBCS-capable device that is configured as one of the following:

- 5555 Model B01, C01, G01, or G02 display station
- 5553 Model B01 printer
- 5583 Model 200 printer

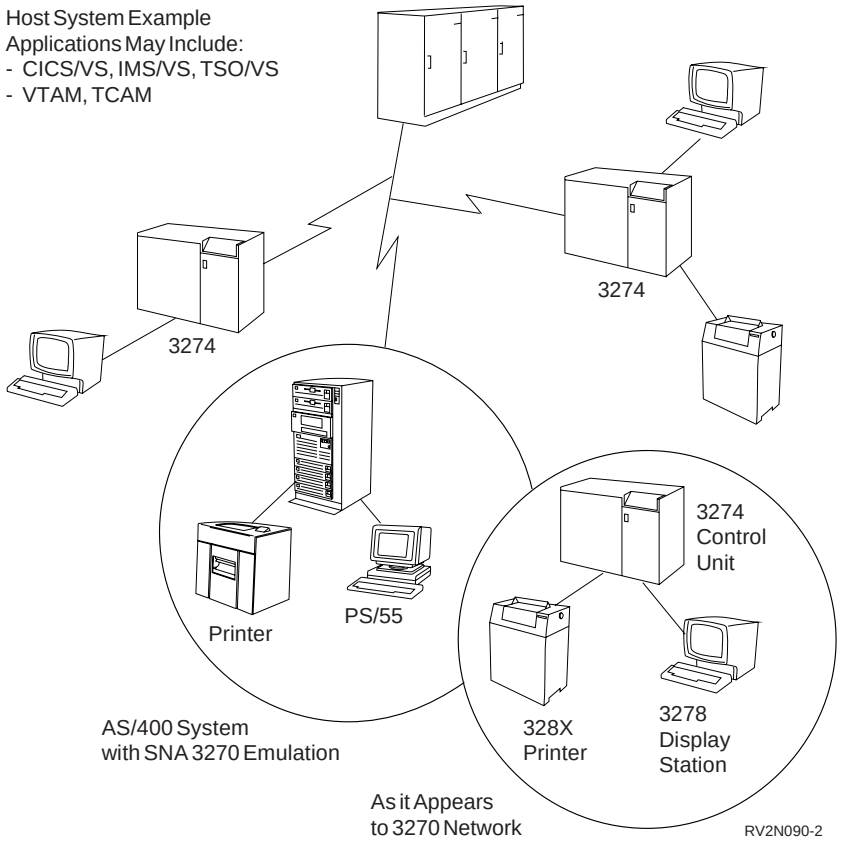


Figure 9-1. 3270 Device Emulation for SNA in a Network

DBCS Display Station Emulation

You can start a DBCS 3270 emulation session on an active or an inactive display station. An active display station is varied on and signed on. An inactive display station is varied on but has not been signed on.

Starting DBCS 3270 Emulation on an Active Display Station

To start DBCS processing, you enter the Start 3270 Emulation (STREML3270) command from a DBCS-capable display device. The keyboard language type associated with your session is specified by the keyboard type (KBDTYPE) parameter on the STREML3270 command. The value of the KBDTYPE parameter must refer to one of these supported DBCS keyboard types:

DBCS Keyboard Type	KBDTYPE Parameter
Japanese (Katakana SBCS base)	JKB
Japanese (English SBCS base)	JUB
Korean	KOB
Traditional Chinese	TAB
Simplified Chinese	RCB

Note: If the KBDTYPE parameter value is *DSPDEV, then the DSPDEV parameter in the device description must refer to one of the supported keyboard types. Similarly, if the KBDTYPE parameter value is *SYSVAL, then the QKBDTYPE must be set to one of the supported keyboard types.

Representative keyboard layout diagrams that illustrate the principal features of the DBCS keyboards and compare their functions to those of a standard 3278 keyboard are included in Appendix L.

You can issue the STREML3270 command on an active display station in the following ways:

- Type the STREML3270 command on the Command Entry display and press F4 to receive prompting displays.
- Type the STREML3270 command on the Command Entry display with appropriate parameters and press the Enter key. Emulation begins immediately. You do not receive prompting displays.
- Use the menu access to 3270 device emulation.
- Embed the STREML3270 command in a control language (CL) program.
- Place the STREML3270 command in the user profile sign-on program to automatically start an emulation session when you sign on to your display station.

Note: If you do not enter the STREML3270 command correctly, you will receive error messages. These messages have a message identification (ID) of CPF85xx.

See the *CL Reference* book for additional information about using command syntax and parameters. You can also use the online help information for additional syntax information.

If you type the STREML3270 command and press F4, the following Start 3270 Device Emulation display appears:

```
                  Start 3270 Display Emulation (STREML3270)

Type choices, press Enter.

Emulation controller, or . . . .  _________   Name
Emulation device, or . . . . . .  _________   Name
Emulation location . . . . . . .  _________   Name
Display device, batch only . . .  *CURRENT    Name, *CURRENT
Page Up (Roll Down) key  . . . .  *PA2        *NONE, *F1, *F2, *F3, *F4...
Page Down (Roll Up) key  . . . .  *PA1        *NONE, *F1, *F2, *F3, *F4...
Test Request key . . . . . . . .  *DFT        *DFT, *CLEAR, *ERASEIN
Cursor Select key  . . . . . . .  *NONE       *NONE, *F1, *F2, *F3, *F4...
SNA DBCS 3270PC Emulation  . . .  *NO         *NO, *YES

                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Figure 9-2. Start 3270 Display Emulation (STREML3270) Display

To change the KBDTYPE parameter, press F10 to view additional parameters, then page forward. The following display appears:

```
                  Start 3270 Display Emulation (STREML3270)

Type choices, press Enter.

Host signon/logon command  . . .  *NONE



End emulation conditions . . . .  *NONE       *NONE, *DACTLU, *UNBIND

Attention Emulation Menu . . . .  *YES        *YES, *NO
Function Key Program:
  Program  . . . . . . . . . . .  *NONE       Name, *NONE
    Library  . . . . . . . . . .               Name, *LIBL, *CURLIB
  Function Keys  . . . . . . . .               *ALLFKEYS, *F1, *F2, *F3...
            + for more values
Keyboard language type . . . . .  *DSPDEV     *DSPDEV, *SYSVAL, *LCL,...
Outgoing translation table . . .  *KBDTYPE    Name, *KBDTYPE
  Library  . . . . . . . . . . .               Name, *LIBL, *CURLIB

                                                                      More
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel    F13=How to use this display
F24=More keys
```

Figure 9-3. Start 3270 Display Emulation (STREML3270) Display

Specifying the Value of the KBDTYPE Parameter

The country keyboard language identifier is required by the emulation program to respond to character set queries from the host. In addition, single-byte character set (SBCS) characters sent to and from the host are converted based on the translation table associated with the country keyboard language identifier.

You specify the country keyboard language identifier through the KBDTYPE parameter by selecting one of the following values:

***DSPDEV**
Display device (*DSPDEV) is the KBDTYPE default. When the STREML3270 command is used on a local display and *DSPDEV is specified, the system uses the KBDTYPE value specified in the display device description. On remote displays, which do not have a KBDTYPE field in the device description, when *DSPDEV is specified the system uses the QKBDTYPE system value. If you allow the KBDTYPE parameter to default to *DSPDEV, you need to verify one of the following:

- That the device description KBDTYPE is set to one of the supported keyboard types (local displays)
- That the QKBDTYPE system value is set to one of the supported keyboard types (remote displays)

***SYSVAL**
When the system value (*SYSVAL) for KBDTYPE is specified, the system uses the QKBDTYPE system value.

***LCL**
When local (*LCL) is specified, the system uses the KBDTYPE valued specified in the device description for a local display. If you specify the *LCL value for the KBDTYPE parameter when issuing the STREML3270 command from a remote display, you will receive error message CPF8525.

country keyboard language identifier
You can specify the country keyboard language identifier if you do not want to use the configured keyboard type or the system value, for example: `KBDTYPE(JKB)`.

Note: The KBDTYPE value can be specified this way for both local and remote display devices.

***TRNTBL, with (TRNTBLIN(name) and TRNTBLOUT(name))**
When translation table (*TRNTBL) is specified, the system uses the KBDTYPE specified in the device description for a local device, or the QKBDTYPE system value for a remote device. You use *TRNTBL in conjunction with the TRNTBLIN and TRNTBLOUT parameters, which provide for the use of user-defined translation tables. This option provides the DBCS user with emulation support for such keys as Field Mark, which is not available on DBCS-capable displays.

Notes:

1. You can also use TRNTBLIN and TRNTBLOUT with the *DSPDEV, *SYSVAL, *LCL, and country keyboard language identifier values, which causes the system to use the specified KBDTYPE value and user-defined translation tables.
2. *TRNTBL only provides for the translation of the SBCS data in the datastream during a DBCS emulation session.

Whichever method you use to start emulation, STREML3270 links the display station with the specified 3270 display device description and puts the work station into an emulation session. During an emulation session, the display station appears to the host system to be a 3278 display station.

Starting a DBCS Emulation Session on an Inactive Display Station

You can start an emulation session on an inactive display station by placing the STREML3270 command with the display device (DSPDEV) parameter in a batch job that is either a CL program or an input stream. See Appendix G for an example of a program that runs emulation as a batch job.

The emulation support acquires the display station specified on the DSPDEV parameter and links the display station to a 3270 display device description. During the emulation session, the display station appears as a 3278 display to the host system. You can run host system procedures directly without having to run any AS/400 system procedures.

Note: You will receive error messages if you enter the STREML3270 command incorrectly. These messages have a message ID of CPF85xx.

STREML3270 Examples

If used on a remote PS/55, the following command:

```
STREML3270 EMLDEV(EMDSP01)
```

- Requests a 3270 display emulation session at emulation device EMDSP01.
- Causes the system to use the default KBDTYPE parameter, *DSPDEV. This accesses the QKBDTYPE system value, which is set to JKB.
- Enables the user to work with Japanese DBCS characters during the 3270 emulation session, because the device is a DBCS-capable device, and one of the supported keyboard types has been specified.

If used on a PS/55, the following command:

```
STREML3270 EMLDEV(EMDSP01)
           KBDTYPE(TAB)
           TRNTBLOUT(USERLIB/CVTOUT)
           TRNTBLIN(USERLIB/CVTIN)
```

- Requests to start a 3270 display emulation session at the emulation device EMDSP01
- Specifies the country keyboard language identifier for Taiwan Basic (TAB), which enables the user to work with DBCS characters.
- Specifies that user-defined translation tables are to be used to convert SBCS characters.

DBCS Printer Support

Two conditions must be in effect to obtain DBCS processing with 3270 printer emulation:

- The printer file IGCDATA parameter must have a value of *YES (which is the default for DBCS systems).
- The value of the Character Set (CHRSET) parameter on the STRPRTEML command must refer to one of the supported DBCS keyboard types.

The supported DBCS keyboard types and their associated country keyboard language identifiers are:

Japanese (Katakana SBCS base)	JKB
Japanese (English SBCS base)	JUB
Korean	KOB
Traditional Chinese	TAB
Simplified Chinese	RCB

If the CHRSET parameter value does not refer to one of the supported keyboard types, the emulation program will override the IGCDTA parameter and only SBCS processing will take place.

Specifying Printer File Parameters

The following parameter definitions specify the format of the default QPEMPRTF printer file on a DBCS system:

```
CRTPRTF FILE(QSYS/QPEMPRTF)
    PAGESIZE(66 132)
    OVRFLW(66)
    LPI(6)
    CPI(10)
    SCHEDULE(*FILEEND)
    CTLCHAR(*NONE)
    IGCSOSI(*NO)
    IGCDATA(*YES)
    MAXRCDS(*NOMAX)
    LVLCHK(*NO)
    FILESEP(1)
    TEXT('3270 Emulation Default Printer File')
```

Your printer file should be large enough to receive the data from the host system. The printer file size is specified on the PAGESIZE parameter.

Using the Override Printer File command: The Override Printer File (OVRPRTF) command can be used to override current values in the printer file. If you run the STRPRTEML command and an override is in effect, the values specified on the STRPRTEML command take precedence over those specified with OVRPRTF. It is suggested that the following printer file parameters not be overridden with the OVRPRTF command, but by specifying the parameters on the STRPRTEML command as described below:

PAGESIZE(width)
Override using the NUMCOL parameter on the STRPRTEML command.

PAGESIZE(length)
Override using the NUMLIN parameter on the STRPRTEML command.

OVRFLW
Do not override. The value of OVRFLW should match the value of the PAGESIZE(width) parameter.

LPI
Override using the LPI parameter on the STRPRTEML command.

SCHEDULE
Override using the DFRPRTOUT parameter on the STRPRTEML command.

CTLCHAR
Do not override. The value must be *NONE.

DEV
Override using the PRTDEV parameter on the STRPRTEML command.

SPOOL
Override using the SPOOL parameter on the STRPRTEML command.

Specifying the Value of the CHRSET Parameter

You can specify the following values for the CHRSET parameter:

***SYSVAL**
System value (*SYSVAL) is the CHRSET default. *SYSVAL causes the system to use the QKBDTYPE system value. If you allow this parameter to default to *SYSVAL, you need to verify that QKBDTYPE is set to one of the supported keyboard types.

country keyboard language identifier
You can specify the country keyboard language identifier if you want the system to use a keyboard type other than that assigned to the the QKBDTYPE system value, for example: `CHRSET(JKB)`.

Note: The USB value was formerly the CHRSET default value. Users who were accustomed to using the United States Basic character set for 3270 emulation and whose QKBDTYPE system value is set to something other than USB, will now have to specify USB on the CHRSET parameter.

***TRNTBL, with TRNTBLOUT(name)**
When translation table (*TRNTBL) values are specified, the system uses the QKBDTYPE to create the CHRID input for the character set query reply. You use *TRNTBL in conjunction with the TRNTBLOUT parameter, which provides for the use of user-defined translation tables to translate the SBCS data from the host system.

Note: You can also use the TRNTBLOUT parameter with CHRSET(*SYSVAL) and CHRSET(*ckl*) (where *ckl* is a country keyboard language identifier). This causes the

system to use, respectively, either the QKBDTYPE system value or the user-specified value to create the CHRID input for the character set query reply, and to use user-defined translation tables to translate the SBCS data from the host system.

For example, when used on a DBCS-capable system, the following command:

```
STRPRTEML EMLDEV(EMPRT01) CHRSET(KOB)
```

- Requests a 3270 printer emulation session using emulation device EMPRT01
- Specifies the Korean Basic country keyboard language identifier
- Assumes the use of the default printer file QPEMPRTF, since no printer file is specified
- Enables the user to print Korean DBCS characters during the 3270 printer emulation session, assuming the default IGCDTA(*YES) is in effect.

Comparing the Variations in DBCS Support

The tables on the following pages summarize the differences between AS/400 SNA 3270 device emulation DBCS support and the following:

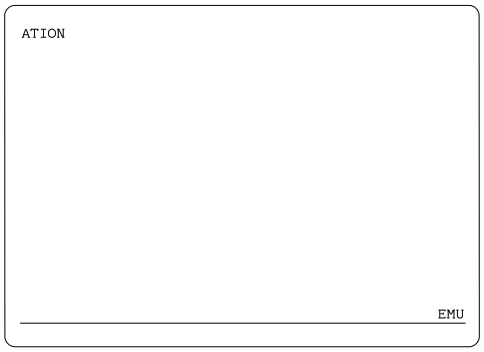
- Actual 3270 DBCS support
- AS/400 3270PC Emulation DBCS support
- System/36 SNA 3270 Kanji emulation

Emulated and Actual DBCS Support

Table 9-1 (Page 1 of 2). Differences between Emulated and Actual DBCS Support

Characteristic	AS/400 3270 Device Emulation	Actual 3270 DBCS Devices
DBCS dup	DBCS dup is not allowed in a DBCS subfield of an input field.	DBCS dup is allowed in an SBCS input field.
Cursor Select Key	Keyboards do not have a real Cursor Select key. You can emulate the key with the CSRSLT parameter on the STREML3270 command.	Keyboards have a Cursor Select key.
Field Mark Support	Keyboards do not have a Field Mark key. You can emulate the single-byte field mark by using the translation table support (TRNTBLIN and TRNTBLOUT parameters on the STREML3270 command).	Keyboards have a Field Mark key.
Gaiji character fonts	Uses Gaiji character fonts on AS/400 system to display (Japan only) and print (all DBCS character sets) Gaijis.	Uses Gaiji character fonts of the device (PS/55).
Extended field attribute limitations	If field outlining is on display, the four character positions on the top left corner of the display (row 1, columns 1 through 4) will not be visible.	Field outlining does not cause characters to be overwritten.
Character Reply Mode	Character reply mode is supported.	Character reply mode is supported.
Character attribute handling	The system queries a device to determine whether it is a DBCS-capable or a dual plane display. If the target display is either a DBCS-capable display with graphic data type capability or a dual plane display, the SA order is handled to set character attributes; however, character attributes in an unprotected field are ignored and the extended field attributes are used.	Character attributes are processed, and the user sees whatever attribute was specified.
Incomplete DBCS Character	In an LU 1 session, if the second byte of a DBCS character is outside the valid range, or no second byte is received, the character is printed as X'4260' (DBCS hyphen).	In an LU 1 session, if the second byte of a DBCS character is outside the valid range, or if no second byte is received, the character is printed as a solid rectangle.
Maximum number of input fields	The number of input-capable fields on the display is limited, in part, by the number of shift in/shift out characters required in the data being written to the display. (See Table 9-5 on page 9-10 for more information.)	No limit on the number of input fields; the contents of a given display are overwritten when the display fills with data.

Table 9-1 (Page 2 of 2). Differences between Emulated and Actual DBCS Support

Characteristic	AS/400 3270 Device Emulation	Actual 3270 DBCS Devices
Graphic data type capability	If the display does not have graphic data type capability, a DBCS-only field is used, which requires two additional bytes in the field for SO/SI control characters. If the length of the DBCS field is less than or equal to 3, a 5250 display treats this field as an SBCS field, and the data in the field is displayed as SBCS data.	Always supports graphic data type fields.
Two-byte field mark	Displays and prints a two-byte field mark control character as two-byte blanks.	Two-byte field mark control character appears as over-scored semicolon.
DBCS field/DBCS subfield screen wrap restriction	If a DBCS field or subfield continues from row 24, column 80 to row 1, column 1, some character positions of the DBCS field become invisible and will not accept input even if the field is unprotected, as illustrated in the following example: [1]  RV2N100-0	All fields accept input.

[1] The display represented above is a dual plane DBCS-capable device that supports DBCS-graphic characters. The word EMULATION is a DBCS-graphic character string in a DBCS field that wraps from the lower-right to the upper-left corner of the display. The letter L does not appear because the display requires one byte to re-specify the display attribute when the field wraps to the upper-right corner of the display.

On a DBCS-capable device that supports only **bracketed DBCS**, which requires shift-out and shift-in (SO/SI) characters to begin and end the DBCS string, two characters, LA, would not appear on the display. The display would require four bytes to specify the display attributes and the S0/SI characters.

The missing characters are included in the data stream sent back to the host:

- If this is a protected field
- If this is an unprotected field into which no data has been entered

If this is an unprotected field and data is entered in it, the data stream sent back to the host will contain only the characters visible on the display when the user presses the Enter key.

DBCS 3270PC Emulation

The AS/400 system provides the following 3270PC emulation functions with the OS/400 program for IBM Personal System/55 users:

- SNA Japanese 3270PC emulation
- SNA Hangeul 3270PC emulation
- SNA Traditional Chinese 3270PC emulation

Information on how to set up and use the SNA Japanese 3270PC emulation is in the *SNA Japanese 3270PC Emulation Installation Guide* and the *SNA Japanese 3270PC Emulation Operation Guide*.

Information on how to set up the environment to use SNA Hangeul 3270PC emulation is in the *SNA Hangeul 3270PC Emulation Installation Guide*. Information on how to use SNA Hangeul 3270PC emulation is in the *SNA Hangeul 3270PC Emulation Operation Guide*.

Information on how to set up the environment to use SNA Traditional Chinese 3270PC emulation is in the *SNA Traditional Chinese 3270PC Emulation Installation Guide*. Information on how to use SNA Traditional Chinese 3270PC emulation is in the *SNA Traditional Chinese 3270PC Emulation Operation Guide*.

Table 9-2 on page 9-7 outlines the differences in DBCS support between AS/400 3270 device emulation and AS/400 3270PC emulation.

Table 9-2. Differences between AS/400 3270 Device Emulation DBCS Support and AS/400 3270PC Emulation DBCS Support

Characteristic	AS/400 3270 Device Emulation	AS/400 3270PC Emulation
Functional differences	See Table 9-1 on page 9-5.	See Table 9-1 on page 9-5.
DBCS-capable displays supported	• Non-programmable DBCS-capable displays (5295, 3477-020 and 030) • PS/55 with OS/2* Extended Edition • PS/55 with DOS plus DBCS 5250 workstation program. • PS/55 with DOS plus DBCS 5250 PC program	Only supports PS/55 with DOS plus DBCS 5250 PC program.
Display emulation	Starts DBCS display session automatically if emulating display is a DBCS-capable display and the DBCS keyboard type is specified in KBDTYPE parameter of STREML3270 command.	Starts DBCS display session by specifying IGCEMLPC(*YES).
Printer emulation	Starts printer emulation by STRPRTEML command.	Starts both display and printer emulation session by STREML3270 command.
Print operations	Writes DBCS data for LU 1 or LU 3 into a printer file that can be linked, with or without spooling, to any DBCS-capable system printer.	Prints DBCS data for LU 1 or LU 3 directly to a printer device attached to the PS/55.
Features supported	Does **not** support these features: • graphics • APL • magnetic strip reader • file transfer • API, SRPI	Supports these features: • graphics • APL • magnetic strip reader • file transfer • API, SRPI
3270 data stream functions supported	Supports these functions: • Field validation field attribute (except trigger attribute) (LU 2) • Underline attribute of SA order (LU 1) Does **not** support these functions: • Extended color character attribute[2] • Character set field attribute[1] • Field outlining field attribute[1]	Does **not** support these functions: • Field validation field attribute (except trigger attribute) (LU 2) • Underline attribute of SA order (LU 1) Supports these functions: • Extended color character attribute • Character set field attribute • Field outlining field attribute
Printer emulation of Field Mark	DBCS field mark prints as two blanks (SBCS field mark prints as single blank).	DBCS field mark prints as double-byte overscored semicolon (SBCS field mark prints as overscored semicolon).
Printer emulation of Dup	DBCS Dup prints as two blanks (SBCS Dup prints as a single blank).	DBCS Dup prints as double-byte overscored asterisk (SBCS Dup prints as single-byte overscored asterisk).

Note:

1 Supported during DBCS sessions.

2 Supported if the workstation device supports extended color character attributes.

System/36 SNA 3270 Kanji Emulation

Table 9-3. Differences between AS/400 3270 DE DBCS Support and System/36 SNA 3270 Kanji Emulation

Characteristic	AS/400 3270 Device Emulation	System/36 SNA 3270 Kanji Emulation
Features supported	Supports the following features: • Grid line (3270 field outlining) (LU 1, LU 2, LU 3)[1] • Cursor Select key (LU2) (Supported by assigning other AID key as the Cursor Select key with STREML3270 command) • Highlighting attribute (LU 2) • Color attribute (LU 2) • Field validation attribute (LU 2) • Underline printing (LU 1, LU 3) • Character Attributes (LU 2)[2] • Character Sets Character Attribute (LU 1, LU 3)	Does not support these features. • Grid line (3270 field outlining) (LU 1, LU 2, LU 3) • Cursor Select key (LU 2) (Supported by assigning other AID key as the Cursor Select key with STREML3270 command) • Highlighting attribute (LU 2) • Color attribute (LU 2) • Field validation attribute (LU 2) • Underline printing (LU 1, LU 3) • Character Attributes (LU 2) when graphic data type is supported • Character Sets Character Attribute (LU 1, LU 3)
3270 DBCS field emulation	The system queries a device to determine if it is a DBCS-capable. If the device is a DBCS-capable, it emulates a 3270 DBCS field with a 5250 graphic data type field (if available on emulating display), which does not require SO/SI. The DBCS graphic data type is supported on the PS/55 with 5250 emulation.	Emulates 3270 DBCS field with 5250 DBCS-only field, which requires SO/SI.
Display of screen wrapped DBCS field or DBCS input enable field	Displays portion between row 1, column 1 and first attribute of the display (with restrictions).	Cannot display portion between row 1, column 1 and first attribute of the display.
Starting 3270 device emulation	This procedure is not supported in the System/36 environment on AS/400 DBCS 3270 device emulation. The native or System/38 command or one of the existing System/36 environment procedures must be used.	Started with the System/36 procedure KJ3270.
Supported Attributes	See Table 9-4 on page 9-9.	See Table 9-4 on page 9-9.

1 The first four characters are not accessible.
2 Character set character attribute is supported when graphic data type is supoported, the other character attributes are supported when the 5250 hardware supports them.

Table 9-4. Supported Attributes

Type Code	Attribute Type	AS/400 3270 Device Emulation (DBCS Support)		S/36 SNA 3270 Kanji Emulation	
		Extended Field Attribute	Character Attribute	Extended Field Attribute	Character Attribute
Reset Attribute	X'00'	NA	Yes	NA	No
3270 Field Attribute	X'C0'	Yes	NA	Yes	NA
Field validation	X'C1'	Yes	NA	No	NA
Field outlining	X'C2'	Yes	NA	No	NA
Extended Highlighting	X'41'	Yes	Yes[1]	No	No
Foreground Color	X'42'	Yes	Yes[1]	No	No
Character Set	X'43'	Yes	Yes[1]	Yes	No
Input Control	X'FE'	Yes	NA	Yes	NA

Note: Yes=Supported, No=Not supported, NA=Not Applicable.

1 Character attributes are only supported in a protected field (output only field).

Restrictions on DBCS Support under 3270 Device Emulation

DBCS 3270 device emulation is subject to the following restrictions:

- 3270 device emulation does not provide DBCS support for BSC users.
- DBCS data stream constructs are not supported by 3270 SNA API (SNUF).
- DBCS support is not provided for the user running 3270 display emulation at an HCF display.
- DBCS support does not provide for an unlimited number of SO/SI characters or input fields. The number of SO/SI characters in an input field is limited by the size of the controller's field format table.

  Table 9-5 shows the number of input fields and SO/SI characters that can be accommodated by controllers that provide DBCS support.

Table 9-5. Maximum Numbers of Input Fields and SO/SI Characters, by Controller Type

Controller Type[1]	Field Format Table Size[2]	Maximum Number of SO/SI	Bytes per DBCS Field[3]	Maximum Input Fields at SO/SI Limit[4]
System/36 and System/38	128*6	350	8	8
WSF	256*6	no limit	6	254
Remote Controllers				
5294	255*6	700	8	16
5394 (Up to Release 2.2)	256*6	700	8	17
5394 (Release 2.2)	256*6	700	6	22
5494 (Release 1.0)	256*6	700	6	22
5494 (Release 1.1 or later)	256*6	no limit	6	255
Local Controllers				
6x4x (Up through V1R2)	256*6	700	8	17
6x4x (V1R3 and later)	256*6	700	6	22
6050	256*6	no limit	6	255

1 Specifications may vary depending on the release level of the controller. Release levels indicated for remote controllers are controller release levels. Release levels indicated for local controllers are AS/400 release levels (shown as Version Release).

2 The number of bytes available in the field format table is calculated by multiplying the number of bytes in each field (6) by the number of fields that would be supported by the controller for SBCS processing.

3 The number of bytes used for each DBCS field in the field format table.

4 The number of input fields that can be displayed if the display contains the maximum number of SO/SI characters. This number increases as the number of SO/SI characters decreases.

The number of input fields is calculated as follows:

```
((FFT * 6) - (SOSI*2))
----------------------
 bytes per DBCS field
```

where FFT * 6 is the size of the field format table, and SOSI*2 is the number of shift-out and shift-in characters on the display.

Appendix A. BSC 3270 Host System Generation Examples

This appendix includes programming examples of the following host system generation applications:

- Network control program (NCP)
- Telecommunications access method (TCAM) interfaces and macroinstructions
- Information management symbol/virtual storage (IMS/VS) generation macroinstructions
- OS CICS/VS and DOS CICS/VS terminal control tables (TCT)
- DOS CICS/VS virtual machine macroinstructions

Note: Not all programming considerations or techniques are illustrated in the examples in this appendix. You should review the examples before you begin application design and coding.

NCP Example

This example shows seven displays and one printer for an NCP line P2024, group P2G05 with one controller and eight ports.

```
P2G05     GROUP DIAL=NO                                          X
                LNCTL=BSC                                        X
                ISTATUS=INACTIVE,       LINE IS INACTIVE AT START UP   X
                TYPE=NCP
P2024     LINE ADDRESS=(024),                                    X
                SPEED=9600                                       X
                CLOCKNG=EXT,                                     X
                DUPLEX=HALF,                                     X
                POLLED=YES,                                      X
                SESSION=9,                                       X
                RETRIES=(5,4,3)
          SERVICE  ORDER=(P2024A,P2024A1,P2024A2,P2024A3,P2024A4,      X
                P2024A5,P2024A6,P2024A7,P2024A8)
P2024A    CLUSTER CUTYPE=3271,                                   X
                TERM=3278,                                       X
                GPOLL=40407F7F
P2024A1   TERMINAL ADDR=60604040,                                X
                POLL=40404040
P2024A2   TERMINAL ADDR=6060C1C1,                                X
                POLL=4040C1C1
P2024A3   TERMINAL ADDR=6060C2C2,                                X
                POLL=4040C2C2
P2024A4   TERMINAL ADDR=6060C3C3,                                X
                POLL=4040C3C3
P2024A5   TERMINAL ADDR=6060C4C4,                                X
                POLL=4040C4C4
P2024A6   TERMINAL ADDR=6060C5C5,                                X
                POLL=4040C5C5
P2024A7   TERMINAL ADDR=6060C6C6,                                X
                POLL=4040C6C6
P2024A8   TERMINAL ADDR=6060C7C7,                                X
                POLL=4040C7C7
                TERM=3286                                        X
```

TCAM Examples

The following examples show host system generation examples for TCAM and the corresponding AS/400 displays for configuring the line, controller, and device.

Host Generation Example for TCAM

This example shows TCAM interfaces with IMS/VS. The TCAM NCP macroinstructions show the requirements for IMS 3270 emulation.

```
        INTRO ,                                                 X
              ABEFMT=ALL,                                       X
              ATRACE=ON,                                        X
              BFRRTN=LO,                                        X
              BRACKET=YES,                                      X
              BTRACE=100                                        X
              BUFFTR=(40,FULL,U,),                              X
              CIB=100,                                          X
              CKREQS=100,                                       X
              COMMBUF=(2,2,424),                                X
              CONTROL=CNTRLMSG,                                 X
              CPB=100,                                          X
              CPINTVL=180,                                      X
              CPRCDS=10,                                        X
              CROSSRF=0,                                        X
              DISK=YES,                                         X
              DLQ=DLQ,                                          X
              DTRACE=(200,POST),                                X
              ENVIRON=TCAM,                                     X
              FEATURE=(,,,,MIXD3705,MIXDSNA,,CLUSTRS),          X
              INTVAL=1,                                         X
              LNUNITS=500,                                      X
              MAXSUBA=7,                                        X
              MSMAX=70,                                         X
              MSMIN=50,                                         X
              MSUNITS=500,                                      X
              PASSWRD=PASSWORD,                                 X
              PLCBNO=100,                                       X
              PROGID=TCAMSSCP,                                  X
              PRIMARY=SYSCON,                                   X
              RAPI=YES,               REQUIRED FOR SUB SYSTEM   X
              RESTART=0,                                        X
              SIBCNT=100,                                       X
              STARTUP=CY,                                       X
              SUBAREA=003,                                      X
              THRESH=(5,1,1,1),                                 X
              TOPMSG=NO,                                        X
              TRACE=(100,ON),                                   X
              TTRACE=100,                                       X
              UNITSZ=255,                                       X
              VM=YES
```

The following shows how to code the RAPI parameter to provide the TCAM subsystem interface (SSI) to IMS/VS.

```
OPEN  (NCPDCB, (INOUT))
OPEN  (NCPDCB2, (INOUT))     2ND NCP FOR SUBSYSTEM
```

The following shows how to code a second NCP for the SSI:

```
CLOSE NCPDCB
CLOSE NCPDCB2                2ND NCP FOR SUBSYSTEM
```

The following shows the referred NCP DCBs:

```
NCPDCB   DCB  ,                                    X
              DDNAME=NCPDD,                         X
              DSORG=TR,                             X
              MACRF=(G,P)
NCPDCB2  DCB  ,               2ND NCP FOR SUBSYSTEM X
              DDNAME=NCPDD2,                        X
              DSORG=TR,                             X
              MACRF=(G,P)
```

The following shows the IMS/VS SSI PCB:

```
IMSPROC   PCB    ,    IMS SUBSYSTEM INTERFACE        X
          RAPI=YES,                                   X
          MH=0       NO APPLICATION MESSAGE HANDLER
```

The following shows the TPROCESS for the SSI:

```
IMSPROC  TPROCESS ,      IMS SUBSYSTEM INTERFACE     X
             PCB=IMSPCB,                             X
             RAPI=YES                                X
```

The following shows the group and terminal macroinstructions for the NCP line P2024, group P2G05 that is shown in the topic “NCP Example” on page A-1.

```
P2G05     GROUP ,                                                 X
               BUFOUT=2,                                          X
               BUFMAX=3,                                          X
               BUFSIZE=279,                                       X
               MH=NOTIMS, DUMMY MESSAGE HANDLER FOR NONSUBSYS MSGS    X
               PCI=(,A),                                          X
               RAPIMH=PAPI3270,   MSG HANDLER FOR SUBSYS MSGS     X
               TRANS=EBCF
          SPACE 3
P2024     TERMINAL  ,                                             X
               ACTIVE=NO,                                         X
               GROUP=P2G05,                                       X
               RLN=1,                                             X
               TERM=LINE
          SPACE 3
P2024A    TERMINAL  ,                                             X
               ACTIVE=YES,                                        X
               GROUP=P2G05,                                       X
               QBY=T,                                             X
               RLN=1,                                             X
               TERM=327C
          SPACE 3

P2024A1   TERMINAL  ,                                             X
               ACTIVE=(,YES),   IMS AUTOLOGON WHEN LINE ACTIVATED     X
               CDABLE=YES,      REQUIRED FOR SUBSYSTEM            X
               GROUP=P2G05,                                       X
               LMD=YES,                                           X
               OPDATA=(P2024A1,,0,0,,IMSPROC),                    X
               QBY=T,                                             X
               QUEUES=MO,                                         X
               RLN=1,                                             X
               SECTERM=YES,                                       X
               TERM=327R
P2024A2   TERMINAL  ,                                             X
               ACTIVE=(,YES),   IMS AUTOLOGON WHEN LINE ACTIVATED     X
               CDABLE=YES,      REQUIRED FOR SUBSYSTEM            X
               GROUP=P2G05,                                       X
               LMD=YES,                                           X
               OPDATA=(P2024A2,,0,0,,IMSPROC),                    X
               QBY=T,                                             X
               QUEUES=MO,                                         X
               RLN=1,                                             X
               SECTERM=YES,                                       X
               TERM=327R
```

The following shows the message handler for the IMS/VS SSI.

```
RAPI3270  STARTMH LC=OUT,      ALL MESSAGES WILL HAVE LINE             X
                  STOP=YES,    CONTROL REMOVED AND TCAM WILL STOP      X
                  MH=USER      XMITTING AND SET ON MER BIT IF ERROR
          SPACE 3
          INHDR
          SPACE 3
          WTO   'TCAM S/3X MCP - RAPI3270 - INHDR',                    X
                DESC=7,ROUTCDE=(2,8,11)
          SPACE 1
          MSGEDIT ((R,,,(2))),BLANK=NO     DELETE THE FIRST 2 CHARS
          SPACE 3
          INPBUF
          SPACE 3
          WTO   'TCAM S/3X MCP - RAPI3270 - INBUF',                    X
                DESC=7,ROUTCDE=(2,8,11)
          SPACE 1
          INMSG
          INEND         INPUT PROCESSING COMPLETE
          SPACE 3
          OUTHDR
          SPACE 3
          WTO   'TCAM S/3X MCP - RAPI3270 - OUTHDR',                   X
                DESC=7,ROUTCDE=(2,8,11)
          SPACE 1
          MSGEDIT ((I,X'27',SCAN))   INSERT ESCAPE CHARACTERS
          SPACE 3
          SPACE 1
          OUTMSG
          OUTEND     OUTPUT PROCESSING COMPLETE
```

Note: Your message handler will not necessarily use the same editing and WTO options shown here.

AS/400 System Configuration Examples for TCAM

To configure your system for BSC 3270 device emulation you must create definitions for each applicable line, controller, and device. The following example shows the displays that appear when you configure BSC 3270 display emulation for a non-switched multipoint tributary line, BSC emulation controller, and BSC 3270 emulation display device.

Creating the Line Description for BSC

Use the Create Line Description (CRTLINBSC) command, or select the configuration option from the menu to create a line configuration. The number and sequence of displays that appear depend on the values you enter. Menus can be used through configuration options.

```
                      Create Line Desc (BSC) (CRTLINBSC)

Type choices, press Enter.

Line description . . . . . > EMLIN1          Name
Resource name  . . . . . > LIN011          Name
Online at IPL  . . . . . .   *YES           *YES, *NO
Application type . . . . . > *EML           *PGM, *RJE, *EML
Physical interface . . . . .   *RS232V24     *RS232V24, *V35, ...
Connection type  . . . . . > *MPTRIB        *NONSWTPP, *SWTPP, *MPTRIB
Station address  . . . . . .   C1            04-FE
Duplex . . . . . .   *HALF          *HALF, *FULL
Line speed . . . . . .   9600          600, 1200, 2400, 4800...
Modem type supported . . . . .   *NORMAL        *NORMAL, *V54, *IBMWRAP
Maximum buffer size  . . . . .   8192          8-8192
Character code . . . . . .   *EBCDIC       *EBCDIC, *ASCII
Receive timer  . . . . . .   30            30-254 (0.1 seconds)
Continue timer . . . . . .   20            16-24 (0.1 seconds)
Contention state retry . . . . .   7             0-21
Data state retry . . . . . .   7             0-255
                                                                  More...
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display       F24=More keys
```

Use the page keys to continue to the next line description display.

```
                    Create Line Desc (BSC) (CRTLINBSC)

Type choices, press Enter.

Transmit TTD or WACK retry . . .   60          0-65534, *NOMAX
Text 'description' . . . . . .   '3270 emulation line for BSC'
```

Creating the Controller Description for BSC

Use the Create Controller Description (CRTCTLBSC) command, or select the configuration option from the menu to create a controller configuration. The number and sequence of displays that appear depend on the values you enter.

```
                    Create Ctl Desc (BSC) (CRTCTLBSC)

Type choices, press Enter.

Controller description . . . . . > EMCTL1       Name
Online at IPL  . . . . . .   *YES          *YES, *NO
Connection type  . . . . . > *MPTRIB      *NONSWTPP, *SWTPP, *MPTRIB
Attached nonswitched line  . . > EMLIN1       Name
Application type . . . . . > *EML         *PGM, *RJE, *EML
Text 'description' . . . . . .   '3270 emulation controller for BSC'
```

Creating the Device Description for BSC

Use the Create Device Description (CRTDEVBSC) command, or select the configuration option from the menu to create a device configuration. The number and sequence of displays that appear depend on the values you enter.

```
                    Create Device Desc (BSC) (CRTDEVBSC)

Type choices, press Enter.

Device description . . . . . > EMDSP40      Name
Local location address . . . . . > 40           00-FE
Remote location  . . . . . > EMCTL1       Name
Online at IPL  . . . . . .   *YES          *YES, *NO
Attached controller  . . . . . > EMCTL1       Name
Connection type  . . . . . > *MPTRIB      *PP, *MPTRIB
Application type . . . . . > *EML         *BSCEL, *RJE, *EML, *BSC38...
Contention resolution winner . .   *SEC          *SEC, *PRI
Emulated device  . . . . . .   3278          3278, 3284, 3286, 3287...
Emulated keyboard  . . . . . .   *LOWER        *UPPER, *LOWER
Emulated numeric lock  . . . . .   *NO           *NO, *YES
Emulation work station . . . . .   *ANY          Name, *ANY
Text 'description' . . . . . .   '3270 emulation display device for BSC'

                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display       F24=More keys
```

IMS/VS Example

Following are examples of the IMS/VS generation macroinstructions used for 3270 emulation.

The following are application (APPLCTN) and transaction (TRANSACT) macroinstructions for some IMS/VS transactions that use message format service (MFS) to interface with a 3270.

```
APPLCTN    DOPT,PSB=P5ITF070,PGMTYPE=(TP,003)
TRANSACT   CODE=ITF070R,EDIT=ULC,SPA=(1000,DASD,FIXED),       X
           MSGTYPE=(SNGLSEG,RESPONSE),SEGSIZE=256,            X
           INQUIRY=YES,MODE=SNGL
TRANSACT   CODE=ITF070N,EDIT=ULC,SPA=(1000,DASD,FIXED),       X
           MSGTYPE=(SNGLSEG,RESPONSE),SEGSIZE=256,            X
           INQUIRY=YES,MODE=SNGL
APPLCTN    DOPT,PSB=P5ITF071,PGMTYPE=(TP,003)
TRANSACT   CODE=ITF071R,MSGTYPE=(MULTSEG,RESPONSE)
TRANSACT   CODE=ITF071N,MSGTYPE=(MULTSEG,NONRESPONSE)
APPLCTN    DOPT,PSB=P5EMF133,PGMTYPE=(TP,003)
TRANSACT   CODE=EMF133R,MSGTYPE=(MULTSEG,NONRESPONSE),        X
           INQUIRY=(YES,NORECOV)
TRANSACT   CODE=EMF133N,MSGTYPE=(MULTSEG,RESPONSE),           X
           INQUIRY=(YES,NORECOV)
```

This is the line group for EP LINE 076 that is identified in “NCP Example” on page A-1 as P20A6.

```
LINEGRP    DDNAME=BTAMBSC3,UNITYPE=3270,CODE=EBCDIC
   LINE    ADDR=076
CTLUNIT    ADDR=40,MODEL=2
TERMINAL   ADDR=40,FEAT=(PFK,NOCD,NOPEN),MODEL=2,UNIT=3278,   X
           OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME       LTRMOO25
TERMINAL   ADDR=C1,FEAT=(PFK,NOCD,NOPEN),MODEL=2,UNIT=3278,   X
           OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME       LTRMOO26
TERMINAL   ADDR=C2,FEAT=(PFK,NOCD,NOPEN),MODEL=2,UNIT=3278,   X
           OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME       LTRMOO27
TERMINAL   ADDR=C3,FEAT=(PFK,NOCD,NOPEN),MODEL=2,UNIT=3278,   X
           OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME       LTRMOO28
TERMINAL   ADDR=C4,FEAT=(PFK,NOCD,NOPEN),MODEL=2,UNIT=3278,   X
           OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME       LTRMOO29
TERMINAL   ADDR=C5,FEAT=(PFK,NOCD,NOPEN),UNIT=3278,           X
           TYPE=3270-A7,
           OPTIONS=(TRANRESP,NOCOPY,PAGDEL),SIZE=(27,132)
NAME       LTRMOO30
TERMINAL   ADDR=C6,FEAT=(PFK,NOCD,NOPEN),UNIT=3278,           X
           TYPE=3270-A7,
           OPTIONS=(TRANRESP,NOCOPY,PAGDEL),SIZE=(27,132)
NAME       LTRMOO31
TERMINAL   ADDR=C7,UNIT=3286,MODEL=2,PTRSIZE=132
NAME       LTRMOO32
```

Note: LTRMOO30 and LTRMOO31 terminals are 3564-character (27 x 132) capable displays. The following is the TYPE definition for the NCP line P2024 shown in “NCP Example” on page A-1. These NCP lines and terminals can be used with either VTAM or TCAM.

```
TYPE UNITYPE=3270,MODEL=2
TERMINAL FEAT=(PFK,NOCD,NOPEN),NAME=P2024A1,            X
     OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME BSC3270A
TERMINAL FEAT=(PFK,NOCD,NOPEN),NAME=P2024A2,            X
     OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME BSC3270B
TERMINAL FEAT=(PFK,NOCD,NOPEN),NAME=P2024A3,            X
     OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME BSC3270C
TERMINAL FEAT=(PFK,NOCD,NOPEN),NAME=P2024A4,            X
     OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME BSC3270D
TERMINAL FEAT=(PFK,NOCD,NOPEN),NAME=P2024A5,            X
     OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME BSC3270E
TERMINAL FEAT=(PFK,NOCD,NOPEN),NAME=P2024A6,            X
     TYPE=3270-A07,SIZE=(27,132),
     OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME BSC3270F
TERMINAL FEAT=(PFK,NOCD,NOPEN),NAME=P2024A7,            X
     TYPE=3270-A07,SIZE=(27,132),
     OPTIONS=(TRANRESP,NOCOPY,PAGDEL)
NAME BSC3270G
TERMINAL UNIT=3286,MODEL=2,PTRSIZE=132,NAME=P2024A8
NAME BSC3270H
```

Note: BSC3270F and BSC3270G terminals are 3564-character (27 x 132) capable displays.

CICS/VS Examples

CICS/VS information includes examples of display and printer entries for OS CISC/VS EP, OS CICS/VS NCP, DOS CICS/VS NCP, and DOS CICS/VS.

OS CICS/VS EP Example

Following are printer and display entries for a customer information control system/virtual storage (CICS/VS) terminal control table (TCT) for a BSC-EP line.

Display Entries

```
         DFHTCT TYPE=SDSCI,BSCODE=EBCDIC,                              X
               DEVICE=3278,                                            X
               MACRF=(R,W),ERROPT=T,DSCNAME=R3270A
POLL78   DFTRMLST AUTOWLST,(40407F7F2D,3737373737)
R3278A   DFTRMLST OPENLST,(606040402D)
R3278B   DFTRMLST OPENLST,(6060C1C12D)
R3278C   DFTRMLST OPENLST,(6060C2C22D)
R3278D   DFTRMLST OPENLST,(6060C3C32D)

R3278E   DFTRMLST OPENLST,(6060C4C42D)
R3278F   DFTRMLST OPENLST,(6060C5C52D)
R3278G   DFTRMLST OPENLST,(6060C6C62D)
R3278H   DFTRMLST OPENLST,(6060C7C72D)
         DFHTCT TYPE=LINE,ACCMETH=BTAM,TRMTYPE=3278,                   X
               CLASS=(CONV,VIDEO,BISYNC),                              X
               INAREAL=2000,BSCODE=EBCDIC,                             X
               BTAMRLN=1,DSCNAME=R3270A,FEATURE=AUTOPOLL,              X
               TRMMODL=2,NPDELAY=20000,GENPOLL=YES,                    X
               LINSTAT='OUT OF SERVICE',                               X
               LISTADR=(POLL78,WRAP)
         DFHTCT TYPE=TERMINAL,TRMIDNT=S32A,TRMADDR=R3278A,             X
               TRMTYPE=3278,                                           X
               TRMSTAT=('OUT OF SERVICE',TRANSCEIVE),                  X
               POLLPOS=1,                                              X
               CLASS=(CONV,BISYNC),FEATURE=DCKYBD,                     X
               TRMMODL=2,
               TIOAL=2000,TCTUAL=70
         DFHTCT TYPE=TERMINAL,TRMIDNT=S32B,TRMADDR=R3278B,             X
               TRMTYPE=3278,                                           X
               TRMSTAT=('OUT OF SERVICE',TRANSCEIVE),                  X
               POLLPOS=1,                                              X
               CLASS=(CONV,BISYNC),FEATURE=DCKYBD,                     X
               TRMMODL=2,                                              X
               TIOAL=2000,TCTUAL=70
               *
               *
               *
```

Printer Entries

```
         DFHTCT TYPE=TERMINAL,TRMIDNT=S32H,TRMADDR=R3278H,             X
               TRMTYPE=3286,                                           X
               TRMSTAT=('OUT OF SERVICE',RECEIVE),                     X
               PGESIZE=(24,80),                                        X
               POLLPOS=1,                                              X
               LASTTRM=LINE,                                           X
               CLASS=(CONV,VIDEO,BISYNC),                              X
               FEATURE=(PRINT),                                        X
               TRMMODL=2,                                              X
               TIOAL=2500,TCTUAL=70
```

OS CICS/VS or DOS CICS/VS NCP Example

This example is a CICS/VS TCT for a BSC NCP line on either DOS or OS.

```
DFHTCT TYPE=TERMINAL,TRMIDNT=B32B,GMMSG=YES,TRMTYPE=3278,     X
      ACCMETH=VTAM,NETNAME=P20A0A2,BUFFER=256,TCTUAL=64,      X
      PGESTAT=AUTOPAGE,CHNASSY=YES,TIOAL=(1000,4000),         X
      TRMMODL=2,RELREQ=(YES,YES),                             X
      TRMSTAT=TRANSCEIVE
DFHTCT TYPE=TERMINAL,TRMIDNT=B32C,GMMSG=YES,TRMTYPE=3278,     X
      ACCMETH=VTAM,NETNAME=P20A0A3,BUFFER=256,TCTUAL=64,      X
      PGESTAT=AUTOPAGE,CHNASSY=YES,TIOAL=(1000,4000),         X
      TRMMODL=2,RELREQ=(YES,YES),                             X
      TRMSTAT=TRANSCEIVE
DFHTCT TYPE=TERMINAL,TRMIDNT=B32D,GMMSG=YES,TRMTYPE=3278,     X
      ACCMETH=VTAM,NETNAME=P20A0A4,BUFFER=256,TCTUAL=64,      X
      PGESTAT=AUTOPAGE,CHNASSY=YES,TIOAL=(1000,4000),         X
      TRMMODL=2,RELREQ=(YES,YES),                             X
      TRMSTAT=TRANSCEIVE
DFHTCT TYPE=TERMINAL,TRMIDNT=B32E,GMMSG=YES,TRMTYPE=3278,     X
      ACCMETH=VTAM,NETNAME=P20A0A5,BUFFER=256,TCTUAL=64,      X
      PGESTAT=AUTOPAGE,CHNASSY=YES,TIOAL=(1000,4000),         X
      TRMMODL=2,RELREQ=(YES,YES),                             X
      TRMSTAT=TRANSCEIVE
DFHTCT TYPE=TERMINAL,TRMIDNT=B32F,GMMSG=YES,TRMTYPE=3278,     X
      ACCMETH=VTAM,NETNAME=P20A0A6,BUFFER=256,TCTUAL=64,      X
      PGESTAT=AUTOPAGE,CHNASSY=YES,TIOAL=(1000,4000),         X
      TRMMODL=2,RELREQ=(YES,YES),                             X
      TRMSTAT=TRANSCEIVE
DFHTCT TYPE=TERMINAL,TRMIDNT=B32G,GMMSG=YES,TRMTYPE=3278,     X
      ACCMETH=VTAM,NETNAME=P20A0A7,BUFFER=256,TCTUAL=64,      X
      PGESTAT=AUTOPAGE,CHNASSY=YES,TIOAL=(1000,4000),         X
      TRMMODL=2,RELREQ=(YES,YES),DEFSCRN=(24,80),             X
      ALTSCRN=(27,132),
      TRMSTAT=TRANSCEIVE
DFHTCT TYPE=TERMINAL,TRMIDNT=B32H,GMMSG=YES,TRMTYPE=3278,     X
      ACCMETH=VTAM,NETNAME=P20A0A8,BUFFER=256,TCTUAL=64,      X
      PGESTAT=AUTOPAGE,CHNASSY=YES,TIOAL=(1000,4000),         X
      TRMMODL=2,RELREQ=(YES,YES),DEFSCRN=(24,80),             X
      ALTSCRN=(27,132),
      TRMSTAT=TRANSCEIVE
```

Note: B32G and B32H terminals are 3564-character (27 x 132) capable displays.

DOS CICS/VS Example Macroinstructions

The following are examples of the CICS(TCT) for DOS CICS 3270 emulation.

This is the DFHTCT macroinstruction.

```
DFHTCT TYPE=SDSCI,BSCODE=EBCDIC,                              X
      DEVICE=R3270                                            X
      CU=2703,                                                X
      LINELST=(011),                                          X
      CONFIG=MPT,                                             X
      MODELST=(0),                                            X
      MACRF=(R,W),ERROPT=T,EDSCNAME=R3270A                    X
```

These are DFTRMLST macroinstructions to define the polling list.

```
      POLL78    DFTRMLST AUTOWLST,3732,40407F7F2D
      R3278A    DFTRMLST OPENLST,(606040402D)
      R3278B    DFTRMLST OPENLST,(6060C1C12D)
      R3286C    DFTRMLST OPENLST,(6060C2C22D)
      R3278D    DFTRMLST OPENLST,(6060C3C32D)
      R3278E    DFTRMLST OPENLST,(6060C4C42D)
      R3278F    DFTRMLST OPENLST,(6060C5C52D)
      R3278G    DFTRMLST OPENLST,(6060C6C62D)
      R3278H    DFTRMLST OPENLST,(6060C7C72D)
      R3278I    DFTRMLST OPENLST,(6060C8C82D)
```

These are the line and terminal macroinstructions.

```
DFHTCT TYPE=LINE,ACCMETH=BTAM,TRMTYPE=R3270,                X
      CLASS=(CONV,VIDEO,BISYNC),                            X
      INAREAL=2000,BSCODE=EBCIDIC,                          X
      BTAMRLN=1,DSCNAME=R3270A,FEATURE=AUTOPOLL,            X
      TRMMODL=2,NPDELAY=20000,GENPOLL=YES,                  X
      LINSTAT='OUT OF SERVICE',                             X
      LISTADR=(POLL78,WRAP)
DFHTCT TYPE=TERMINAL,TRMIDNT=S32A,TRMADDR=R3278A,           X
      TRMTYPE=R3277,                                        X
      TRMSTAT=TRANSCEIVE,                                   X
      POLLPOS=1,                                            X
      CLASS=(CONV,BISYNC),FEATURE=(DCKYBD,UCTRAN),          X
      TRMMODL=2,                                            X
      TIOAL=2000,TCTUAL=70
DFHTCT TYPE=TERMINAL,TRMIDNT=S32B,TRMADDR=R3278B,           X
      TRMTYPE=R3277,                                        X
      TRMSTAT=TRANSCEIVE,                                   X
      POLLPOS=1,                                            X
      CLASS=(CONV,BISYNC),FEATURE=(DCKYBD,UCTRAN),          X
      TRMMODL=2,DEFSCRN=(24,80),ALTSCRN=(27,132),           X
      TIOAL=2000,TCTUAL=70
DFHTCT TYPE=TERMINAL,TRMIDNT=L06B,TRMADDR=R3286C,           X
      TRMTYPE=R3270P,                                       X
      TRMSTAT=RECEIVE,                                      X
      POLLPOS=1,                                            X
      CLASS=(CONV,BISYNC),FEATURE=(PRINT,COPY),             X
      TRMMODL=2,                                            X
      TIOAL=2200,TCTUAL=80
DFHTCT TYPE=TERMINAL,TRMIDNT=L06B,TRMADDR=R3286E,           X
      TRMTYPE=3286,                                         X
      TRMSTAT=RECEIVE,                                      X
      POLLPOS=1,                                            X
      CLASS=(CONV,BISYNC),FEATURE=(PRINT,COPY),             X
      TRMMODL=2,                                            X
      TIOAL=2200,TCTUAL=80
```

Note: The S32B terminal is a 3564-character (27 x 132) capable display.

Virtual Machine Example Macroinstructions

These are the virtual machine (VM) macroinstructions that are changed when adding a 3270 line. The following CLUST macroinstruction defines the 3270 Control Unit.

```
CLUST052 CLUSTER
CUTYPE=3271,GPOLL=407F,LINE=052,DIAL=NO
```

The terminal macroinstruction defines the devices on the controller.

```
TERMINAL TERM=3278,SELECT=6040,MODEL=2
TERMINAL TERM=3278,SELECT=60C1,MODEL=2
TERMINAL TERM=3278,SELECT=60C2,MODEL=2
TERMINAL TERM=3278,SELECT=60C3,MODEL=2
TERMINAL TERM=3278,SELECT=60C4,MODEL=2
TERMINAL TERM=3278,SELECT=60C5,MODEL=2
TERMINAL TERM=3278,SELECT=60C6,MODEL=5
TERMINAL TERM=3286,SELECT=60C7,MODEL=2
```

Note: The 3278 Model 5 terminal is a 3564-character (27 × 132) capable display.

The device macroinstruction defines the port address and line type:

```
RDEVICE
ADDRESS=052,DEVTYPE=2073,ADAPTER=BSCA,
CLUSTER=CLUST052
```

The following macroinstructions define the control unit type and address on the channel:

```
RCTLUNIT ADDRESS=050,CUTYPE=2703
RCHANNEL ADDRESS=0,CHTYPE=MULTIPLEXOR
```

The *Virtual Machine/Enterprise Systems Architecture: CP Planning and Administration*, SC24-5521, contains information about attaching devices to the virtual machine.

Appendix B. SNA 3270 Host System Generation

This appendix provides coding, display and macroinstruction examples of host system generation to help you configure and program System Network Architecture (SNA).

Note: Not all programming considerations or techniques are illustrated in the examples in this appendix. You should review the examples before you begin application design and coding.

VTAM/NCP Generation

You must define the system during virtual telecommunications access method/network control program (VTAM/NCP) generation to communicate with a host system.

Macroinstructions

Use the following parameters of the GROUP, LINE, Physical Unit, and Logical Unit (LU) macroinstructions for SNA 3270 device emulation. For further information about VTAM/NCP generation parameters, refer to the *ACF/VTAM Installation and Resource Definition* book.

GROUP Macroinstruction

MAXDATA = 265, 521, 1033, 1994, or 2057:

The maximum data received (MAXDATA) parameter specifies the maximum amount of data that the physical unit can receive. Data received includes the transmission header and request/response header.

MAXOUT = 7:

The maximum data sent (MAXOUT) parameter specifies the number of RUs that NCP sends to the system before requesting a response.

DISCNT = YES or NO:

The disconnect (DISCNT) parameter specifies whether VTAM is to disconnect the physical unit when the last logical unit session is ended. It is only valid for switched connections.

DISCNT = NO allows the system to remain active when no sessions are active. The physical unit is deactivated when the last subsystem on the line is disabled.

DISCNT = YES disconnects the system when the last session ends. SNA 3270 device emulation remains active until you enter a Vary Configuration (VRYCFG) command. VTAM ignores the VRYCFG request.

SSCPFM = name:

Specify SSCPFM=USSSCS to indicate that the logical units associated with this physical unit use character-coded messages to communicate with VTAM. The system requires character-coded messages.

LINE Macroinstruction

NRZI = YES or NO:

The nonreturn-to-zero inverted (NRZI) parameter specifies whether the data terminal equipment (both controller and remote station) of the synchronous data link control (SDLC) link operates in NRZI mode, or in nonreturn to zero (NRZ) mode. Specify NRZI=YES for NRZI mode and specify NRZI=NO for NRZ mode, on the SETCOMM command. The AS/400 system and the host system must operate in the same mode.

Physical Unit Macroinstruction

Each AS/400 line is represented as a physical unit in the VTAM generation. Each line that SNA 3270 device emulation uses requires a physical unit (PU) definition in the generation. Use the following parameters during the physical unit macroinstructions:

PUTYPE = 2:
The physical unit type (PUTYPE) must be 2.

ADDR = xx:
The address (ADDR) parameter specifies the SDLC station address. This parameter must be the same as the SDLC station address specified on the CRTCTLHOST command.

ISTATUS = ACTIVE or INACTIVE:
The ISTATUS parameter specifies whether the physical unit should be activated when its major node is activated.

IDBLK = 056; IDNUM = number:
The IDBLK and IDNUM parameters make up the SDLC exchange ID. These parameters are specified only for a switched line. The IDBLK must be specified as 056 for an AS/400 system. The IDNUM must be the same as the local system's station ID, expressed in hexadecimal, specified during SDLC line configuration.

PACING = count:
The PACING parameter specifies the way pacing is to be handled between NCP and the logical unit. Pacing controls the rate of data flow between the AS/400 system and the host system by controlling the rate at which the sender transmits requests. Each logical unit has both a sending and a receiving pacing value.

Logical Unit (LU) Definition

Each device attached to SNA 3270 device emulation corresponds to an SNA logical unit. Each device requires a logical unit (LU) definition in the VTAM generation. Use the following parameters during the LU macroinstruction:

LOCADDR = address:
The local address (LOCADDR) parameter specifies the local address of the device. The local address is equivalent to a logical unit number. Any number of logical units can be defined, but only 254 logical units per line can be active at one time.

USSTAB = name:
The unformatted system service table (USSTAB) parameter specifies the name of the unformatted system service (USS) definition table. MSG0 and MSG10 must not contain device control characters.

ENCR = NONE:
The encryption (ENCR) parameter specifies the type of encryption to be used. Specify NONE because encryption is not supported by the system.

ISTATUS = ACTIVE or INACTIVE:
The ISTATUS parameter specifies whether the logical unit is to be activated when the physical unit is activated. You should not specify ACTIVE unless the logical unit address is specified in the AS/400 SNA 3270 configuration and in the AS/400 logical unit configuration table.

BIND Command

VTAM must send a correctly formatted BIND command to SNA 3270 device emulation before it can be started. See Appendix C for the list of BIND protocol values. The following topic shows an example list for a VTAM logon mode table (MODETAB) generated by a host system for an SNA 3270 BIND command.

Example Logon Mode Table (MODETAB) for SNA 3270 BIND Generation

Use MODEENT specifications to build the BIND command sent to the system to begin a session. CICS uses its own BIND command if you do not specify MODEENT in the CICS/VS terminal control table (TCT). See the *CICS/VS,5740-XX1, 5746-XX3, 3270/8775 Guide* for additional information.

```
//MODETAB  JOB ,DKOLSON,CLASS=A,MSGCLASS=H
//TABLE EXEC ASMHCL,PARM.ASM='OBJ,NODECK,RENT',
//           PARM.LKED=(XREF,LIST,LET,NCAL,RENT)
//*ABLE EXEC ASMHCL,PARM.ASM='OBJ,NODECK',       <---- NON-RENT
//*          PARM.LKED=(XREF,LIST,LET,NCAL)      <---- NON-RENT
//SYSIN   DD *
        TITLE 'RSC   - LOGON MODE TABLE'
RNMSCMT   MODETAB
*            AS/400 DEVICE EMULATION - DISPLAY
S3270     MODEENT LOGMODE=S3270,                    * ENTRY NAME        X
               FMPROF=X'03',                        * FM PROFILE        X
               TSPROF=X'03',                        * TS PROFILE        X
               PRIPROT=X'91',    (A1 OR B1)         * PLU PROTOCOL      X
               SECPROT=X'90',    (A0 OR B0)         * SLU PROTOCOL      X
               COMPROT=X'3080',                     * COMMON PROTOCOL   X
               SSNDPAC=X'00',                       * SEC SEND PACING   X
               SRCVPAC=X'00',                       * SEC RECV PACING   X
               RUSIZES=X'8585',                     * RU SIZES (256)    X
               PSNDPAC=X'00',                       * PRI SEND PACING   X
               PSERVIC=X'020000000000000000000200'  * LU PRES. SERVICES
          EJECT
*         AS/400 DEVICE EMULATION - DSC PRINTERS
S3286     MODEENT LOGMODE=S3286,                    * ENTRY NAME        X
               FMPROF=X'03',                        * FM PROFILE        X
               TSPROF=X'03',                        * TS PROFILE        X
               PRIPROT=X'91',    (A1 OR B1)         * PLU PROTOCOL      X
               SECPROT=X'90',    (A0 OR B0)         * SLU PROTOCOL      X
               COMPROT=X'3080',                     * COMMON PROTOCOL   X
               SSNDPAC=X'00',                       * SEC SEND PACING   X
               SRCVPAC=X'00',                       * SEC RECV PACING   X
               RUSIZES=X'8585',                     * RU SIZES          X
               PSNDPAC=X'00',                       * PRI SEND PACING   X
               PSERVIC=X'030000000000000000000200'  * LU PRES. SERVICES
          EJECT
*         AS/400 DEVICE EMULATION - SCS PRINTERS
S3287     MODEENT LOGMODE=S3287,                    * ENTRY NAME        X
               FMPROF=X'03',                        * FM PROFILE        X
               TSPROF=X'03',                        * TS PROFILE        X
               PRIPROT=X'91',    (A1 OR B1)         * PLU PROTOCOL      X
               SECPROT=X'90',    (A0 OR B0)         * SLU PROTOCOL      X
               COMPROT=X'3080',                     * COMMON PROTOCOL   X
               SSNDPAC=X'00',                       * SEC SEND PACING   X
               SRCVPAC=X'00',                       * SEC RECV PACING   X
               RUSIZES=X'8585',                     * RU SIZES          X
               PSNDPAC=X'00',                       * PRI SEND PACING   X
               PSERVIC=X'010000000000000000000200'  * LU PRES. SERVICES
S7FM2M5   MODEENT LOGMODE=S7FM2M5,                  * ENTRY NAME        X
               FMPROF=X'03',                        * FM PROFILE        X
               TSPROF=X'03',COS=INTERACT            * TS PROFILE        X
               PRIPROT=X'B1',                       * PLU PROTOCOL      X
               SECPROT=X'90',                       * SLU PROTOCOL      X
               COMPROT=X'3080',                     * COMMON PROTOCOL   X
               SSNDPAC=X'00',                       * SEC SEND PACING   X
               SRCVPAC=X'00',                       * SEC RECV PACING   X
               RUSIZES=X'8785',                     * RU SIZES          X
               PSNDPAC=X'00',                       * PRI SEND PACING   X
               PSERVIC=X'028000000000018501B847F00'  * LU PRES. SERVICES
S7EMOD5   MODEENT LOGMODE=S7EMOD5,                  * ENTRY NAME        X
               FMPROF=X'03',                        * FM PROFILE        X
               TSPROF=X'03',COS=INTERACT            * TS PROFILE        X
               PRIPROT=X'B1',                       * PLU PROTOCOL      X
               SECPROT=X'90',                       * SLU PROTOCOL      X
               COMPROT=X'3080',                     * COMMON PROTOCOL   X
               SSNDPAC=X'00',                       * SEC SEND PACING   X
               SRCVPAC=X'00',                       * SEC RECV PACING   X
               RUSIZES=X'8785',                     * RU SIZES          X
               PSNDPAC=X'00',                       * PRI SEND PACING   X
               PSERVIC=X'0280000000001B8400007E00'  * LU PRES. SERVICES
          MODEEND
          END
/*
//LKED.SYSLMOD DD DSN=SYS1.VTAMLIB,DISP=SHR.UNIT=DISK,VOL=SER=RSC001
//LKED.SYSIN DD *
  ALIAS RMSCMT
  NAME RNMSCMT(R)
/*
```

Figure B-1. Logon Mode Table Example

Notes:

1. The maximum RUSIZE can be up to 4096 bytes (X '8989') for this parameter. Varying the maximum RUSIZE value can affect the performance for the AS/400 3270 device emulation session. For more information about calculating the RUSIZE value, refer to Notes 1 and 2 on page C-4.
2. Terminals S7FM2M5 and S7EMOD5 are 3564-character (27 x 132) capable displays.

VTAM/NCP Examples

The following examples show host system generation for VTAM/NCP and the corresponding AS/400 line, controller, and device configurations.

The examples of VTAM/NCP generations show nonswitched and switched line generations for an SNA 3274 Control Unit. They contain:

- The GROUP macroinstruction describing SDLC lines with similar characteristics
- The LINE macroinstruction describing an SDLC line attached to a communications controller
- The Physical Unit macroinstruction representing a physical unit type 2 with which the NCP communicates on a switched or nonswitched line
- The LU macroinstructions representing all the logical units of an SDLC station

The configuration displays related to the nonswitched and switched-line generations are shown with references relating the listings to the displays.

Examples include an advanced communications function/VTAM (ACF/VTAM*) start deck, USSTAB, a CICS/VS TCT, and a logon interpret table. Keys referring to commonly shared AS/400 and VTAM/NCP parameters are explained after the examples.

Host Generation Example for a VTAM/NCP Nonswitched Line

Parameters corresponding to SNA 3270 device emulation configuration are highlighted in the following VTAM/NCP nonswitched-line generation example.

```
         TITLE 'RSC/3705-II GEN        GROUP MACRO DEFINITION-SNA/LSD'
LSGRP2   GROUP DIAL=NO,                 LEASED LINE                      X
               LNCTL=SDLC,              SYNCHRONOUS DATA LINK CONTROL    X
               AVGPB=256,               ALL PU'S                         X
               MAXDATA=521,             MAX DATA FOR PIU                 X
               MAXOUT=7,                MAX PIU,S SENT                   X
               PASSLIM=7,               MAX CONSECUTIVE PIU'S SENT       X
               SRT=(4000,64),           ALL PU'S                         X
               BATCH=YES,               ALL LU'S                         X
               ACTIVTO=420.0,           ELAPSED TIME OUT VALUE           X
               REPLYTO=1.0,             ELAPSED TIME OUT VALUE           X
               TEXTTO=3,                ELAPSED TIME OUT VALUE           X
               VIRTUAL=NO,              DEFAULT (GROUP)                  X
               DATRATE=HIGH,            RATE FOR DUAL RATE MODEM         X
               ETRATIO=30,              DEFAULT (LINE)                   X
               INTPRI=1,                LINE INTERRUPT PRIORITY          X
               LPDATS=NO,               DEFAULT (LINE)                   X
               SERVLIM=4,               SERVICE ORDER TABLE SCANS        X
               SPDSEL=NO,               ALLOW VTAM TO CHANGE MODEM RATE  X
               ANS=STOP,                DEFAULT (PU)                     X
               IRETRY=NO,               RE-POLL IMMED AFTER IDLE DETECT  X
               PUDR=NO,                 DEFAULT (PU)                     X
               LUDR=NO,                 DEFAULT (PU)                     X
               PACING=(7,1),            DATA TRANSFER BETWEEN LU & NCP   X
               SSCPFM=USSSCS,           DEFAULT (LU) VTAM ONLY           X
               MODETAB=RMSCMT,          DEFAULT (LU) VTAM ONLY           X
               USSTAB=RMSCLSD,          DEFAULT (LU) VTAM ONLY           X
               LOGTAB=RMSCIT,           DEFAULT (LU) VTAM ONLY           X
               DISCNT=NO,               N/A                              X
               VPACING=8,               DEFAULT (LU) VTAM ONLY           X
               TYPE=NCP                 NETWORK CONTROL MODE
         TITLE 'RSC/3705-II GEN            LINE MACRO - IN HOUSE DDP'
L10      LINE  ADDRESS=(010),                                             X
               DUPLEX=HALF,                                               X
               HDXSP=YES,                                                 X
               PAUSE=0,                 AVG DURATION OF POLLING CYCLE    X
               IRETRY=YES,              RE-POLL IMMED AFTER IDLE DETECT  X
               SPEED=9600,              BITS PER SECOND                  X
               NRZI=YES,                NON RETURN TO ZERO INVERTED      X
```

RSLN026-2

Figure B-2. (Part 1 of 2) VTAM/NCP Nonswitched-Line Generation Example

1 MAXDATA in NCP and switched major node to 521.

2 This is the maximum receive pacing count.

3 SSCPFM must point to USSSCS to support the use of unformatted LOGON. This is a required parameter.

4 USSTAB points to the appropriate unformatted system services table. MSG0 and MSG10 should be in tables used by 3270 device emulation. They should not be in tables used by remote job entry (RJE), SNA upline facility (SNUF), and DSNX, and must not contain device control characters.

5 Disconnect (DISCNT) is controlled by the host system, except when the controller is varied off by the AS/400 system.

6 If this parameter is YES, the CRTLINSDLC procedure command must specify NRZI(*YES). If this parameter is NO, the CRTLINSDLC procedure command must specify NRZI(*NO). The NRZI entry must be the same for the AS/400 system and the host system.

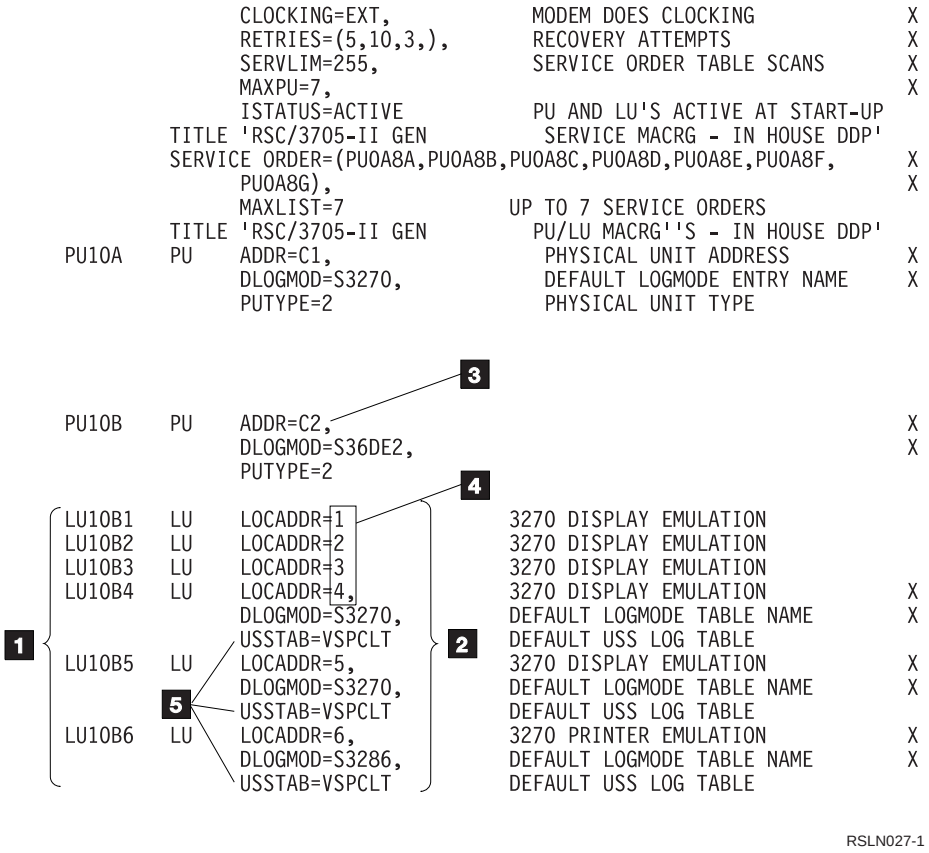


Figure B-3. (Part 2 of 2) VTAM/NCP Nonswitched-Line Generation Example

1 The logical units you define as initially active must correspond to the logical units you define in the host device configuration.

2 The quantity of logical units you define should agree with the host system. The value you assign should agree with the LOCADDR setting in the LU definition.

3 The address (ADDR) parameter is the same as that specified for the station address on the CRTCTLHOST command.

4 A corresponding VTAM/NCP logical unit definition must exist, with the same value specified for LOCADDR, for every logical unit address defined.

5 USSTAB points to the appropriate unformatted system services table. MSG0 and MSG10 should be present in tables used by 3270 device emulation, but must be absent from tables used by RJE and SNUF, and must not contain device control characters. See the *3270 Programmer's Description Manual* for additional information.

AS/400 System Configuration Examples for a VTAM/NCP Nonswitched Line

To configure your system for SNA 3270 device emulation you must create definitions for each applicable line, controller, and device. The following example shows the displays that appear when you configure SNA 3270 device emulation for a SDLC nonswitched multipoint line, SNA host controller, and SNA 3270 emulation display device.

You can obtain the configuration displays in any of the following ways:

- The *Configuration* option of the menu interface
- Any of the specific configuration commands:
  - Create SDLC Line Description (CRTLINSDLC)
  - Create Host Controller Description (CRTCTLHOST)
  - Create Host Device Description (CRTDEVHOST)

Creating the Line Description for SNA

Use the Create SDLC Line Description (CRTLINSDLC) command, or select the configuration option from the menu to create a line configuration. The number and sequence of displays that appear depend on the values you enter.

```
                    Create Line Desc (SDLC) (CRTLINSDLC)

Type choices, press Enter.

Line description . . . . . > EMLIN2          Name
Resource names . . . . . > LIN012          Name
             + for more values
Online at IPL  . . . . . .   *YES           *YES, *NO
Data link role . . . . . > *SEC           *NEG, *PRI, *SEC
Physical interface . . . . .   *RS232V24     *RS232V24, *V35, *X21, ...
Connection type  . . . . . > *MP            *NONSWTPP, *SWTPP, *MP, *SHM
Switched network backup  . . .   *NO          *NO, *YES
Exchange identifier  . . . . .   *SYSGEN      05600000-056FFFFF, *SYSGEN
NRZI data encoding . . . . . .   *YES         *YES, *NO
Maximum controllers  . . . . .   1            1-254
Line speed . . . . . . . . . .   9600         600, 1200, 2400, 4800...
Modem type supported . . . . .   *NORMAL      *NORMAL, *V54, *IBMWRAP...
Maximum frame size . . . . . .   521          265, 521, 1033, 2057
Duplex . . . . . . . . . . . .   *HALF        *HALF, *FULL
Inactivity timer . . . . . .   300          *NOMAX, 150-4200 (0.1 sec)
                                                                    More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Use the page keys to continue to the next line description display.

```
                    Create Line Desc (SDLC) (CRTLINSDLC)

Type choices, press Enter.

Poll response delay  . . . . . .   0            0-2048 (0.0001 seconds)
Fair polling timer . . . . . .   15           5-60 (1 second)
Text 'description' . . . . . .   *BLANK
_____
```

Creating the Controller Description for SNA

Use the Create Controller Description (SNA Host) (CRTCTLHOST) command, or select the configuration option from the menu to create a controller configuration. The number and sequence of displays that appear depend on the values you enter.

```
                    Create Ctl Desc (SNA Host) (CRTCTLHOST)

Type choices, press Enter.

Controller description . . . . . > EMCTL2          Name
Link type  . . . . . . . . . . . > *SDLC           *IDLC, *LAN, *SDLC, *X25
Online at IPL  . . . . . . . . .   *YES           *YES, *NO
Switched connection  . . . . . .   *NO            *NO, *YES
Switched network backup  . . . .   *NO            *NO, *YES
APPN-capable . . . . . . . . . . > *NO            *YES, *NO
Attached nonswitched line  . . . > EMLIN2         Name
Maximum frame size . . . . . . .   *LINKTYPE      265-16393, 265, 521, 1033...
Remote network identifier  . . .   *NETATR        Name, *NETATR, *NONE
Remote control point . . . . . .                  Name
SSCP identifier  . . . . . . . .                  050000000000-05FFFFFFFFF
Station address  . . . . . . . .   c1             01-FE
Recontact on vary off  . . . . .   *YES           *YES, *NO
Text 'description' . . . . . . .   '3270 emulation controller for SNA'
_____

                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Creating the Device Description for SNA

Use the Create Device Description (SNA Host) (CRTDEVHOST) command, or select the configuration option from the menu to create a controller configuration. The number and sequence of displays that appear depend on the values you enter.

```
                    Create Device Desc (SNA Host) (CRTDEVHOST)

Type choices, press Enter.

Device description . . . . . > EMDSP40         Name
Local location address . . . . > 40            01-FF
Remote location  . . . . . . . > EMCTL2        Name
Online at IPL  . . . . . . . .   *YES          *YES, *NO
Attached controller  . . . . . > EMCTL2        Name
Application type . . . . . . . > *EML          *RJE, *EML, *PGM
Maximum length of request unit   *CALC         *CALC
Emulated device  . . . . . . .   3278          3278, 3284, 3286, 3287...
Emulated keyboard  . . . . . .   *UPPER        *UPPER, *LOWER
Emulated numeric lock  . . . .   *NO           *NO, *YES
Emulation work station . . . .   *ANY          Name, *ANY
Text 'description' . . . . . .   '3270 emulation display device for SNA'
_____

                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

VTAM Switched-Line Generation

The following is an example of VTAM switched-line generation. Values and parameters corresponding to SNA 3270 device emulation configuration are highlighted.

```
                MEMBER NAME S36DDP01

S36DDP01 VBUILD TYPE=SWNET          DEFINE AS SWITCHED MAJOR NODE
PU20A    PU  1 ADDR=C1,             MINOR NODE NAME (A)                    X
             IDBLK=056,             BITS 16-27 OF VTAM STATION ID          X
           3 IDNUM=00FC1,         4 BITS 28-47 OF VTAM STATION ID          X
             MAXDATA=521,           MAXDATA THAT PU CAN RECEIVE IN ONE PIUX
           5 DISCNT=(NO:F),         DISCONNECT THE PHONE                   X
             IRETRY=YES,            REPOLL IMMED. AFTER IDLE DETECT        X
             ISTATUS=ACTIVE,        PU IS ACTIVATED AT START UP            X
             MAXOUT=7,              SEND 7 PIU'S BEFORE PU MUST RESPOND    X
             PASSLIM=7,             SAME AS MAXOUT                         X
             PUTYPE=2,              TYPE 2 PU                              X
             BATCH=YES,             PROCESSING PRIORITY YES=LOW PRTY       X
             DLOGMOD=S3270,         DEFAULT LOGMODE ENTRY NAME             X
             LOGTAB=RMSCIT,         INTERPRET TABLE NAME                   X
             MODETAB=RMSCMT,        DEFAULT LOGMODE TABLE NAME             X
           6 PACING=7,              DATA TRANSFER BETWEEN LU AND NCP       X
           7 SSCPFM=USSSCS,         DEFAULT TO VTAM USSSCS                 X
             USSTAB=RMSCLT,         DEFAULT USS LOG TABLE                  X
           8 VSPACING=8             DATA TRANSFER VTAM TO NCP

10 LU20A7   LU   LOCADDR=7          9 ADDRESS ON PHYSICAL UNIT
   LU20A8   LU   LOCADDR=8            ADDRESS ON PHYSICAL UNIT
   LU20A9   LU   LOCADDR=9            ADDRESS ON PHYSICAL UNIT
   LU20A10  LU   LOCADDR=10           ADDRESS ON PHYSICAL UNIT
   LU20A11  LU   LOCADDR=11           ADDRESS ON PHYSICAL UNIT
   LU20A12  LU   LOCADDR=12           ADDRESS ON PHYSICAL UNIT
   LU20A13  LU   LOCADDR=13           ADDRESS ON PHYSICAL UNIT
   LU20A14  LU   LOCADDR=14           ADDRESS ON PHYSICAL UNIT
   LU20A15  LU   LOCADDR=15,          ADDRESS ON PHYSICAL UNIT               X
                 DLOGMOD=S3270,       DEFAULT LOGMODE ENTRY NAME DISPLAY     X
                 USSTAB=VSPCLT        DEFAULT USS LOG TABLE
   LU20A16  LU   LOCADDR=16,          ADDRESS ON PHYSICAL UNIT               X
                 DLOGMOD=S3270,       DEFAULT LOGMODE ENTRY NAME DISPLAY     X
                 USSTAB=VSPCLT        DEFAULT USS LOG TABLE
   LU20A17  LU   LOCADDR=17,          ADDRESS ON PHYSICAL UNIT   (DE3270)    X
                 DLOGMOD=S3286,       DEFAULT LOGMODE ENTRY NAME PRINTER     X
              11 USSTAB=RMSCLT        DEFAULT USS LOG TABLE (NO MSG 0 & 10)
```

RSLN028-2

Figure B-4. VTAM Switched-Line Generation Example

1 This value corresponds to the station address specified during the host controller configuration.

2 This parameter requires an entry of hex 056.

3 The IDNUM parameter is the same as the parameter specified for local XID (exchange identifier).

4 MAXDATA in NCP and switched major node can be set to 521.

5 Disconnect (DISCNT) is controlled by the host except when the controller is varied off by the AS/400 system.

6 This is the maximum receive pacing count.

7 SSCPFM must point to USSSCS to support the use of unformatted LOGON. This is a required parameter.

8 For every logical unit address defined, a corresponding VTAM/NCP logical unit definition must exist with the same value specified for LOCADDR.

9 The quantity of logical units defined should agree with the host system. The value assigned should agree with the LOCADDR setting in the LU definition.

10 The logical units defined as initially active must correspond to the logical units defined and to those defined by the host device configuration.

11 USSTAB points to the appropriate unformatted system services table. MSG0 and MSG10 should be present in tables used by 3270 device emulation, must be absent from tables used by RJE and SNUF, and must not contain device control characters.

ACF/VTAM Start Option List (ATCSTR00) Example

The following is an example of the ACF/VTAM start option list (ATCSTR00). The start options are used and remain in effect, until changed, or until ACF/VTAM is stopped when ACF/VTAM is started (initialized). Start options are from the start option list provided by the system programmer. The command starting ACF/VTAM uses the default start option list (ARCSTR00) if no changes or additions are needed. For further information, see the *ACF for VTAM Operator's Guide*.

```
1
SSCPID=10,                    SYSTEM SERVICES CONTROL POINT IDX
COLD,                         COLD START NCP                  X
CONFIG=00,                    DEFAULT CONFIG LIST (ATCCON00)  X
DLRTCB=8,                     # OF TCB'S USED BY DUMP-LOAD RSTX
HOSTSA=1,                     ACF/VTAMS SUBAREA               X
IOINT=180,                    DEFAULT                         X
ITLIM=150,                    SESSION INITIATION REQUESTS     X
LIST=00,                      DEFAULT START UP LIST(ATCSTR00) X
MAXAPPL=50,                   MAX APPLICATIONS TO SIGN ON     X
MAXSUBA=7,                    MAX SUBAREA'S TO BE ACTIVE      X
MSGMOD=NO,                    DEFAULT                         X
NOPROMPT,                     DO NOT PROMPT OPER FOR START UPTX
SONLIM=(60,30),               DEFAULT                         X
SUPP=NOSUP,                   DO NOT SUPPRESS AMY MSG'S       X
NOTNSTAT,                     DEFAULT                         X
NOTRACE,TYPE=VTAM,            NO TRACE FUNCTION ON STARTUP    X
VTAMEAS=100,                  MAX # CF CONCURRENT SNA UNITS   X
APBUF=(25,,1,,4,2),                                           X
CRPLBUF=(,,,,5,8),            FROM A VTAM/NCP INSTALLATION    X
IOBUF=(150,152,5,,1,15),      MANUAL WRITTEN BY HAL LIBERTY   X
LFBUF=(50,,5,,10,10),         GG24-1509-0                     X
LPBUF=(20,,2,,1,5),           DTD JUN 1980                    X
SFBUF=(25,,,,3,3),                  |                         X
WPBUF=(75,,,,8,8),                  |
                                                        RSLN029-0
```

Figure B-5. ACF/VTAM Start Option List

1 SSCP identification must agree with SSCPID setting in VTAM member ATCSR00. Enter the value 00000 to allow connection with several different control points (SSCP) in special cases.

Unformatted System Service Table (USSTAB) Example

ACF/VTAM can accept logon and logoff requests in character-coded (unformatted) form from any LU. An LU sends a logon request to ACF/VTAM specifying the application program name when requesting an SNA 3270 device emulation session with a host system application program. A logon mode name and other user data may also be sent.

The Unformatted System Services (USS) component of ACF/VTAM must have the appropriate tables to convert the character strings into formatted requests, and to create an unformatted logon and logoff. These tables can be any or all of the following:

- The IBM-supplied USS definition table
- A USS definition table you have written to supplement the IBM-supplied table as shown in this USSTAB example
- The logon interpret tables you have written to provide application program names associated with the character strings as shown in "Logon Interpret Table Example" on page B-18.

```
         MEMBER NAME USSTAB


//VSPCTAB  JOB ,DKOLSON,CLASS=A,MSGCLASS=H
//TABLE EXEC ASMHCL,PARM.ASM= 'OBJ,NODECK,RENT',
//           PARM.LKED=(XREF,LIST,LET,NCAL,RENT)
//*ABLE EXEC ASMHCL,PARM.ASM='OBJ,NODECK',          <----  NON-RENT
//*          PARM.LKED=(XREF,LIST,LET,NCAL)         <----  NON-RENT
//SYSIN    DD *
*********************************************************************
          TITLE 'RNMSC - UNFORMATTED SYSTEM SERVICES TABLE'
VSPCLT    USSTAB  TABLE=STDTRANS
          SPACE 3
LOGON     USSCMD  CMD=LOGON,FORMAT=PL1
          USSPARM PARM=APPLID
          USSPARM PARM=LOGMODE
          USSPARM PARM=DATA
          EJECT
VSPC      USSCMD  CMD=VSPC,REP=LOGON,FORMAT=BAL
          USSPARM PARM=APPLID,DEFAULT=VSPC
          USSPARM PARM=LOGMODE,DEFAULT=S3278
          EJECT
CICS      USSCMD  CMD=CICS,REP=LOGON,FORMAT=BAL
          USSPARM PARM=APPLID,DEFAULT=CICS
          USSPARM PARM=LOGMODE,DEFAULT=S3270
          USSPARM PARM=ID,REP=DATA
          EJECT
IMS       USSCMD  CMD=IMS,REP=LOGON,FORMAT=BAL
          USSPARM PARM=APPLID,DEFAULT=IMS
          USSPARM PARM=LOGMODE,DEFAULT=S3270
          EJECT
NCCF      USSCMD  CMD=NCCF,REP=LOGON,FORMAT=BAL
          USSPARM PARM=APPLID,DEFAULT=NCCF
          USSPARM PARM=LOGMODE,DEFAULT=S3270
          EJECT
DSX       USSCMD  CMD=DSX,REP=LOGON,FORMAT=BAL
          USSPARM PARM=APPLID,DEFAULT=DSX
          USSPARM PARM=LOGMODE,DEFAULT=S3270
          EJECT
DSXIOF    USSCMD  CMD=DSXIOF,REP=LOGON,FORMAT=BAL
          USSPARM PARM=APPLID,DEFAULT=DSXIOF
          USSPARM PARM=LOGMODE,DEFAULT=S3270
          EJECT
HCF       USSCMD  CMD=HCF,REP=LOGON
          USSPARM PARM=APPLID,REP=APPLID,DEFAULT=HCF
          USSPARM PARM=MODE,REP=LOGMODE,DEFAULT=S3270
          EJECT
LOGOFF    USSCMD  CMD=LOGOFF
          USSPARM PARM=APPLID
          USSPARM PARM=TYPE,DEFAULT=UNCOND
          USSPARM PARM=HOLD,DEFAULT=NO
          EJECT
SIGNOFF   USSCMD  CMD=SIGNOFF
          USSPARM PARM=APPLID
          USSPARM PARM=TYPE, DEFAULT=UNCOND
          USSPARM PARM=HOLD, DEFAULT=NO
          EJECT

MESSAGES  USSMSG  MSG=0,TEXT='%   ACF/VTAM COMMAND IN PROCESS'

          SPACE 4
          USSMSG MSG=1,TEXT='INVALID COMMAND SYNTAX'
          EJECT
          USSMSG MSG=2,TEXT='% COMMAND UNRECOGNIZED'
          SPACE 4
          USSMSG MSG=3,TEXT='% PARAMETER UNRECOGNIZED
          EJECT
          USSMSG MSG=4,TEXT='% PARAMETER INVALID/UNDEFINED/NOT ACTIVE'
          SPACE 4
          USSMSG MSG=5,TEXT='UNSUPPORTED FUNCTION'
          EJECT
          USSMSG MSG=6,TEXT='SEQUENCE ERROR'
          SPACE 4
          USSMSG MSG=7,
       TEXT='BIND ERROR/APPLICATION NOT ACTIVE/LU NAME NOT IN CICS TCT'
          EJECT
          USSMSG MSG=8,TEXT='INSUFFICIENT STORAGE'
          SPACE 4
          USSMSG MSG=9,TEXT='MAGNETIC CARD DATA ERROR'
          EJECT
          USSMSG MSG=10,TEXT='ENTER RNMSC - ACF/VTAM LOGON'
          SPACE 4
          USSMSG MSG=11,TEXT='SESSION ENDED'
```

```
         EJECT

         USSMSG MSG=12,TEXT='REQUIRED PARAMETER OMITTED'
         SPACE 4
         USSMSG MSG=13,TEXT='IBMECHO %'

         EJECT
STDTRANS DC    X'000102030440060708090A0B0C0D0E0F'
         DC    X'101112131415161718191A1B1C1D1E1F'
         DC    X'202122232425262728292A2B2C2D2E2F'
         DC    X'303132333435363738393A3B3C3D3E3F'
         DC    X'404142434445464748494A4B4C4D4E4F'
         DC    X'505152535455565758595A5B5C5D5E5F'
         DC    X'606162636465666768696A6B6C6D6E6F'
         DC    X'707172737475767778797A7B7C7D7E7F'
         DC    X'80C1C2C3C4C5C6C7C8C9CACBCCCDCECF'
         DC    X'90D1D2D3D4D5D6D7D8D9DADBDCDDDEDF'
         DC    X'A0A1A2A3A4A5A6A7A8A9AAABACADAEAF'
         DC    X'B0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF'
         DC    X'C0C1C2C3C4C5C6C7C8C9CACBCCCDCECF'
         DC    X'D0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF'
         DC    X'E0E1E2E3E4E5E6E7E8E9EAEBECEDEEEF'
         DC    X'F0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF'
         SPACE 3
END      USSEND
         END
/*
//LKED.SYSLMOD DD DSN=SYS1.VTAMLIB,DISP=SHR,UNIT-DISK,VOL=SER=RSC001
//LKED,SYSIN DD *
  NAME VSPCLT(R)
/*
```

Figure B-6. USSTAB Example

Note: MSG0 and MSG10 must not contain any device control characters other than hex 15 (new line).

CICS/VS Terminal Control Table (TCT) Example

Terminal control tables (TCTs) are created to describe the configuration of terminals, logical units, or other CICS/VS systems in the CICS/VS network with which the CICS/VS system might communicate. The following is an example of a CICS/VS TCT.

```
         MEMBER NAME CICTCTSN


//TCTV8  JOB ,'LJALLEN',CLASS=E,MSGLEVEL=1,MSGCLASS=H
//       EXEC  DFHAUPLK
//ASSEM.SYSUT1 DD *
         TITLE 'CICS TCT FOR CICS REL 1.7'
         PRINT NOGEN
         DFHTCT TYPE=INITIAL,SUFFIX=V8,ACCMETH=(VTAM),                 X
               APPLID=CICS,ERRATT=NO,OPNDLIM=10,RAMAX=256,RAMIN=80,    X
               RAPOOL=3,RATIMES=10,RESP=FME,                           X
               GMTEXT='WELCOME TO THE ROCHESTER SYSTEMS CENTER DEMO SYSX
               TEM'
*
*
          TITLE '3270 SWITCHED SNA/SDLC FOR DEVICE EMULATION - AS/400 SY
               STEM - LINE 1'
*
          DFHTCT TYPE=TERMINAL,ACCMETH=VTAM,TRMIDN =RX1,  ,CHNASSY=YES,
                NETNAME=LU20A15,TRMTYPE=LUTYPE2,TRMMODL=2,BUFFER=256,
               FEATURE=UCTRAN,TRMSTAT=TRANSCEIVE,RELREQ=(YES,YES),     X
               PGESTAT=PAGE,                                           X
               TCTUAL=64,TIOAL=(960,4096),RUSIZE=256,GMMSG=YES
         DFHTCT TYPE=TERMINAL,ACCMETH=VTAM,TRMIDNT=RX1B,CHNASSY=YES,   X
               NETNAME LU20A16,TRMTYPE=LUTYPE2,TRMMODL=2,BUFFER=256,   X
                FEATURE=UCTRAN,TRMSTAT=TRANSCEIVE,RELREQ=(YES,YES),    X
                PGESTAT=PAGE,                                          X
                TCTUAL=64,TIOAL=(960,4096),RUSIZE=256,GMMSG=YES
          DFHTCT TYPE=TERMINAL,ACCMETH=VTAM,TRMIDNT=RX1E,CHNASSY=YES,  X
                NETNAME=LU20A17,TRMTYPE=LUTYPE3,TRMMODL=2,BUFFER=256,  X
                FEATURE=UCTRAN,TRMSTAT=RECEIVE,RELREQ=(YES,YES),       X
                PGESTAT=AUTOPAGE,                                      X
                TCTUAL=64,TIOAL=(960,4096),RUSIZE=256,GMMSG=NO
*
          TITLE '3270 LEASED SNA/SDLC FOR DEVICE EMULATION - AS/400 SYST
               EM FOR IN HOUSE USE'
*
         DFHTCT TYPE=TERMINAL,ACCMETH=VTAM,TRMIDNT=RX7A,CHNASSY=YES,   X
               NETNAME=LU10B4,TRMTYPE=LUTYPE2,TRMMODL=2,BUFFER=256,    X
               FEATURE=UCTRAN,TRMSTAT=TRANSCEIVE,RELREQ=(YES,YES),     X
               PGESTAT=PAGE,                                           X
               TCTUAL=64,TIOAL=(960,4096),RUSIZE=256,GMMSG=YES
         DFHTCT TYPE=TERMINAL,ACCMETH=VTAM,TRMIDNT=RX78,CHNASSY=YES,   X
               NETNAME=LU10B5,TRMTYPE=LUTYPE2,TRMMODL=2,BUFFER=256,    X
               FEATURE=UCTRAN,TRMSTAT=TRANSCEIVE,RELREQ=(YES,YES),     X
               PGESTAT=PAGE,                                           X
               TCTUAL=64,TIOAL=(960,4096),RUSIZE=256,GMMSG=YES
         DFHTCT TYPE=TERMINAL,ACCMETH=VTAM,TRMIDNT=RX7E,CHNASSY=YES,   X
               NETNAME=LU10B6,TRMTYPE=LUTYPE3,TRMMODL=2,BUFFER=256,    X
               FEATURE=UCTRAN,TRMSTAT=RECEIVE,RELREQ=(YES,YES),        X
               PGESTAT=AUTOPAGE,DEFSCRN=(24,80),ALTSCRN=(27,132),      X
               TCTUAL=64,TIOAL=(960,4096),RESIZE=256,GMMSG=NO
*
         DFHTCT TYPE=FINAL
         END   DFHTCTBA
```

RSLN031-3

Figure B-7. CICS/VS Terminal Control Table Example

1 The device type entry must agree with the TRMTYPE setting in CICS/VS. Values set by the user in the TCT determine the content of the BIND because CICS/VS can ignore the MODEENT. The following values are appropriate for 3270 device emulation:

Display	**Printer**
TRMTYPE=LUTYPE2	TRMTYPE=LUTYPE3 or SCSPRT
TRMMODL=2	TRMMODL=2

2 BUFFER designates to CICS/VS the maximum RU size that can be sent to the system during 3270 Device Emulation. RUSIZE sets the system to the maximum RU size to be sent to CICS/VS. The value can be from 256 through 12288 (12K).

3 The RX7E terminal is a 3564-character (27 x 132) capable display.

CICS Example

The following example shows VTAM displays and a printer defined in the CICS terminal control table (TCT).

```
         DFHTCT TYPE=TERMINAL,TRMIDNT=EMAA,GMMSG=YES,TRMTYPE=LUTYPE2,     X00014000
                ACCMETH=VTAM,NETNAME=P20AAA01,BUFFER=256,TCTUAL=64,       X00014100
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00014200
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00014300
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00014400
                                                                           00014500
         DFHTCT TYPE=TERMINAL,TRMIDNT=EMAB,GMMSG=YES,TRMTYPE=LUTYPE2,     X00014600
                ACCMETH=VTAM,NETNAME=P20AAA02,BUFFER=256,TCTUAL=255,      X00014700
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00014800
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00014900
                FEATURE=UCTRAN,                                           X00015000
                ERRATT=(LASTLINE,INTENSIFY,BLINK),                        X00015100
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00015200
                                                                           00015300
         DFHTCT TYPE=TERMINAL,TRMIDNT=EMAC,GMMSG=YES,TRMTYPE=LUTYPE2,     X00015400
                ACCMETH=VTAM,NETNAME=P20AAA03,BUFFER=256,TCTUAL=64,       X00015500
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00015600
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00015700
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00015800
                                                                           00015900
         DFHTCT TYPE=TERMINAL,TRMIDNT=EMAD,GMMSG=YES,TRMTYPE=LUTYPE2,     X00016000
                ACCMETH=VTAM,NETNAME=P20AAA04,BUFFER=256,TCTUAL=64,       X00016100
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00016200
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00016300
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00016400
                                                                           00016500
         DFHTCT TYPE=TERMINAL,TRMIDNT=EMAE,GMMSG=YES,TRMTYPE=LUTYPE2,     X00016600
                ACCMETH=VTAM,NETNAME=P20AAA05,BUFFER=256,TCTUAL=64,       X00016700
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00016800
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00016900
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00017000
                                                                           00017100
         DFHTCT TYPE=TERMINAL,TRMIDNT=EMAF,GMMSG=YES,TRMTYPE=LUTYPE2,     X00017200
                ACCMETH=VTAM,NETNAME=P20AAA06,BUFFER=256,TCTUAL=64,       X00017300
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00017400
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00017500
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00017600
                                                                           00017700
         DFHTCT TYPE=TERMINAL,TRMIDNT=EMAG,GMMSG=YES,TRMTYPE=LUTYPE2,     X00017800
                ACCMETH=VTAM,NETNAME=P20AAA07,BUFFER=256,TCTUAL=64,       X00017900
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00018000
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00018100
                DEFSCRN=(24,80),ALTSCRN=(27,132),                         X00018200
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00018300
                                                                           00018400
PRINTA   DFHTCT TYPE=TERMINAL,TRMIDNT=EMAH,GMMSG=YES,TRMTYPE=LUTYPE3,     X00018500
                ACCMETH=VTAM,NETNAME=P20AAA08,BUFFER=256,TCTUAL=64,       X00018600
                PGESTAT=PAGE,CHNASSY=YES,TIOAL=2000,RUSIZE=256,           X00018700
                TRMMODL=2,RELREQ=(YES,YES),FEATURE=UCTRAN,                X00018800
                TRMSTAT=TRANSCEIVE,PGESIZE=(24,80),PRINTTO=(PRINTA)        00018900
```

Note: The EMAG terminal is a 3564-character (27 x 132) capable display.

TCAM Example

The following example shows the GROUP and TERMINAL macroinstructions for the NCP line P2026 and group P2603.

```
P2G03    GROUP ,                                                  X00004300
               BUFOUT=2,                                          X00004400
               BUFMAX=3,                                          X00004500
               BUFXIZE=279,                                       X00004600
               MH=NOTIMS,  DUMMY MESSAGE HANDLER FOR NON-SUBSYS MSGS X00004700
               PCI=(,A),                                          X00004800
               RAPIMH=0,    NO RAPIMH NEEDED FOR SNA 3270         X00004900
               TRANS=EBCF                                          00005000
         SPACE 3                                                   00005100
P2026    TERMINAL ,                                               X00005200
               ACTIVE=NO,                                         X00005300
               GROUP=P2G03,                                       X00005400
               RLN=1,                                             X00005500
               TERM=LINE                                           00005600
         SPACE 3                                                   00005700
P2026A   TERMINAL ,                                               X00005800
               DISCNT=NO,                                         X00005900
               TERM=PUNT                                           00006000
         SPACE 3                                                   00006100
P2026A01 TERMINAL ,                                               X00006200
               ACTIVE=(,YES),     IMS AUTOLOGN WHEN LU ACTIVATED  X00006300
               GROUP=P2G03,                                       X00006400
               LMD=YES,                                           X00006500
               OPDATA=(P2026A01,,0,0,INTRACT12,IMSPROC),          X00006600
               QBY=T,                                             X00006700
               QUEUES=MR,                                         X00006800
               RLN=1,                                             X00006900
               SECTERM=YES,                                       X00007000
               TERM=LUNT,                                         X00007100
               TCMSESN=LUTERM,                                    X00007200
               USS=3270                                            000  300
P2026A02 TERMINAL ,                                               X00007400
               ACTIVE=(,YES),     IMS AUTOLOGN WHEN LU ACTIVATED  X00007500
               GROUP=P2G03,                                       X00007600
               LMD=YES,                                           X00007700
               OPDATA=(P2026A02,,0,0,INTRACT12,IMSPROC),          X00007800
               QBY=T,                                             X00007900
               QUEUES=MR,                                         X00008000
               RLN=1,                                             X00008100
               SECTERM=YES,                                       X00008200
               TERM=LUNT,                                         X00008300
               TCMSESN=LUTERM,                                    X00008400
               USS=3270                                            00008500
```

IMS Example

The following example shows the APPLICTN and TRANSACT macroinstructions for IMS transactions.

```
APPLCTN    DOPT,PSB=P5ITF070,PGMTYPE=(TP,003)                 00008800
TRANSACT   CODE=ITF070R,EDIT=ULC,SPA=(1000,DASD,FIXED),      X00008900
           MSGTYPE=(SNGLSEG,RESPONSE),SEGSIZE=256,           X00009000
           INQUIRY=YES,MODE=SNGL                              00009100
TRANSACT   CODE=ITF070N,EDIT=ULC,SPA=(1000,DASD,FIXED),      X00009200
           MSGTYPE=(SNGLSEG,RESPONSE),SEGSIZE=256,           X00009300
           INQUIRY=YES,MODE=SNGL                              00009400
APPLCTN    DOPT,PSB=P5ITF071,PGMTYPE=(TP,003)                 00009500
TRANSACT   CODE=ITF071R,MSGTYPE=(MULTSEG,RESPONSE)           X00009600
TRANSACT   CODE=ITF071N,MSGTYPE=(MULTSEG,NONRESPONSE)        X00009700
APPLCTN    DOPT,PSB=P5EMF133,PGMTYPE=(TP,003)                 00009800
TRANSACT   CODE=EMF133R,MSGTYPE=(MULTSEG,RESPONSE)           X00009900
           INQUIRY=(YES,NORECOV)                             X00010000
TRANSACT   CODE=EMF133N,MSGTYPE=(MULTSEG,NONRESPONSE)        X00010100
           INQUIRY=(YES,NORECOV)                             X00010200
```

The following example shows the TYPE and TERMINAL definitions for the line P2026. The first five are displays and the last three are printers.

```
TITLE    'AS/400 SLUTYPE2 3270 EMULATION DEFINITIONS'        00010400
*                                                            00010500
TYPE       UNITYPE=SLUTYPE2,MODEL=2,OUTBUF=256               00010600
TERMINAL   NAME=P2026A01,                                    X00010700
           FEAT=(PFK,NOCD,NOPEN),                            X00010800
           OPTIONS=(TRANRESP,COPY,PAGDEL,OPNDST)              00010900
NAME       LTRMLU01                                          00011000
TERMINAL   NAME=P2026A02                                     X00011100
           FEAT=(PFK,NOCD,NOPEN),                            X00011200
           OPTIONS=(TRANRESP,COPY,PAGDEL,OPNDST)              00011300
NAME       LTRMLU02                                          00011400
TERMINAL   NAME=P2026A03,                                    X00011500
           FEAT=(PFK,NOCD,NOPEN),                            X00011600
           OPTIONS=(TRANRESP,COPY,PAGDEL,OPNDST)              00011700
NAME       LTRMLU03                                          00011800
TERMINAL   NAME=P2026A04,                                    X00011900
           FEAT=(PFK,NOCD,NOPEN),                            X00012000
           OPTIONS=(TRANRESP,COPY,PAGDEL,OPNDST)              00012100
NAME       LTRMLU04                                          00012200
TERMINAL   NAME=P2026A05,                                    X00012300
           FEAT=(PFK,NOCD,NOPEN),TYPE=3270-A7,SIZE=(27,132), X00012400
           OPTIONS=(TRANRESP,COPY,PAGDEL,OPNDST)              00012500
NAME       LTRMLU05                                          00012600
```

Note: The LTRMLU05 terminal is a 3564-character (27 x 132) capable display.

```
   SPACE 3                                                   00012700
TYPE UNITYPE=SLUTYPE1                                        00012800
TERMINAL NAME=P2026A06,                                      X00012900
           COMPTI1=(PRINTER1,MFS-SCS1)                       00013000
NAME       LTRMLU06,COMPT=1                                  00013100
TERMINAL NAME=P2026A07,                                      X00013200
           COMPTI1=(PRINTER1,MFS-SCS1)                       00013300
NAME       LTRMLU07,COMPT=1                                  00013400
TERMINAL NAME=P2026A08,                                      X00013500
           COMPTI1=(PRINTER1,MFS-SCS1)                       00013600
NAME       LTRMLU08,COMPT=1                                  00013700
```

Logon Interpret Table Example

The following is an example of a logon interpret table. An interpret table can be used to translate a character string into a LOGON.

```
//INTAB    JOB ,DKOLSON,CLASS=H,MSGCLASS=H
//TABLE EXEC ASMHCL,PARM.ASM= 'OBJ,NODECK,RENT',
//           PARM.LKED=(XREF,LIST,LET,NCAL,RENT)
//SYSIN   DD *
*********************************************************************
         TITLE 'RSC    - LOGON INTERPRET TABLE'
RNMSCIT  INTAB
         EJECT
         LOGCHAR APPLID=(APPLICID,CICS),SEQNCE='CICS'
         LOGCHAR APPLID=(APPLICID,CICS),SEQNCE='cics'
         LOGCHAR APPLID=(APPLICID,IMS),SEQNCE='IMS'
         LOGCHAR APPLID=(APPLICID,IMS),SEQNCE='ims'
         LOGCHAR APPLID=(APPLICID,VSPC),SEQNCE='VSPC'
         LOGCHAR APPLID=(APPLICID,VSPC),SEQNCE='vspc'
         LOGCHAR APPLID=(APPLICID,VSPC),SEQNCE=')'
         LOGCHAR APPLID=(APPLICID,VSPC),SEQNCE='"'
         LOGCHAR APPLID=(APPLICID,VSPC),SEQNCE='*'
         LOGCHAR APPLID=(APPLICID,VSPC),SEQNCE='v'
         ENDINTAB
         END
/*
//LKED.SYSLMOD  DD DSN=SYS1.VTAMLIB,DISP=SHR,UNIT=DISK,VOL=SER=RSC001
//LKED.SYSIN DD *
  ALIAS RMSCIT
  NAME RNMSCIT(R)
/*
```

SNA Sense Data

If an error is detected while data is being processed, SNA 3270 device emulation responds to the host system with SNA sense data as follows:

Data	Meaning
08130000	(Display station emulation only) The system received a bid command or a begin bracket, and SNA 3270 device emulation is in the send state.
081B0000	Receiver in transmit mode. The system cannot process. SSCP data received on the logical unit address because SNA 3270 device emulation is in LU-LU session mode or display station is busy.
081C0009	Request not run.
08210000	A BIND command contained unacceptable session parameters.
08290000	The system received a read command but the request header did not specify change direction.
082A0000	Presentation space is altered and the request was not run. This occurs when the write operations of the user and the host system contend.
082B0000	The display was cleared because an error occurred at a display station.
082D0000	The system cannot process a message received on the logical unit address because SNA 3270 device emulation is in LU-SSCP session mode.
08310000	The device associated with this session has been signed off SNA 3270 device emulation.
0845000	3270 emulation is ending and permission is rejected.
084A000	Presentation space is altered and the request was not run. This occurs when the write operations of the user and the host system contend.
10030000	The system received an unsupported data flow control command.
	The system received a 3270 command code that was not valid.
	The system received an SCS control code that was not valid.
	The system received data following a read, read modified, read modified all, or erase all unprotected command.
10050000	The system received a screen buffer address that was not valid following a 3270 order.
	The system received a data stream that defined more than the maximum number of input fields for your display.
	The system received a set buffer address, repeat to address, or erase all unprotected to address command without complete parameters.
	The system received an SNA character string parameter.
	The system received a valid SCS control code that had a parameter that was not valid.
10070000	Category not supported.
	A printer using SNA 3270 device emulation received an LU-SSCP message.

Appendix C. 3270 Device Emulation BIND Values

The following chart lists the various BIND protocol values available for defining a Systems Network Architecture (SNA) session.

Note: If you do not use the required BIND value, the system sends a CPF5517 or CPF8516 message as shown in Table C-1. Both messages end the 3270 emulation session. However, the CPF5517 message sends a negative response of hex 0821, while the CPF8516 message sends a positive response to the BIND command. The values in quotation marks are binary values, and the others are hexadecimal values.

Table C-1 (Page 1 of 4). Device Emulation BIND Values

BIND Position	Meaning	Required Values	Error Message
0	Request code	31 = BIND request.	No error
1	Request code (ID) format	Format 0 and nonnegotiable BIND.	CPF5517
2	Function management (FM) profile	03 = FM profile 3.	CPF5517
3	Transmission services (TS) profile	03 = TS profile 3 set and test sequence numbers (STSN) not supported.	CPF5517
4	Primary LU protocols for FM data		
	Bit 0: Chaining use selection	'0' = Single RU chains from primary. '1' = Multiple RU chains from primary.	No error
	Bit 1: Request control mode selection	'0' = Immediate request mode.	CPF5517
	Bits 2, 3: Chain response protocol for chains sent by primary	'01' = Exception response only or '10' = Definite response only or '11' = Definite response or exception response.	CPF5517
	Bit 4: Two-phase commit for synchronization=point protocol	Ignored: Not supported on TS profile 3.	No error
	Bit 5: Reserved	Ignored.	No error
	Bit 6: Compression used by primary	'0' = Primary does not use compression.	CPF5517
	Bit 7: Primary can send end bracket	'1' = Primary can send end bracket.	CPF8516
5	Secondary LU protocols for function management data		
	Bit 0: Chaining use selection	'1' = Multiple RU chains from secondary.	CPF5517
	Bit 1: Request control mode selection	'0' = Immediate request mode for display emulation. Ignored for printer emulation.	CPF5517
	Bits 2, 3: Chain response protocol for chains sent by secondary	'01' = Exception response only or '10' = Definite response only or '11' = Definite response or exception response.	CPF5517
	Bit 4: Two phase commit for synchronization point protocol	Ignored.	No error
	Bit 5: Reserved	Ignored.	No error
	Bit 6: Compression used by secondary	'0' = Secondary does not use compression.	CPF5517
	Bit 7: Secondary can send end bracket	'0' = Secondary does not send end bracket. or '1' = Secondary can send end bracket.	No error

Table C-1 (Page 2 of 4). Device Emulation BIND Values

BIND Position	Meaning	Required Values	Error Message
6 – 7	Common (primary and secondary) LU protocols for FM data		
6	Bit 0: Reserved	Ignored.	No error
	Bit 1: FM header use	'0' = FM headers not allowed.	CPF8516
	Bit 2: Brackets use and reset state	'1' = Brackets are used and reset states are controlled by between brackets (BETB).	CPF5517
	Bit 3: Bracket end rules	'1' = Rule 1 (conditional end) is used.	CPF5517
	Bit 4: Alternative code set use	'0' = Alternative code set is not used.	CPF5517
	Bit 5: Sequence number avail- ability if synchronization point is used	Ignored.	No error
	Bit 6: Bracket initiation stopped (BIS) sent for synchronization point	Ignored.	No error
	Bit 7: Reserved	Ignored.	No error
7	Bits 0, 1: Normal flow send or receive mode selection	'10' = Half-duplex flip-flop.	CPF5517
	Bit 2: Recovery responsibility if duplex (bits 0,1='00')	Ignored; half-duplex supported.	No error
	Bit 3: Contention winner or loser	Ignored; the AS/400 system is contention winner because it is bracket first speaker.	No error
	Bits 4-6: Reserved	Ignored.	No error
	Bit 7: Half-duplex flip-flop reset states	Ignored; the AS/400 system is first speaker.	No error
8 – 9	TS (transmission services) use as secondary		
8	Bit 0: Staging indicator for pacing from secondary to primary normal flow	Ignored.	No error
	Bit 1: Reserved	Ignored.	No error
	Bits 2-7: Secondaries send pacing count	The AS/400 system paces according to this value.	No error
9	Bits 0, 1: Reserved	Ignored.	No error
	Bits 2-7: Secondaries receive pacing count	The AS/400 system paces according to this value.	No error
10	Maximum RU sizes AB:a(2^b) Examples: 85 = 256, 86 = 512, 88 = 2048, 89 = 4096	See Note 1 on page C-4.	No error
11	Primary send depth	See Note 1 on page C-4.	CPF5517
12	TS use as primary		
	Bit 0: Staging indicator for pacing from primary to secondary	Ignored.	No error
	Bits 2-7: Primaries send pacing count	The AS/400 system accepts this pacing count.	No error

Table C-1 (Page 3 of 4). Device Emulation BIND Values

BIND Position	Meaning	Required Values	Error Message
13	TS use		
	Bits 0, 1: Reserved	Ignored.	No error
	Bits 2-7: Primaries receive pacing count	The AS/400 system accepts this value.	No error
14	Presentation services profile		
	Bit 0: Use field format	Ignored.	No error
	Bits 1-7: LU-LU session type	'0000001' LU session type 1 (3287, 3289). '0000010' LU session type 2 (3278). '0000011' LU session type 3 (3284, 3286, 3287, 3288, 3289).	CPF8516
15-25	Miscellaneous information regarding: Function management (FM) header use, peripheral data information record (PDIR) use, data set options, and document format		
15	Function management (FM) header use and data stream profile	00 = No function management (FM) headers supported.	CPF5517
16, 17	Primary LU function management (FM) header flags	0000 = No compaction, no peripheral data information record (PDIR), no key direct or sequential data sets, no query.	CPF5517
18, 19	Primary LU data stream flags	0000 = No horizontal or vertical format data streams; attended sessions are used; no transparent data.	CPF5517
20	Primary LU media flags	00 = No document, card, or disk format data can be sent (see Note 3 on page C-5 and Note 4 on page C-5).	CPF5517
21, 22	Secondary LU function management (FM) header subset flags	0000 = No compaction, no peripheral data information record (PDIR), no key direct or sequential data sets, no query (see Note 3 on page C-5 and Note 4 on page C-5).	CPF5517
23 – 24	Secondary LU data stream flags		
23		Ignored.	No error

Table C-1 (Page 4 of 4). Device Emulation BIND Values

BIND Position	Meaning	Required Values	Error Message
24	Screen/buffer size	00 = 3278 base default screen size for a 24 x 80 display (see Note 2 on page C-4).	CPF8516
		02 = 3278 alternative base default screen size for a 24 x 80 display (see Note 2 on page C-4).	CPF8516
		03 = 3278 unspecified screen size (see Note 5 on page C-5).	CPF8516
		7E = 3278 extended default screen size in bytes (see Note 3 on page C-5).	CPF8516
		7F = 3278 extended alternate screen size in bytes (see Note 4 on page C-5).	CPF8516
		00, 80, 01, 81, 02, 82 = 3284, 3286, 3287, 3288, and 3289 printers with 1920 buffer size (see Note 2 on page C-4).	CPF8516
		7E = 1920 static buffer size for 3284, 3286, 3287, 3288, and 3289 printers, defined in bytes (see Note 6 on page C-5).	CPF8516
		7F = 1920 alternate buffer size for 3284, 3286, 3287, 3288, and 3289 printers, defined in bytes (see Note 7 on page C-5).	CPF8516
25	Secondary LU media flags	00 = No document, card, or disk format data can be sent.	CPF5517
26	Cryptographic control	00 = No cryptography.	CPF5517
27	Primary LU name length	Ignored.	No error
28-n	Primary LU name	Ignored.	
	Following primary LU name, 1 byte of user data length followed by user-data; total BIND length cannot exceed 256 bytes		No error

Notes:

1. The first 2 digits refer to the secondary send RUSIZE, and the last 2 digits refer to the primary send RUSIZE. The RU size is coded as follows:

   (first digit)*2(second digit)

   For example:

   - 85 means $8*2^5 = 256$
   - 87 means $8*2^7 = 1024$

   If RUSIZE is not specified, MAXLENRU in the device description is the default. There is no restriction on the secondary send RUSIZE. However, if the RUSIZE is greater than 4KB, then 4KB is used. The maximum size allowed for the primary send RUSIZE is 32KB-1.

   Examples of the RUSIZE are:

   ```
   85=256      A7=1280     98=2304     D8=3328
   86=512      C7=1536     A8=2560     E8=3584
   C6=768      E7=1792     B8=2816     F8=3840
   87=1024     88=2048     C8=3072     89=4096
   ```

2. BIND positions 20 through 23 are ignored.

3. When BIND position 24 is hex 7E, the screen size is defined in bytes 20 and 21 of the BIND, and bytes 22 and 23 are ignored. Valid hexadecimal values of bytes 20 and 21 are shown in Table C-2 on page C-5.

Table C-2. Hexadecimal Values

Screen Size	**BIND Position**	
	20	**21**
24 x 80	18	50
27 x 132	1B	84

4. When BIND position 24 is hex 7F, the screen size is defined in bytes 20 through 23. Valid hexadecimal values of bytes 20 through 23 are as follows:

Table C-3. Hexadecimal Values of Bytes 20 through 23

Screen Size		**BIND Position**			
Default	Alternate	20	21	22	23
24 x 80	24 x 80	18	50	18	50
24 x 80	27 x 132	18	50	1B	84
27 x 132	24 x 80	1B	84	18	50
27 x 132	27 x 132	1B	84	1B	84

5. When BIND position 24 is hex 03, the default screen size is set to 24 x 80 characters. The alternate screen size is set to the maximum allowed by the device.
6. When BIND position 24 is hex 7E, the buffer size is defined in bytes 20 and 21 of the BIND. Bytes 22 and 23 are ignored. Byte 20 must be hex 18 and byte 21 must be hex 50.
7. When BIND position 24 is hex 7F, the screen size is defined in bytes 20 through 23. Bytes 20 and 22 must be hex 18. Bytes 21 and 23 must be hex 50.

Appendix D. Translation Table Examples

Two tables are required for 3270 device emulation: one to translate incoming data *to* the host system (5250 to 3270 translation) and one to translate outgoing data *from* the host system (3270 to 5250 translation). To create a user-defined translation table, you must do the following:

- Use the Start Source Entry Utility (STRSEU) command to create a source member containing the hexadecimal values you want included in the translation table. Each source member must contain 512 hexadecimal characters, since each translation table contains 256 bytes of translation data.
- Use the Create Table (CRTTBL) command to create the translation table from the source members.

See the *Programming Reference Summary* book for additional information about creating and editing tables.

Notes:

1. Translate tables are ignored by 3270 pass-through on a 3270 remote attached display.
2. Not all programming considerations or techniques are illustrated in the examples shown in this appendix. You should review the example before you begin application design and coding.
3. The examples of incoming and outgoing data are based on the U.S. basic keyboard with the KBDTYPE(USB) parameter.

Creating a Source Member for Incoming Data

The following example shows the syntax for creating the source member for an incoming translation table. You specify the incoming data by entering the TBLIN value on the SRCMBR parameter:

```
STRSEU SRCFILE(QGPL/QTBLSRC) SRCMBR(TBLIN) TYPE(TXT)
```

The following format shows an example of source member data for an incoming translation table for 3270 display emulation.

```
                ****BEGINNING OF TBLIN DATA****
00010203040506070809 0A0B0C0D0E0F101112131415161718191A1B1C1D1E1F
20212223242526272829 2A2B2C2D2E2F303132333435363738393A3B3C3D3E3F
40414243444546474849 4A4B4C4D4E4F505152535455565758595A5B5C5D5E5F
60616263646566676869 6A6B6C6D6E6F707172737475767778797A7B7C7D7E7F
80818283848586878889 8A8B8C8D8E8F909192939495969798999A9B9C9D9E9F
A0A1A2A3A4A5A6A7A8A9AAABACADAEAFB0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF
C0C1C2C3C4C5C6C7C8C9CACBCCCDCECFD0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF
E0E1E2E3E4E5E6E7E8E9EAEBECEDEEEFF0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF
                ********END OF DATA********
```

Figure D-1. Example of Incoming Data (TBLIN) to the Host System

Creating a Source Member for Outgoing Data

The following examples show the syntax for creating the source member for an outgoing translation table. You specify the outgoing data by entering the TBLOUT value on the SRCMBR parameter:

```
STRSEU SRCFILE(QGPL/QTBLSRC) SRCMBR(TBLOUT) TYPE(TXT)
```

The following format shows an example of source member data for an outgoing translation table for 3270 display emulation or 3270 printer emulation (applies only to 3270 DSC using LU3 or BSC).

```
                ****BEGINNING OF TBLOUT DATA****
  0060606005606060606060C0D6060601112136015606060196060 1C1D1E60
  6060606060606060606060606060606060606060606060606060603C60603F
  4041424344454647484 94A4B4C4D4E4F505152535455565758595A5B5C5D5E5F
  6061626364656667686 96A6B6C6D6E6F707172737475767778797A7B7C7D7E7F
  8081828384858687888 98A8B8C8D8E8F909192939495969798999A9B9C9D9E9F
  A0A1A2A3A4A5A6A7A8A 9AAABACADAEAFB0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF
  C0C1C2C3C4C5C6C7C8C 9CACBCCCDCECFD0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF
  E0E1E2E3E4E5E6E7E8E 9EAEBECEDEEEFF0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF
                 ********END OF DATA********
```

Figure D-2. Example of Outgoing Data (TBLOUT) from the Host System for 3270 DSC using LU2, LU3, or BSC

The following format shows an example of source member data for an outgoing translation table for 3270 printer emulation (applies only to SCS using LU1).

```
               ****BEGINNING OF TBLOUT DATA****
006060600005606008606 00B0C0D6060606060600015166060606060606015 60
606060600025606028606 02B6060600060606060600060606060606060606060
404142434445464748494 A4B4C4D4E4F505152535455565758595A5B5C5D5E5F
606162636465666768696 A6B6C6D6E6F707172737475767778797A7B7C7D7E7F
808182838485868788898 A8B8C8D8E8F909192939495969798999A9B9C9D9E9F
A0A1A2A3A4A5A6A7A8A9A AABACADAEAFB0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF
C0C1C2C3C4C5C6C7C8C9C ACBCCCDCECFD0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF
E0E1E2E3E4E5E6E7E8E9E AEBECEDEEEFF0F1F2F3F4F5F6F7F8F9FAFBFCFDFE60
               ********END OF DATA********
```

Figure D-3. Sample Translation Table of Outgoing Data from the Host System for SCS using LU1

Reading a Translation Table

The hexadecimal values in each translation table represent EBCDIC values to which data in the data stream are converted. To find a translation value in the table, count to the position corresponding to the hexadecimal value of the character to be converted. For example, in Figure D-2, the translation value of characters with a value of hex 01, is hex 60, as shown in the highlighted position of hexadecimal 01 (row 1, columns 3 and 4). Alternatively, in Figure D-1 on page D-1, characters are not converted; they remain their original values. For example, the translation value for characters with a value of hex 00, remain hex 00, as shown in the highlighted position of hex 00 (row 1, column 1).

Creating a Translation Table

After you have created the source members, you can create the translation tables from the source by using the CRTTBL command. The following example shows how to create the incoming translation table from the source member in the QGPL/QTBLSRC file:

```
CRTTBL TBL(TBLIN) SRCFILE(QGPL/QTBLSRC)
```

Once the table has been created, you receive the following message indicating the operation was successful:

```
TABLE QGPL/TBLIN CREATED
```

To create an outgoing translation table you would specify the TBLOUT keyword for the TBL parameter:

```
CRTTBL TBL(TBLOUT) SRCFILE(QGPL/QTBLSRC)
```

Once the table has been created, you receive the following message indicating the operation was successful:

```
TABLE QGPL/TBLOUT CREATED
```

Changing a Translation Table

To change a translation table, you must do the following:

- Change the source member for the incoming or outgoing data by using the STRSEU command.
- Delete the old translation table by using the Delete Table (DLTTBL) command.
- Create the new translation table from the source member by using the CRTTBL command.

The following example translates a backslash (hex E0) sent to the host system as a field mark (hex 1E) as shown by the highlighted hex 1E in row 8, columns 3 and 4. (Remember, the hexadecimal value of a character represents the position in which to find the translation value.)

```
                ****BEGINNING OF TBLIN DATA****
000102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E1F
202122232425262728292A2B2C2D2E2F303132333435363738393A3B3C3D3E3F
404142434445464748494A4B4C4D4E4F505152535455565758595A5B5C5D5E5F
606162636465666768696A6B6C6D6E6F707172737475767778797A7B7C7D7E7F
808182838485868788898A8B8C8D8E8F909192939495969798999A9B9C9D9E9F
A0A1A2A3A4A5A6A7A8A9AAABACADAEAFB0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF
C0C1C2C3C4C5C6C7C8C9CACBCCCDCECFD0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF
1EE1E2E3E4E5E6E7E8E9EAEBECEDEEEFF0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF
                ********END OF DATA********
```

Figure D-4. Sample Translation of an Incoming Backslash to a Field Mark

This next example translates a field mark character (hex 1E) outgoing from the host system to a backslash (hex E0) as shown by the highlighted character in position 1E (row 1, second hexadecimal pair from the end). The example also translates a backslash (hex E0) to a hyphen (hex 60). End medium (EM) and new line (NL) translate to a hyphen.

```
                ****BEGINNING OF TBLOUT DATA****
00606060600560606060600C0D6060601112136060606060606060601C1DE060
60606060606060606060606060606060606060606060606060606060603C60603F
404142434445464748494A4B4C4D4E4F505152535455565758595A5B5C5D5E5F
606162636465666768696A6B6C6D6E6F707172737475767778797A7B7C7D7E7F
808182838485868788898A8B8C8D8E8F909192939495969798999A9B9C9D9E9F
A0A1A2A3A4A5A6A7A8A9AAABACADAEAFB0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF
C0C1C2C3C4C5C6C7C8C9CACBCCCDCECFD0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF
60E1E2E3E4E5E6E7E8E9EAEBECEDEEEFF0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF
                ********END OF DATA********
```

Figure D-5. Sample Translation of Outgoing Data to a Backslash and Hyphen

Using Translation Tables for 3270 Display Emulation

You can use translation tables for display emulation by specifying the following values for the EMLCTL, KBDTYPE, TRNTBLIN, and TRNTBLOUT parameters when you start emulation:

```
STREML3270 EMLCTL(controller name) KBDTYPE(*TRNTBL) TRNTBLIN(TBLIN)
        TRNTBLOUT(TBLOUT)
```

Note: You should translate all displayable characters (hex 40 through FE) to displayable characters, not nondisplayable characters. Control characters (hex 00 through 3F), except hex 15 and hex 19, should be translated to themselves or to displayable characters. Hex 15 and hex 19 should be translated to displayable characters. Those control characters that are

translated to hex 60 in the outgoing translation table should only be translated to displayable characters by the incoming translation table.

Using Translation Tables for 3270 Printer Emulation

You can only use outgoing translation tables when you run printer emulation. Printers can receive outgoing data but cannot send data to the host system. You specify the outgoing translation table on the TRNTBLOUT parameter.

An example of using a translation table for printer emulation is as follows:

```
STRPRTEML EMLDEV(printer device name) CHRSET(*TRNTBL) TRNTBLOUT(TBLOUT)
```

Appendix E. System/36 and System/38 Emulation Support

The AS/400 system can emulate a System/36 or a System/38. When the AS/400 system is operating in a System/36 or System/38 environment, it can support System/36 or System/38 operations.

System/36 procedures, including statements, and message files can run on the AS/400 system when running in the System/36 environment. See the *System/36 Environment Programming* book for more information.

System/38 commands and files are available through the System/38 environment. The System/38 environment is only available from programs that are written with a System/38-type attribute. See the *System/38 Environment Programming* book for additional information.

System Environment Comparisons

The following differences concerning 3270 emulation apply to the AS/400 system, System/36, and the System/38:

- The System/36 EP3270 support is not provided on the AS/400 system. This command uses the ES3270 support.
- The AS/400 BSC line buffer size will be defined by the line description. The BSC emulation file requests a 8K byte buffer. The SNA communications file requests a 12K buffer.
- The 3270 host system started Copy command is not provided on the AS/400 system.
- The AS/400 system provides data compression for LU-LU session type 1 printer emulation. The support is available on System/36 but is not on the System/38.
- User-defined translation tables are supported on the AS/400 system. However, this support is not available through either the System/36 environment or System/38 environment.
- The base/monochrome color switch function is not available through System/36 SNA environment.
- The AS/400 system and the System/36 and the System/38 environments can use group jobs during 3270 emulation through the Attn key.
- The AS/400 system ends an SNA emulation session by sending an SNA UNBIND to the host system.
- The translate data stream (TRNDTASTM) parameter is only available in the System/38 environment from the EML3270 command. In the System/38 environment, the default is *YES. However, the AS/400 system and the System/36 do not support this option; their default is *DEVTYPE.
- The AS/400 system will not issue a request disconnect when DISCNT = NO is specified on the host system for a switched line. This support is only available on the System/36.
- When starting a 3270 display emulation session using one of the System/36 procedures, F16 is initially assigned as the key to emulate the Cursor Select key. You can override this assignment during the 3270 emulation session from the Change Assigned Keys display. For more information about keyboard differences when using a display station during 3270 device emulation, see Appendix L.

System Key Comparisons

Table E-1 compares the function key differences between the AS/400 system, the System/36, and the System/38. The farthest left column of the table represents 3270 device emulation implementation for all environments used on the AS/400 system: the AS/400 system, the System/36 environment, and the System/38 environment.

Table E-1. Comparisons of System Function Keys

Function	AS/400 5251 Keys	System/36 5251 Keys	System/38 5251 Keys
Program attention 1	From Attn or (Roll Up) or (Roll Down) (See Note 3)	(Roll Up)	From Help or (Roll Up) or (Roll Down)
Program attention 2	From Attn or (Roll Up) or (Roll Down) (See Note 3)	(Roll Down)	From Help or (Roll Up) or (Roll Down)
Program attention 3	From Attn or (Roll Up) or (Roll Down) (See Note 3)	Cmd (-)	From Help or (Roll Up) or (Roll Down)
Attention	From Attn	From Attn	From Help
Delete end of field	Field Exit (See Note 3)	Cmd (@)	Field Exit
Delete all input fields	From Attn or Cmd ← or (Roll Up) or (Roll Down)	Cmd (|)	From Help or Cmd ← or (Roll Up) or (Roll Down)
B/M color (Not supported on the AS/400 system)	N/A	Cmd (#)	N/A
Test Request or System Request (Sys Req key)	Cmd ← or from Attn	Cmd ← or from Attn	Cmd ←
Clear display (Clear key)	Cmd (←) or Cmd ← or (Roll Up) or (Roll Down)	Cmd (←)	Cmd (←) or Cmd ← or (Roll Up) or (Roll Down)
Sign off	From Attn	Cmd (+) or from Attn	From Help
To reset, reset error messages, or unlock the keyboard	(Sys Req) or Reset or from Attn	(Sys Req) or Reset	(Sys Req) or Reset or Attn
Program function keys (PF1 to PF12)	Cmd 1 to =	Cmd 1 to =	Cmd 1 to =
Program function keys (PF13 to PF24)	Cmd (| to +)	Help, Cmd (| to +)	Cmd (| to +)
Field mark	(See Note 3)	\	(Not supported)
Cursor Select key	(See Note 3)	Cmd ($)	(Not supported)

Note:

1. ( ) — indicates a shifted key.
2. Cmd — indicates a key that must be preceded by a command key.
3. Refer to Appendix L for a description of real keys that call this function.

Appendix F. 3270 Emulation Implementation of BSC Protocol

The charts on the following pages show examples of the BSC line protocol for 3270 emulation. This information helps you determine the following:

- User action during display emulation
- User action during printer emulation

Display Emulation

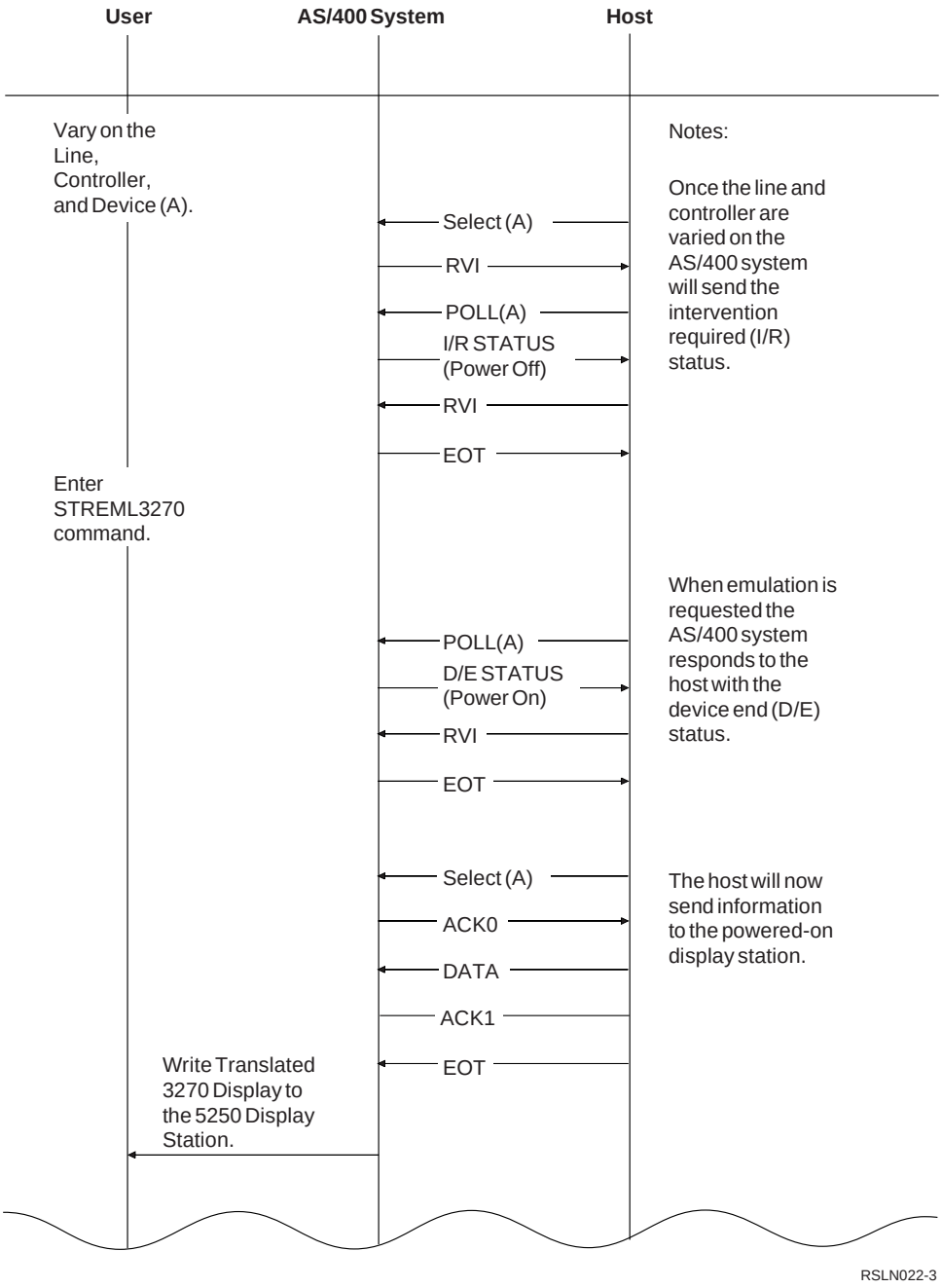


Figure F-1 (Part 1 of 2). Display Emulation Example

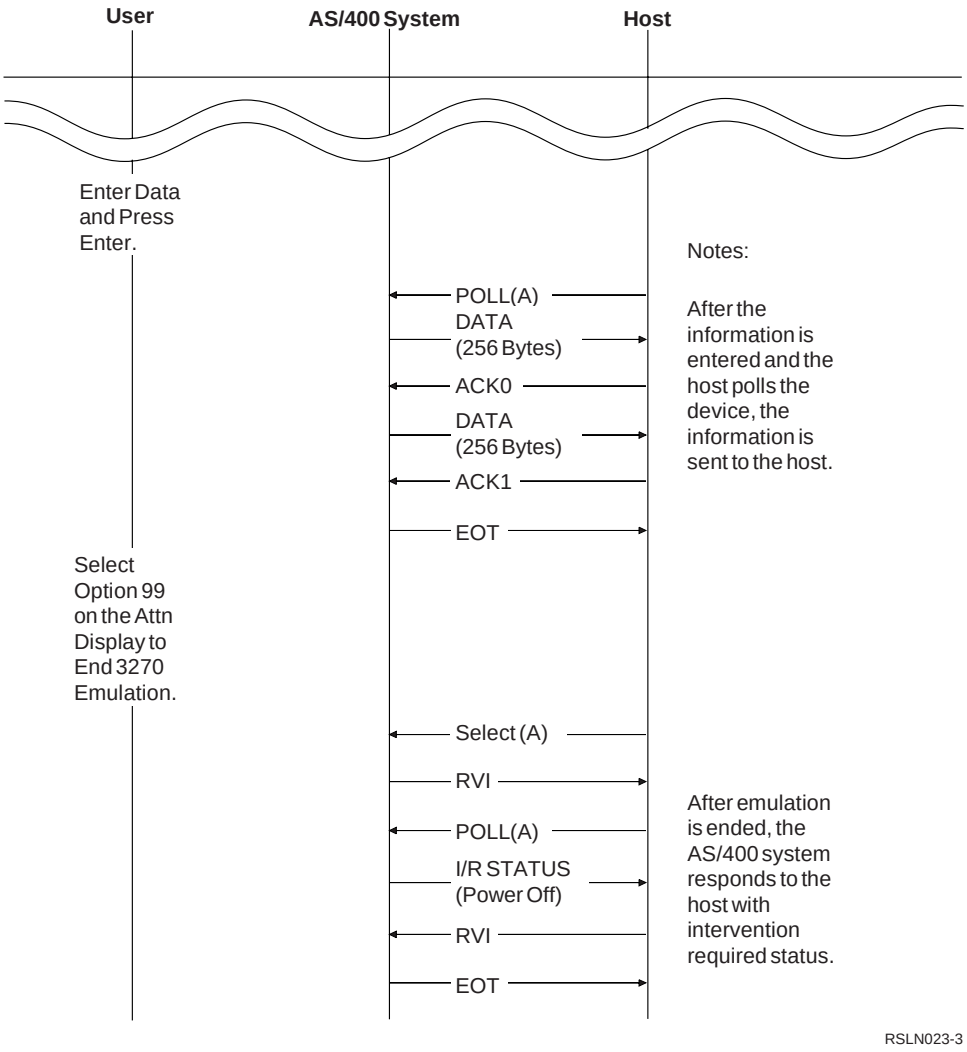


Figure F-1 (Part 2 of 2). Display Emulation Example

Printer Emulation

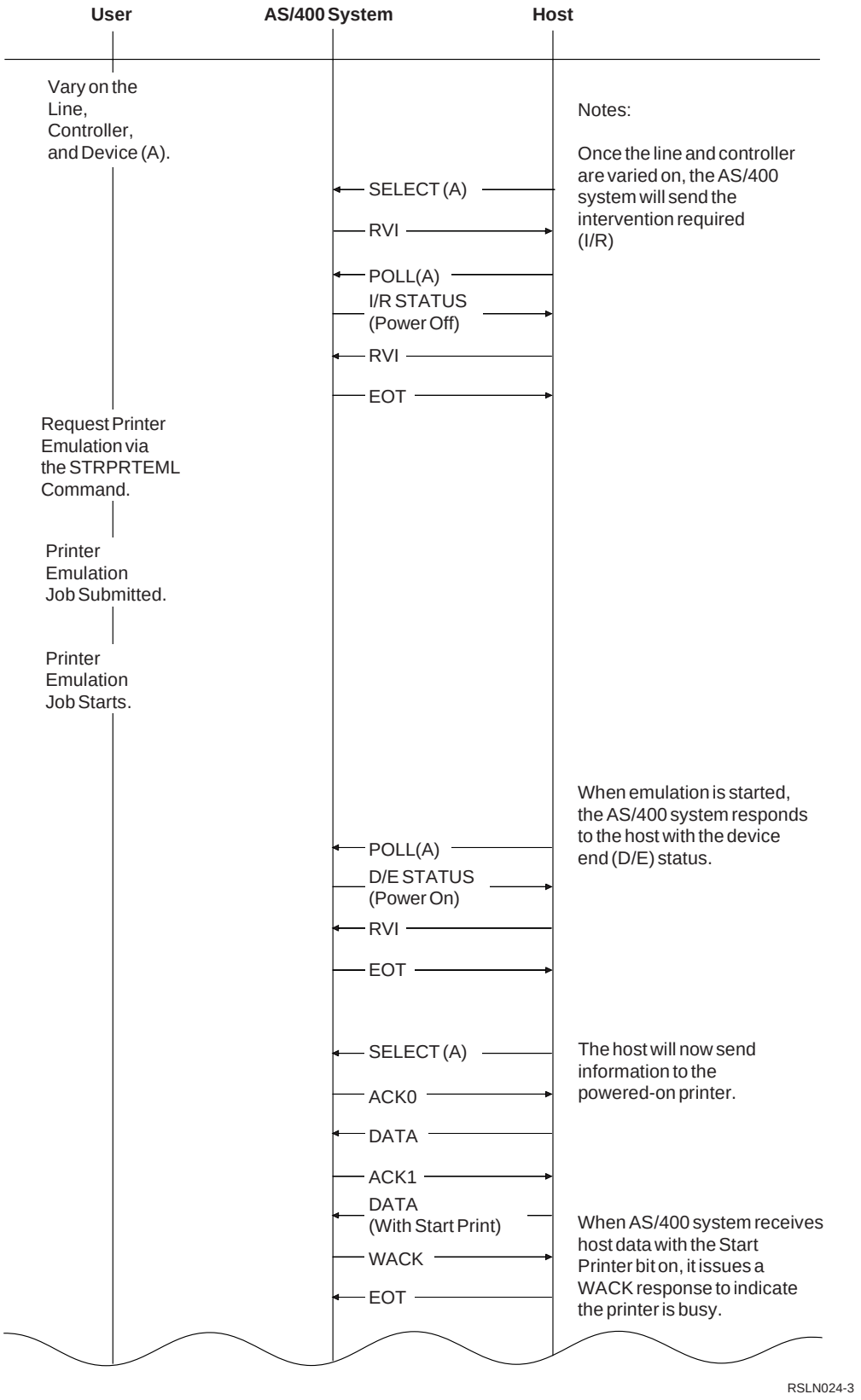


Figure F-2 (Part 1 of 2). Printer Emulation Example

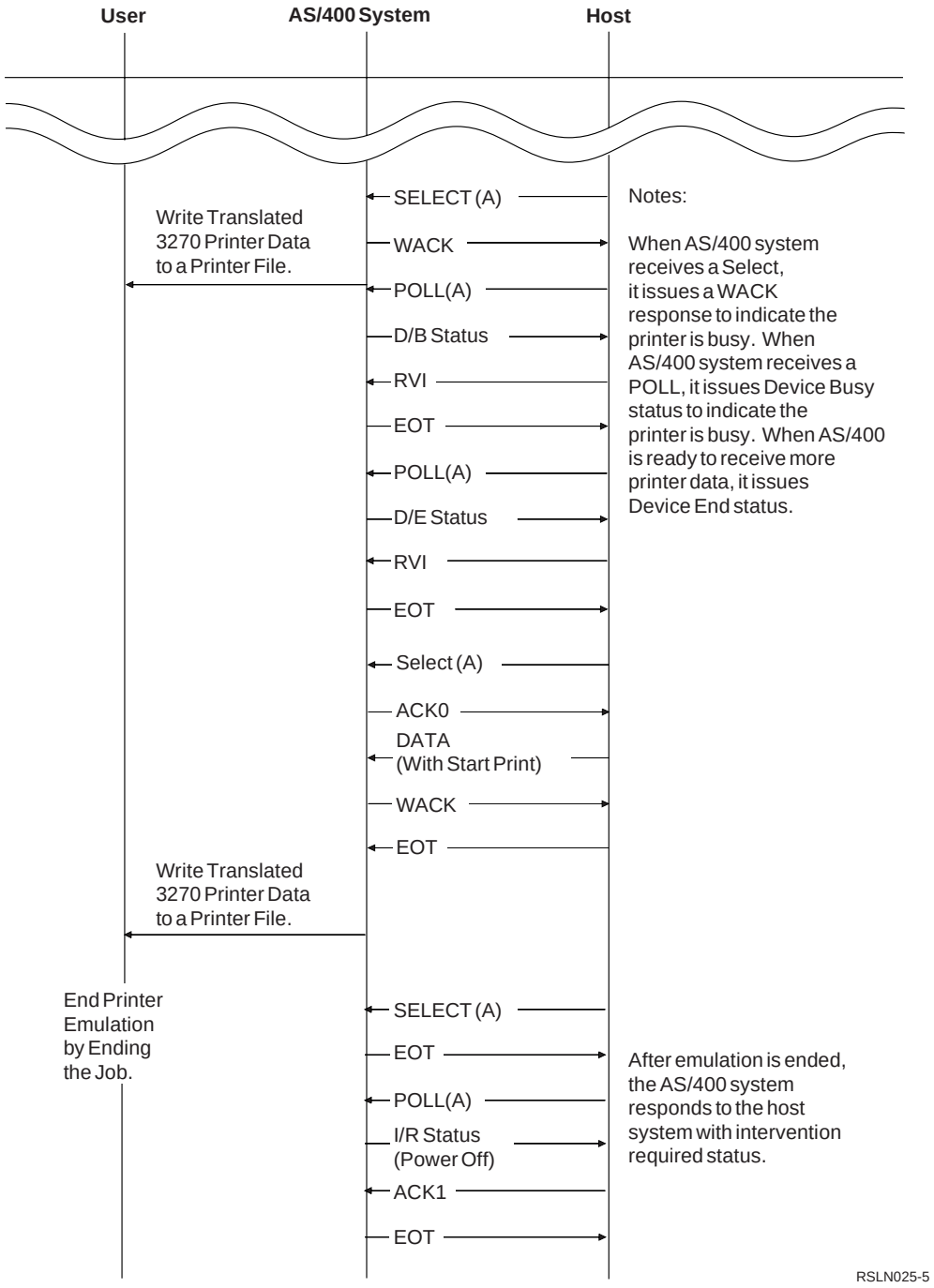


Figure F-2 (Part 2 of 2). Printer Emulation Example

Appendix G. Emulation as a Batch Job

The following list is a sample program that illustrates one method of running an emulation session as a batch job.

Notes:

1. Not all programming considerations or techniques are illustrated in this example. You should review the example before you begin application design and coding.
2. Lines with a <== in a comment indicate information that you must change to reflect your own local configuration.

```
/*********************************************************************/
/*                                                                   */
/* NAME:      BATCHEML                                               */
/*                                                                   */
/* FUNCTION:  CL program to start BATCH 3270 EMULATION on            */
/*            specific work stations using specific 3270             */
/*            emulation devices.                                     */
/*                                                                   */
/* PROGRAM CALL:          CALL BATCH3270   *ALL                      */
/*                      or CALL BATCH3270 work-station-name          */
/*                                                                   */
/* NOTES:     The display station chosen for batch 3270 emulation    */
/*            must be powered on, varied on, and not allocated       */
/*            to another job.  The work station must also be         */
/*            either showing the sign-on display or NOT be           */
/*            defined in any active subsystem.  (Hence the caller    */
/*            cannot specify the work station where he entered       */
/*            the call to BATCHEML.)                                 */
/*                                                                   */
/* NOTES:     The QBATCH subsystem must be active in order to        */
/*            execute the 3270 emulation jobs submitted in this pgm. */
/*            Issue 'STRSBS QBATCH' in order to start it.            */
/*                                                                   */
/*            In order to have more than one batch 3270 emulation    */
/*            job running at the same time, the QBATCH subsystem     */
/*            must be defined with MAXJOBS greater than or equal     */
/*            to the number of emulation jobs submitted in this      */
/*            CL program.  If necessary, issue the command:          */
/*            'CHGSBSD QBATCH MAXJOBS(new-value)' to change it.      */
/*            'DSPSBSD QBATCH' will display the current operational  */
/*            attributes of the QBATCH subsystem description.        */
/*                                                                   */
/* NOTES:     The jobs submitted by this program use the *JOBD       */
/*            defaults for many of the SBMJOB options.  These        */
/*            may be changed by the programmer as required in        */
/*            your installation.  Even the use of QBATCH may be      */
/*            changed to specify some other batch-like subsystem.    */
/*********************************************************************/
```

```
PGM PARM(&WS)
  /*****************************************************************/
  /*          EMULATION WORK STATION PARAMETER ENTERED BY CALLER       */
  /*          A VALUE OF *ALL INDICATES ALL WORK STATIONS IN THE       */
  /*          LIST BELOW WILL BE ASSIGNED TO AN EMULATION SESSION.     */
  /*****************************************************************/
  DCL &WS   TYPE(*CHAR) LEN(10)
  /*****************************************************************/
  /*          WORK STATION NAME USED FOR DEDICATED 3270 EMULATION      */
  /*****************************************************************/
  DCL  &WSNAME1   *CHAR LEN(10) +
                      VALUE('DSP07    ')/* <== USE YOUR WS NAMES HERE  */
  DCL  &WSNAME2   *CHAR LEN(10) +
                      VALUE('DSP08    ')/* <== USE YOUR WS NAMES HERE  */

                                        /* <== ADD MORE WS NAMES HERE  */
  /*****************************************************************/
  /*  EMULATION DEVICE NAME ASSIGNED TO THE ABOVE WORK STATIONS        */
  /*****************************************************************/
  DCL  &EMLNAME1  *CHAR LEN(10) +
                      VALUE('D20EC1   ')/* <== USE YOUR EML NAMES HERE */
  DCL  &EMLNAME2  *CHAR LEN(10) +
                      VALUE('D20EC2   ')/* <== USE YOUR EML NAMES HERE */

                                        /* <== ADD MORE EML NAMES HERE */

  /*****************************************************************/
  /*          CONSTANT PORTION OF RQSDATA COMMAND BEGIN BUILT           */
  /*          EMLJOB <== USE THE NAME OF YOUR CL PROGRAM                */
  /*          YOURLIB <== USE THE LIB WHERE YOUR PROGRAM IS LOCATED     */
  /*****************************************************************/
  DCL &CALL  *CHAR LEN(21) VALUE('CALL YOURLIB/EMLJOB (')


  /*****************************************************************/
  /*          THE COMPLETE STREML3270 COMMAND WILL BE BUILT HERE        */
  /*          BY CONCATENATING ALL THE ABOVE PARTS TOGETHER             */
  /*****************************************************************/
  DCL  &CALLPGM *CHAR LEN(128)
```

```
  /*********************************************************************/
  /*          MISCELLANEOUS VARIABLES FOR TRACKING JOBS SUBMITTED      */
  /*********************************************************************/
  DCL  &JOBCOUNT  *DEC  LEN(2) VALUE(0)
  DCL  &CHRCOUNT  *CHAR LEN(3)
  /*********************************************************************/
  /*                                                                   */
  /* ##################  START OF OPERABLE CODE  #################     */
  /*                                                                   */
  /*********************************************************************/

BEGIN:
  /*********************************************************************/
  /*          PROCESS WORK STATION # 1                                 */
  /*********************************************************************/
  IF ( (&WS  *EQ &WSNAME1) +
    *OR (&WS  *EQ '*ALL          ') ) +
    DO
      CHGVAR &JOBCOUNT VALUE(JOBCOUNT+1)
      CHGVAR &CALLPGM +
        VALUE(&CALL  *CAT &WSNAME1  *CAT ' '  *CAT &EMLNAME1  *CAT ')')
      SNDPGMMSG MSG(&CALLPGM) MSGTYPE(*INFO)
      SBMJOB JOB(STREML3270)          /* LOG ALL ERRORS TO HELP    */ +
             LOG(4 00  *SECLVL)       /* TRACK DOWN PROBLEMS       */ +
             HOLD(*NO) JOBPTY(*JOBD) +
             RQSDTA(&CALLPGM)
    ENDDO
  /*********************************************************************/
  /*          PROCESS WORK STATION # 2                                 */
  /*********************************************************************/
  IF ( (&WS  *EQ &WSNAME2) +
    *OR (&WS  *EQ '*ALL          ') ) +
    DO
      CHGVAR &JOBCOUNT VALUE(JOBCOUNT+1)
      CHGVAR &CALLPGM +
        VALUE(&CALL  *CAT &WSNAME2  *CAT ' '  *CAT &EMLNAME2  *CAT ')')
      SNDPGMMSG MSG(&CALLPGM) MSGTYPE(*INFO)
      SBMJOB JOB(STREML3270)          /* LOG ALL ERRORS TO HELP    */ +
             LOG(4 00  *SECLVL)       /* TRACK DOWN PROBLEMS       */ +
             HOLD(*NO) JOBPTY(*JOBD) +
             RQSDTA(&CALLPGM)
    ENDDO
  /*********************************************************************/
  /* <== REPEAT THE ABOVE SECTION # 2 CODE, CHANGING THE               */
  /*    &WSNAME AND &EMLNAME VARIABLE NAMES                            */
  /*    TO ADD MORE DEVICES                                            */
  /*********************************************************************/
DONE:
  /*********************************************************************/
  /*          SEND APPROPRIATE COMPLETION MESSAGE TO CALLER            */
  /*********************************************************************/
  IF (&JOBCOUNT  *LE 0) +
    DO
      SNDPGMMSG MSG('*** Work station '  *CAT &WS  *CAT ' not found +
                in authorized list') +
                MSGTYPE(*DIAG)
    ENDDO
  ELSE +
    DO
      CHGVAR &CHRCOUNT VALUE(&JOBCOUNT)
      SNDPGMMSG MSG(&CHRCOUNT  *CAT ' emulation jobs submitted') +
                MSGTYPE(*DIAG)
    ENDDO
  ENDPGM
```

```
/*********************************************************************/
/*                                                                   */
/* NAME:      EMLJOB                                                 */
/*                                                                   */
/* FUNCTION:  CL program to start BATCH 3270 EMULATION session       */
/*            on specific work stations using specific 3270          */
/*            emulation devices.                                     */
/*                                                                   */
/* PROGRAM INVOCATION:  CALL EMLJOB (work-station-name eml-device)   */
/*                                                                   */
/*                                                                   */
/* NOTES:     The work station chosen for batch 3270 emulation       */
/*            must be powered on, varied on, and not allocated       */
/*            to another job.  The work station must also be         */
/*            either showing the sign-on display or NOT be           */
/*            defined in any active subsystem.  (Hence the caller    */
/*            cannot specify the work station where he entered       */
/*            the call to EMLJOB.)                                   */
/*                                                                   */
/*            The emulation device must not already be allocated     */
/*            to another job.                                        */
/*                                                                   */
/* NOTES:     Specify LOG(*YES) on the CRTCLPGM when creating        */
/*            this program to allow logging of commands and to       */
/*            help in tracking down communications problems          */
/*            that may occur when using 3270 emulation.              */
/*                                                                   */
/*            The SBMJOB command issued in the BATCHEML CL program   */
/*            should specify LOG(4 00  *SECLVL) to log as much       */
/*            information as possible.                               */
/*                                                                   */
/*********************************************************************/
PGM PARM(&WSNAME &EMLDEV)
  /*******************************************************************/
  /*          WORK STATION NAME AND 3270 EMULATION DEVICE NAME       */
  /*          PARAMETERS ENTERED BY THE CALLER TO THIS PROGRAM.      */
  /*******************************************************************/
  DCL &WSNAME  TYPE(*CHAR) LEN(10)
  DCL &EMLDEV  TYPE(*CHAR) LEN(10)
```

```
  /*****************************************************************/
  /*          COUNT OF STREML3270 SESSION REPETITIONS USED TO PREVENT   */
  /*          AN EXCESSIVELY LARGE JOB LOG FOR THIS BATCH JOB           */
  /*****************************************************************/
  DCL &COUNT   TYPE(*DEC) LEN(3) VALUE(0)
  DCL &MAX     TYPE(*DEC) LEN(3) VALUE(20)  /* <== ARBITRARY MAXIMUM    */

  /*****************************************************************/
  /*                                                               */
  /*  ###############  START OF OPERABLE CODE ###################      */
  /*                                                               */
  /*****************************************************************/
BEGIN:
  CHGVAR &COUNT VALUE(&COUNT+1)
  /*****************************************************************/
  /*                       BEGIN 3270 EMULATION                    */
  /*****************************************************************/
  STREML3270 EMLDEV(&EMLDEV)  /* EMULATION DEV FROM INPUT PARAMETER    */ +
          DSPDEV(&WSNAME)     /* DISPLAY STATION FROM INPUT PARAMETER  */ +
          KBDTYPE(USB)         /* <== SPECIFY YOUR KYBD LANGUAGE TYPE  */ +
          PAGEUP (*F7)         /* <== SPECIFY YOUR DFT KEY ASSIGNMENTS */ +
          PAGEDOWN (*F8)       /* <== SPECIFY YOUR DFT KEY ASSIGNMENTS */ +
          TESTREQ(*CLEAR)      /* <== SPECIFY YOUR DFT KEY ASSIGNMENTS */ +
          INZWAIT(*NOMAX)
  MONMSG MSGID(CPF8515 CPF8541) EXEC(GOTO BEGIN)
  MONMSG MSGID(CPF8501 CPF8502 CPF8503 CPF8504) EXEC(GOTO BADCMD)
  MONMSG MSGID(CPF8505 CPF8521 CPF8522 CPF8523) EXEC(GOTO BADCMD)
  MONMSG MSGID(CPF8525 CPF8526 CPF8527 CPF8528) EXEC(GOTO BADCMD)
  MONMSG MSGID(CPF8530 CPF8532 CPF8533 CPF8534) EXEC(GOTO BADCMD)
  MONMSG MSGID(CPF8535 CPF8536 CPF8539) EXEC(GOTO BADCMD)
  MONMSG MSGID(CPF0000) EXEC(GOTO ERROR)  /* CPF8519 IS AN APAR       */
                        /* OTHER ERRORS MAY BE CAUSED BY THE         */
                        /* HOST, LINE ERRORS, OR OTHER CAUSES        */
  IF (&COUNT  *GE &MAX) GOTO EXIT  /* EXIT WHEN JOB LOG GETS BIG      */

  GOTO BEGIN            /* <== LOOP FOR DEDICATED STREML3270.        */
                        /*     REMOVE THIS (GOTO BEGIN) FOR          */
                        /*     NONDEDICATED 3270 EMULATION.          */
                        /* <== WARNING: THIS JOB CAN ONLY            */
                        /*     BE TERMINATED BY ERRORS, BY THE       */
                        /*     CNLJOB COMMAND, OR BY EXCEEDING       */
                        /*     THE MAXIMUM NUMBER OF REPETITIONS     */
                        /*     WHEN IN DEDICATED OPERATION.          */

  GOTO EXIT             /*     EXIT WHEN NONDEDICATED.               */
                        /*     NORMAL EXIT IS USED IF THE ABOVE      */
                        /*     (GOTO BEGIN) IS REMOVED               */

ERROR:
  /*****************************************************************/
  /*          HANDLE 3270 EMULATION ERRORS                         */
  /*****************************************************************/
  SNDPGMMSG MSG('*** Errors occurred during 3270 emulation.') +
            MSGTYPE(*DIAG) TOPGMQ(*EXT)
  GOTO ERROREXIT           /*                                       */

BADCMD:
  /*****************************************************************/
  /*          HANDLE ERRORS DUE TO BAD INPUT PARAMETERS             */
  /*****************************************************************/
  SNDPGMMSG MSG('*** Errors occurred on STREML3270 command parameters') +
            MSGTYPE(*DIAG) TOPGMQ(*EXT)

ERROREXIT:
  /*****************************************************************/
  /*          SEND ERROR TERMINATION MESSAGE TO JOB LOG            */
  /*****************************************************************/
  SNDPGMMSG MSG('*** Review errors listed in job log and take +
            actions to correct the errors before trying again.') +
            MSGTYPE(*DIAG) TOPGMQ(*EXT)
EXIT:
ENDPGM
```

Appendix H. Considerations for 3270 Display Station Pass-Through for SNA

The 3270 display station pass-through support allows the user to access application programs on System/370 systems acting as SNA hosts without data stream translation. The host session can be simultaneous with an AS/400 session, and you can move between the sessions as you normally do during 3270 device emulation. The 3270 display station pass-through support is also referred to as 3270 pipeline. This can be accessed using the STREML3270 command when the 3270 display station is remotely attached to an AS/400 system. It can also be accessed when using a PS/55 attached to a double-byte system. The SNA DBCS 3270 PC emulation parameter must be specified.

Binary synchronous communications (BSC) System/370 applications cannot be accessed through 3270 display station pass-through. When attaching to a BSC host system from a remotely attached 3270 device, the keyboard mapping for the 3270 remote attachment is active.

Beginning a Nontranslated Session

As a user at a remotely attached 3270 device, you issue the STREML3270 command to an SNA host system to begin a nontranslated session.

Select 3270 Data Stream Pass-Through Option for SNA Menu

When you press the Attn key during an emulation session using a 3270 Remote Attach display, you receive the following Select 3270 Data Stream Pass-Through Option for SNA menu.

```
           Select 3270 Data Stream Pass-Through Option for SNA

Emulation device . . . . . :   EMLDEVNAME

Select one of the following:

     1.  Transfer to secondary job
     2.  3270 Attn key - Request for permission to send

    99.  End 3270 emulation









Selection
     —

F3=Exit   F12=Cancel   Attn=Interrupt current task
```

Unsupported 3270 Data Streams

The data flowing between the 3270 device and the host system can contain several types of data. These include data flow control commands, session control commands, and SNA Sense Data negative responses. Some of the controls and responses can cause the emulation session to end.

Data Flow Control: The following data flow control commands are valid. Any other data flow control command causes 3270 emulation to end.

- Valid only from host system:

  SHUTD Request
  SHUTC Response
  RSHUTD Response
  BID Request for brackets
  LUSTAT Response
  CHASE Request

- Valid only from 3270:

  BID Response
  CHASE Request
  RSHUTD Request
  LUSTAT Request 0400010000
  LUSTAT Request 04082B0000

- Valid in either direction:

  Signal Request to Send (RTS)
  Signal Response

Session Control: A BIND request greater than 256 bytes that is received from the host system causes the 3270 emulation session to end.

If the System/370 system sends a DACTLU command, 3270 display station pass-through attempts to start a new session to the host system on the SSCP-LU data flow. If 3270 display station pass-through cannot start the session, 3270 display station pass-through ends.

Any session control other than the following also causes the session to end.

- Valid only from host system:

  BIND Request
  SDT Request
  CLEAR Request

- Valid only from 3270:

  BIND Response
  SDT Response
  CLEAR Response

- Valid in either direction:

  UNBIND Request
  UNBIND Response

It is important for the AS/400 user to receive break messages from the AS/400 system, or to go back and forth between an AS/400 system and the host application. To support these capabilities, 3270 display station pass-through allows a session to be suspended and resumed. You can request that the session be suspended by pressing the Attn key.

When the STREML3270 session is suspended, the screen image is saved using a 3270 data stream READ BUFFER command. When the session is resumed, the AS/400 system sends the display device a copy of the last SNA BIND command that was sent from the host application. The screen is restored using the data that was returned in answer to the 3270 READ BUFFER command.

For devices configured as 3277 displays (including 3270 Model 2 displays), the data stream does not contain WRITE STRUCTURED FIELDS (WSF) command. For devices configured as 3278 or 3279 displays, the data stream is in WSF form.

Note: For more information about how the READ BUFFER command depends on the reply mode, refer to the *3270 Information Display Station Data Stream Programmer's Reference* book.

If the host application uses a reply mode that does not match the field attributes, those attributes can be lost. You can usually press the Clear key or the Enter key to restore the attributes.

SNA Sense Data Negative Responses: The following SNA negative responses are supported from the display station device in the SSCP data flow. Any other SSCP negative response from the display station device causes 3270 display station pass-through to end.

08010000 Resource not available

08020000 Intervention required

08110000 Break

08130000 Bracket bid reject

08140000 Bracket bid reject

08150000 Function active

081B0000 Receiver in transmit mode

08260000 FM function not supported

08290000 Change direction required

082A0000 Presentation space altered

082B0000 Presentation space lost

082D0000 LU busy

084A0000 Presentation space altered

10010000 RU data error

10030000 Function not supported

10050000 Parameter error

20030000 Bracket state error

Note: The last 2 bytes are not checked, and may be nonzero.

In the LU-LU data flow, all negative responses received are passed to the host system.

Messages Sent by 3270 Emulation during Nontranslation

The following is a list of the messages sent in addition to those sent by 3270 SNA emulation.

CPF8550 Emulation ended due to time-out internal failure.

CPF8551 Emulation ended with error code &1 (see codes listed below for values of this parameter).

CPF8552 Emulation ended because of return code.

Error Codes for 3270 Emulation during Nontranslation

Error Code	Reason
0000 0000	Normal code for REQPO (end).
0xyy zzzz	x = 1: Ending due to 3270 controller. x = 2: Ending due to host system. yy = Specific reason code (see detail below). zzzz = Negative response, feedback code, or damaged data from either host system or 3270 controller.
0101 zzzz	Negative response received from 3270 controller. This response was not in previous list.
0102 zzzz	Feedback error from 3270 controller.
0103 zzzz	Negative response to host system BIND command.
0104 zzzz	Signal request from 3270 control unit was not RTS (hex C900010000).
0105 zzzz	LUSTAT from 3270 controller was not hex 0400010000 or hex 04082B0000. zzzz = hex FFFF for LUSTAT response from 3270 controller.
0106 zzzz	DFC from 3270 controller was not SIGNAL, LUSTAT, or BID.
0107 zzzz	Power-down notice received from 3270 controller.
0201 zzzz	Negative response received from host system.
0202 zzzz	Feedback error from host system.
0203 zzzz	Faulty DFC request or response from host system.
0204 zzzz	Faulty SC request or response from host system.

0205 zzzz Sequence number error from host system.

0206 zzzz End chain indicator (ECI) not on host request chain (number of frames without ECI).

0207 zzzz Host system BIND length greater than 256 bytes (zzzz = length).

04FF zzzz 3270 display station pass-through received a VLIC log.

Note: Error code is in hexadecimal.

Configuration Considerations

A minimum SNA request unit (RU) size of 256 bytes is required. Data moving between the AS/400 system and the 3270 controller will be up to 2048 (2KB) RUs. Larger RU sizes, up to 4096 (4KB), are allowed for the host system to AS/400 system connection.

Only SNA chains of 10.5K or smaller can be used. Larger chains cause abnormal ends.

Any nonfunction management data received on the LU-LU flow after the SNA begin-chain and before the SNA end-chain for that chain causes an abnormal end.

A single SNA chain can span no more than 42 RUs. Larger spans cause abnormal ends.

The sequence number used for the negative response to the host system might not be the same sequence number of the SNA chain that caused the negative response if both of the following are true:

- More than one SNA chain specifying an exception response without an end bracket (EB) or a change direction (CD) is sent from the host system.
- A valid negative response is received from the 3270 controller.

For a user running 3270 display station pass-through from a 3278 (Model 2) display station, the display device description should be created as a 3277 device using the CRTDEVDSP command with TYPE(3277). If the device is configured as a 3278 (Model 2), a work station error (PROG403) can occur when returning from a secondary job. An error can also occur when returning from the display of a *BREAK message.

Data is passed from the host application to the display device or from the display device to the host application in chains of RUs. The 3270 display station pass-through processes the data a chain at a time. There is no capability to pass a partial chain. To get the best performance, the 3270 display station pass-through code uses the RU sizes configured in the device description for the 3270. The BIND command passed to the 3270 device is not the same as the BIND command received from the host application because the maximum RU size has changed.

Translation of SSCP-LU Data to LU-LU Data

3270 device emulation is an application in which the user can press the Attn key and receive break messages. To turn on the Attn key, the display device must be in LU-LU flow. Data received by the AS/400 system from the host on the SSCP-LU flow is translated to the LU-LU flow.

There are differences between the way the logon screen appears on the 3270 device directly attached to a host system (VTAM) and the way the screen appears on a 3270 device attached by way of an AS/400 system. These differences are only pertinent to screens that are sent from the host system on the SSCP-LU data flow (VTAM MSG10 screen). These differences are as follows:

- The operator information area of the 3270 device has a solid block rather than a block containing a stick figure.
- For the VTAM MSG10 screen or other SSCP-LU screens, the AS/400 system allows three lines for input. The data must not exceed 256 characters. The input field cannot wrap from the bottom of the screen to the top.
- The input field starts in column 1 of the first line following the last line of output data. The cursor is positioned at the beginning of the input field.
- The SSCP-LU data from the host system might not allow space for the field attribute bytes that appear in the LU-LU data sent from the AS/400 system.

  When the output text ends in column 80, the last byte is overlaid by a field attribute. This can be avoided by shortening the output data or adding a blank.

  When the output data causes the buffer addressing to wrap from the bottom of the screen to the top, data in the input field can be sent unless you erase it. Both the beginning and ending field attributes can overlay output data.

Translation of LU-LU Data to SSCP-LU Data

When the display device should be in SSCP-LU mode, but is in LU-LU mode to enable the Attn key, data received from the display device is sent to the host system on the SSCP-LU flow. The length of this data cannot exceed 256 bytes.

Handling of SSCP-LU Data from the Display Device

Input data can be sent from the display device to both the AS/400 system and the host system on the SSCP-LU data flow. For example, press the SYS REQ key, type LOGOFF, and press the Enter key to ask VTAM to recover when your host application is hung. This data cannot exceed 256 bytes.

To allow you to end or suspend a session by pressing the Attn key, the 3270 display station pass-through code forces the display device back into LU-LU flow. This is done by sending an SNA UNBIND and an SNA BIND command, in addition to displaying a blank screen.

The AS/400 system suppresses null transactions and forces the display device back to LU-LU flow with a blank screen. Therefore, after pressing the System Request key, press the Enter key or the Clear key to return to the previous screen. The LUSTAT 082B (Presentation Space Integrity Lost) is not sent to the host system in this situation because typical application programs do not handle the 082B.

Appendix I. 3270 Emulation Performance Considerations

You should evaluate both communication line considerations and main storage requirements when setting up 3270 device emulation. This appendix discusses these considerations.

Communication Line Considerations

Evaluate the following communication line considerations when setting up 3270 device emulation:

- The work load should be balanced among the lines.
- Individual line utilization should not exceed 50% - 60% for interactive transaction processing.
- Faster response times might be achieved by selecting a higher speed communication line.
- Better processing unit and line utilizations might be realized by using frame and RU sizes larger than 256 bytes.

Main Storage Requirements

Requirements for the user pool storage should include 150KB as a base allotment for 3270 device emulation, plus an additional 105KB per 3270 display device emulation user. If a user is running 3270 device emulation at a device capable of displaying 27 x 132 screens, then approximately 6.5KB of additional storage is required as compared with running at a device capable of displaying only 24 x 80 screens. Add an additional 7KB to the user pool storage for each display emulation user who will run at a 27 x 132 capable device. For example,

```
48 users (8 on 27 x 132 capable devices)
```

would need:

```
(150KB + (48 x 105KB) + (8 x 7KB))
= 5246KB for the user pool.
```

Refer to the *Work Management* book for more information about user pools.

With 3270 display station pass-through (see Appendix H), the storage used to support each 3270 device comes from the machine pool. When you use the CHGSYSVAL command to increase the value in QMCHPOOL, you usually must also use CHGSYSVAL to change QPFRADJ to 0.

Appendix J. 3270 Emulation Bidirectional Considerations

During a 3270 display emulation session, you can reverse the screen image so that data for the first column is displayed on the right, and data for the last column is displayed on the left. This function is similar to the one provided by 3270 bidirectional displays.

Screen Image Reversal

The screen image reversal is activated manually on an Arabic or Hebrew keyboard by using one of the following key sequences:

5291 keyboard CMD + REVERSE

3180 keyboard pseudo CMD + REVERSE

3196G keyboard ALT + REVERSE

Note: The pseudo CMD key is the key with a blank key top next to the System Request key.

The manual screen reversal is disabled for 3179 devices since the pseudo CMD key is not implemented on this keyboard.

For Arabic displays, directional characters are exchanged when they are written to, or read from, a reversed screen. The exchanged character pairs are:

- (and)
- < and >

Function Differences

The following is a list of function differences for AS/400 bidirectional support:

- On AS/400 displays, the screen image reversal is activated by a key sequence. On 3270 displays, the activation is done by either a switch on the display, or by a key sequence.
- The Push key is not supported on AS/400 displays.
- On Arabic 3270 controllers, the activation of the symmetric exchanging function can be configured. On the AS/400 system, the function is always activated.
- The numeric distinction function for Arabic displays is not supported on the AS/400 system.

Restrictions

The following is a list of AS/400 bidirectional support restrictions:

- When the screen image is reversed, contention of attributes at line boundaries might cause a one position shift of data within the problematic lines, or a loss of a problematic attribute.
- Reversed image for printers is not supported by the AS/400 system.
- The screen image reversal function is supported on the following devices:
  - Any locally attached display with an Arabic or Hebrew keyboard
  - Displays attached to a 5394 or 5494 controller with an Arabic or Hebrew keyboard

The above device list also applies to a display station pass-through environment. The source system must be an AS/400 system containing the support for the screen image reversal function.

Appendix K. 3270 Data Stream Support

This appendix provides information on the types of data streams that are supported during 3270 device emulation, and on the data stream control codes, orders, and attributes that are supported during 3270 device emulation.

3270 Printer Emulation

3270 printer emulation can emulate the following data streams:

- SNA character string (SCS) using LU1
- 3270 data stream compatibility (3270 DSC) using LU3 or BSC

Tables K-1 and K-2 show the data stream control codes that are supported. You can refer to the *3270 Information Display System Data Stream Programmer's Reference* book for a description of the function performed for each control code.

Table K-1. SCS Control Codes

Code	EBCDIC	Name	Support
BS	16	Back space	Supported
BEL	2F	Bell function	Not supported[1]
CR	0D	Carriage return	Supported
ENP	14	Enable presentation	Supported[2]
FF	0C	Form feed	Supported
GE	08	Graphic escape	Not supported[3]
HT	05	Horizontal tab	Supported
INP	24	Inhibit presentation	Supported[2]
IRS	1E	Interchange-record separator	Supported
LF	25	Line feed	Supported
NL	15	New line	Supported
NUL	00	Null	Supported[4]
SA	28	Set attribute	Supported[5]
SHF	2BC1	Set horizontal format	Supported[6]
SLD	2BC6	Set line density	Supported[6]
SVF	2BC2	Set vertical format	Supported[6]
TRN	35	Transparent	Supported[7]
VCS	04XX	Vertical channel select	Supported[7]
VT	0B	Vertical tab	Supported

1 This control code is ignored.

2 This control code performs no function on the LU session type 1 device.

3 A negative response with a sense code 10030000 is returned to the host system.

4 During SBCS processing, the null control code is replaced by a hyphen.

5 Highlight (underline) is supported for all sessions. Character set (DBCS character set) and field outlining are supported only during DBCS sessions. Other valid SA types are ignored.

6 These control codes are handled in a 3270-type fashion when you specify *RCVDTA for the OPNPRTF parameter and *PRTFILE for the NUMCOL, NUMLIN, and LPI parameters on the STREML3270 command. See the *CL Reference* book for a description of these parameters.

7 This code is handled just as a 3287 printer would handle it.

Table K-2. 3270 Data Stream Compatibility (3270 DSC)

Code	EBCDIC	Name	Support
CR	0D	Carriage return	Supported[1]
FF	0C	Form feed	Supported[1]
NL	15	New line	Supported
EM	19	End message	Supported
SI	BF	Suppress index	Not supported[2]

1 This is allowed for all 3270-type printers.

2 This control code is ignored.

3270 Display Emulation

3270 display emulation can emulate the 3270 data stream using LU2 or BSC. Tables K-3, K-4, and K-5 show the 3270 data stream commands, orders, and attributes that are supported. You can refer to the *3270 Display System Data Stream Programmer's Reference* book for a description of the function performed by each.

Table K-3. 3270 Data Stream Commands

Command	EBCDIC	Support
Copy	F7	Not supported[1]
Erase all unprotected	6F	Supported
Erase/write	F5	Supported
Erase/write alt	7E	Supported
Read buffer	F2	Supported
Read modified	F6	Supported
Read modified alt	6E	Supported
Write	F1	Supported
Write structured field	F3	Supported

1 This command is ignored.

Table K-4. 3270 Data Stream Orders

Order	EBCDIC	Name	Support
EUA	12	Erase unprotected to address	Supported
GE	08	Graphic escape	Not supported[1]
IC	13	Insert cursor	Supported
MF	2C	Modify field	Supported[2]
PT	05	Program tab	Supported
RA	3C	Repeat to address	Supported
SA	28	Set attribute	Supported[2]
SBA	11	Set buffer address	Supported
SF	1D	Start field	Supported
SFE	29	Start field extended	Supported[3]

1 This order is ignored.

2 See Table K-5 for the current support (SNA only).

3 See Table K-5 for the current support.

Table K-5. 3270 Data Stream Attributes

Category	Type	Support
Character	Extended highlighting	Supported[1]
Character	Extended color	Supported[1]
Character	Character set	Supported[2]
Extended field	3270 field	Supported[3]
Extended field	Field validation	Supported[4]
Extended field	Extended highlighting	Supported[5]
Extended field	Extended color	Supported[6]
Extended field	Character set	Supported[7]
Extended field	Field outlining	Supported[7]
3270 field	N/A	Supported[3]

1 These attributes are used in conjunction with the SA order and are handled on 3477 or 3487 terminals or on a PS/55 with a 5250 emulator that supports graphic data type DBCS fields. On other devices this attribute is ignored. These attributes are only supported in protected, displayable fields.

2 During a DBCS session, these attributes are used in conjunction with the SA order and are handled on a PS/55 with a 5250 emulator that supports graphic data type DBCS fields. On other devices this attribute is ignored. These attributes are only supported in protected, displayable fields.

3 Numeric fields are controlled with the NUMLCK parameter. See “Display Differences” on page L-11 for further information.

4 The trigger attribute is not supported.

5 Blinking fields are available in red only.

6 Turquoise and yellow fields always have column separators that can appear as dots (periods).

7 A negative response with sense code 10050000 is returned to the host system for a SBCS session. The DBCS character set and field outlining are supported during a DBCS session.

Appendix L. Keyboard and Display Differences

This appendix summarizes the differences between the 3278 keyboard and display and the 5250-type keyboards and displays of devices supported for 3270 device emulation.

Keyboard Differences

The placement and function of keys on the 5250-type keyboards (IBM Enhanced, PS/2, 122-key typewriter, 5251-011, 5576-001, or 5576-002) differ from those on the 3278 keyboard. Figures L-1 through L-12 enable you to compare these keyboards and show how the keys on the 5250-type keyboards correspond to those on the 3278 keyboard.

Note: On personal computer displays using the work station function, you can display the arrangement of your keyboard using the WSFKEYS command. You can alter the arrangement using the CFGWSF command. These commands are documented in the *Client Access/400 for DOS with Extended Memory Setup* book and the *Client Access/400 for OS/2 Setup* book. If your personal computer is not using the work station function, then refer to the appropriate documentation for your personal computer to view or change the keyboard arrangement.

Key Placement Differences between 3278 and IBM Enhanced Keyboards

The IBM Enhanced keyboard F1 through F24 keys directly correspond to the 3270 PF1 through PF24 keys. You can select PA1, PA2, PA3, and delete input functions for the IBM Enhanced keyboard from the Select 3270 Emulation Option menu.
Figure L-13 on page L-8 and Figure L-14 on page L-9 provide a description of the callouts.

Note: This keyboard is supported by the 3179-2, 3196, 3197, 3476, 3477, 3486, 3487, and 3488 displays.

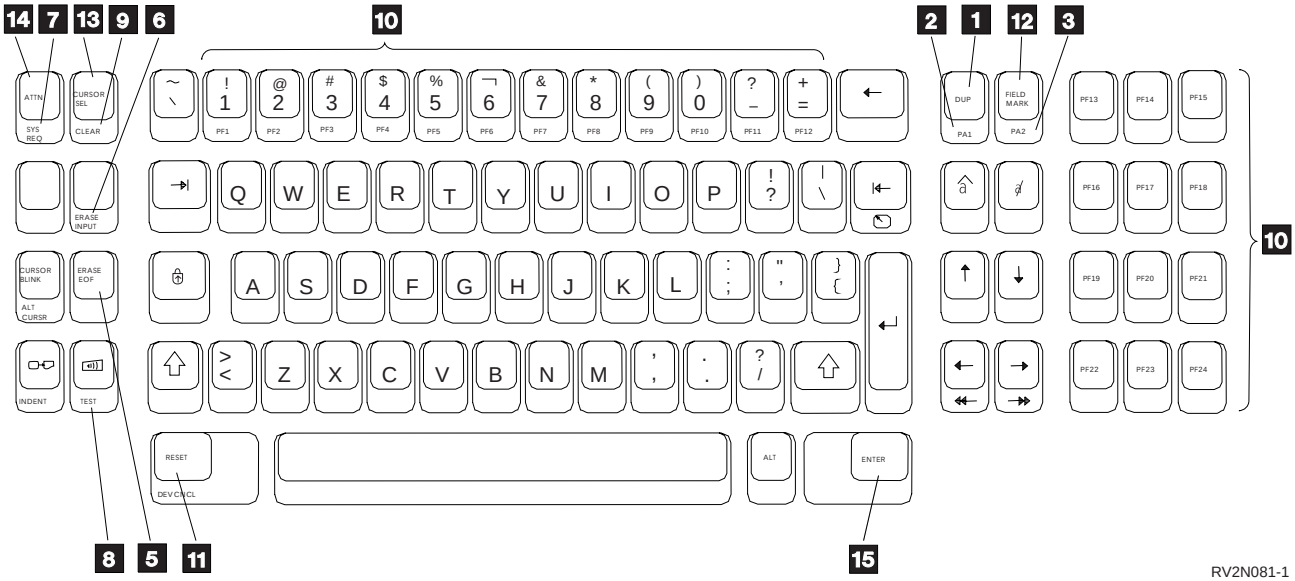


Figure L-1. 3278 Keyboard Compared to the IBM Enhanced Keyboard

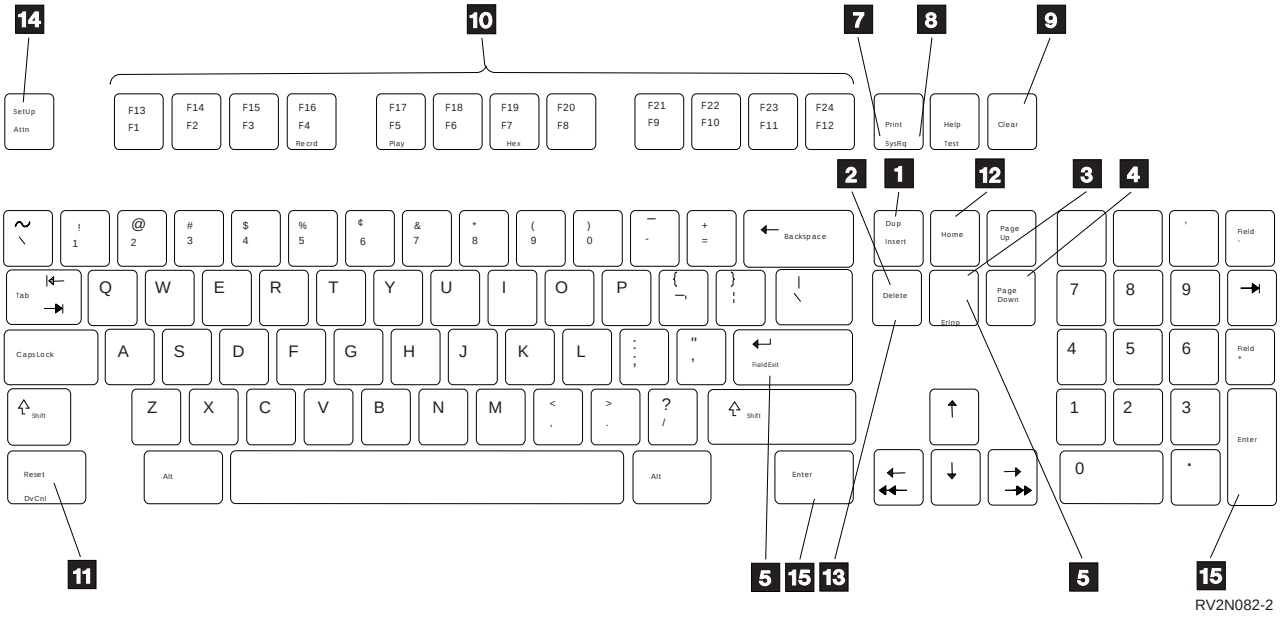


Figure L-2. IBM Enhanced Keyboard

Key Placement Differences between 3278 and PS/2* Keyboards

You can select PA1, PA2, PA3, and erase input functions for the PS/2 keyboard from the Select 3270 Emulation Option menu.

Figure L-13 on page L-8 and Figure L-14 on page L-9 provide a description of the callouts.

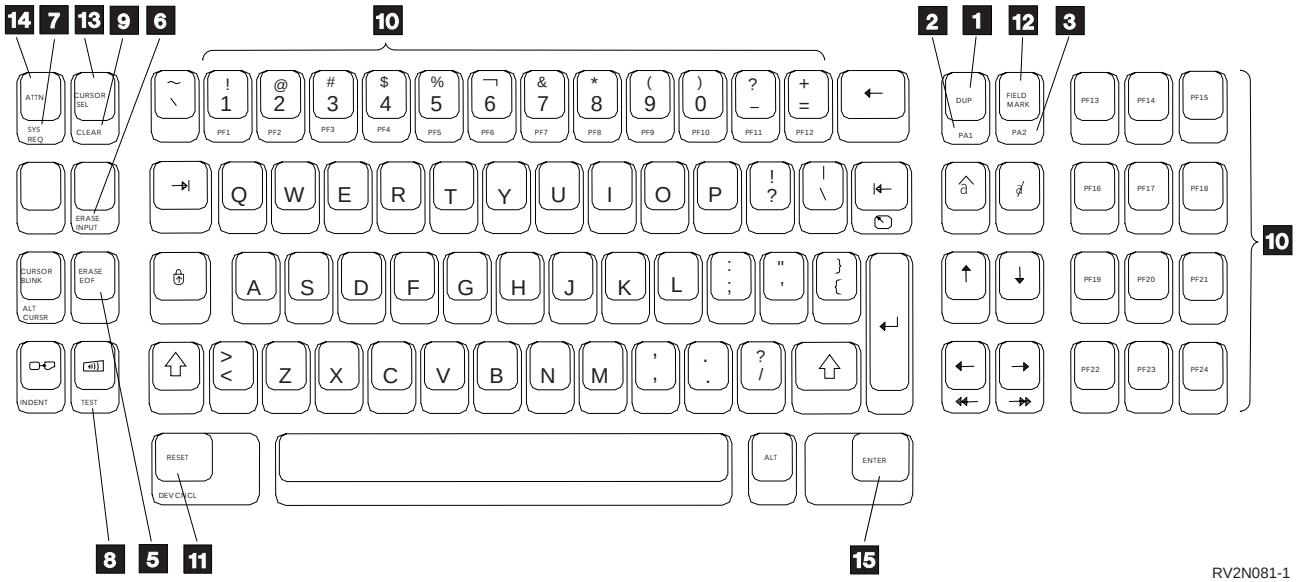


Figure L-3. 3278 Keyboard Compared to the PS/2 Keyboard

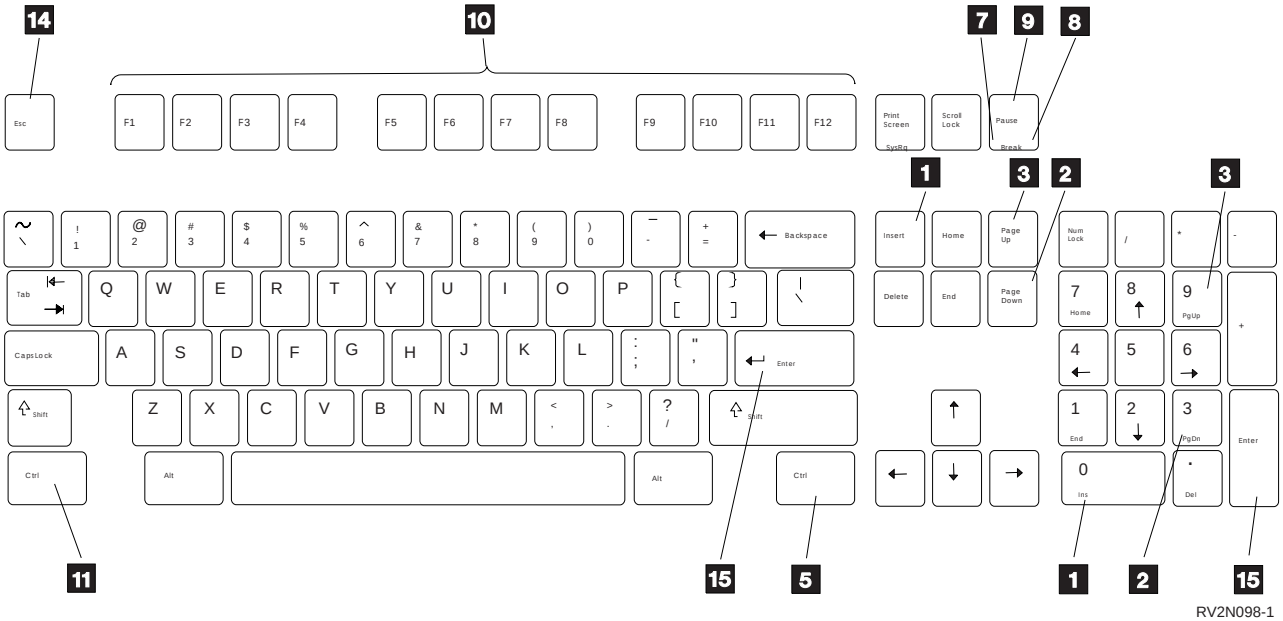


Figure L-4. PS/2 Keyboard

Key Placement Differences between 3278 and 122-Key Typewriter Keyboards

You can select PA1, PA2, PA3, and erase input functions for the 122-key typewriter keyboard from the Select 3270 Emulation Option menu.

Figure L-13 on page L-8 and Figure L-14 on page L-9 provide a description of the callouts.

Note: This keyboard is supported by the 3179-2, 3180-2, 3196, 3197, 3476, 3477, 3486, 3487, and 3488 displays.

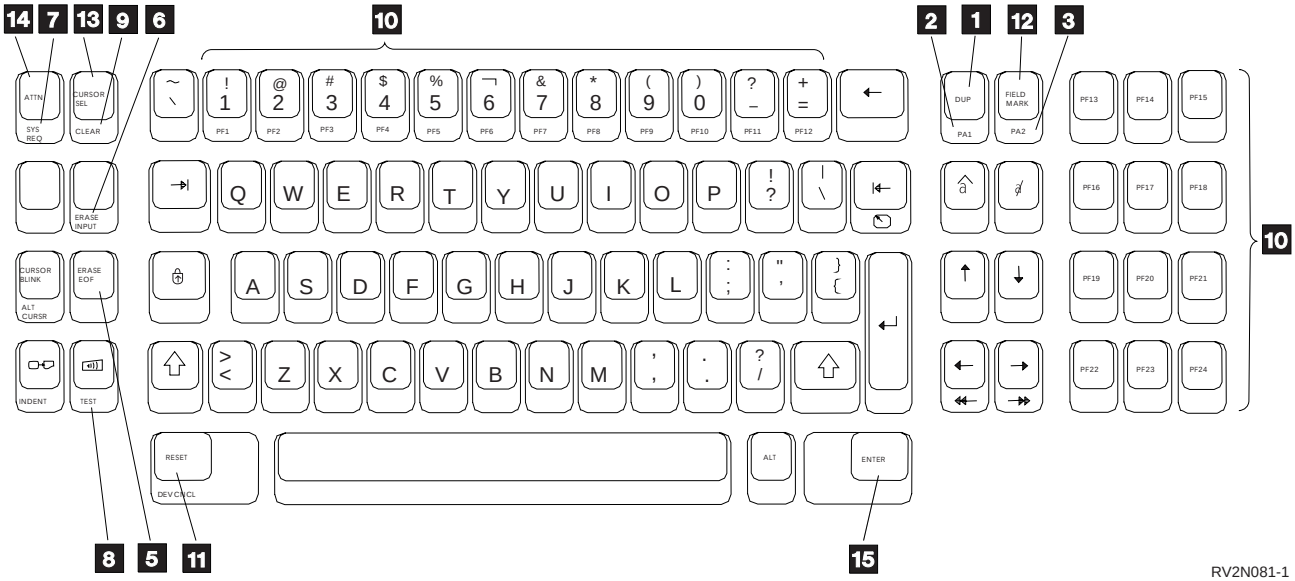


Figure L-5. 3278 Keyboard Compared to the 122-Key Typewriter Keyboard

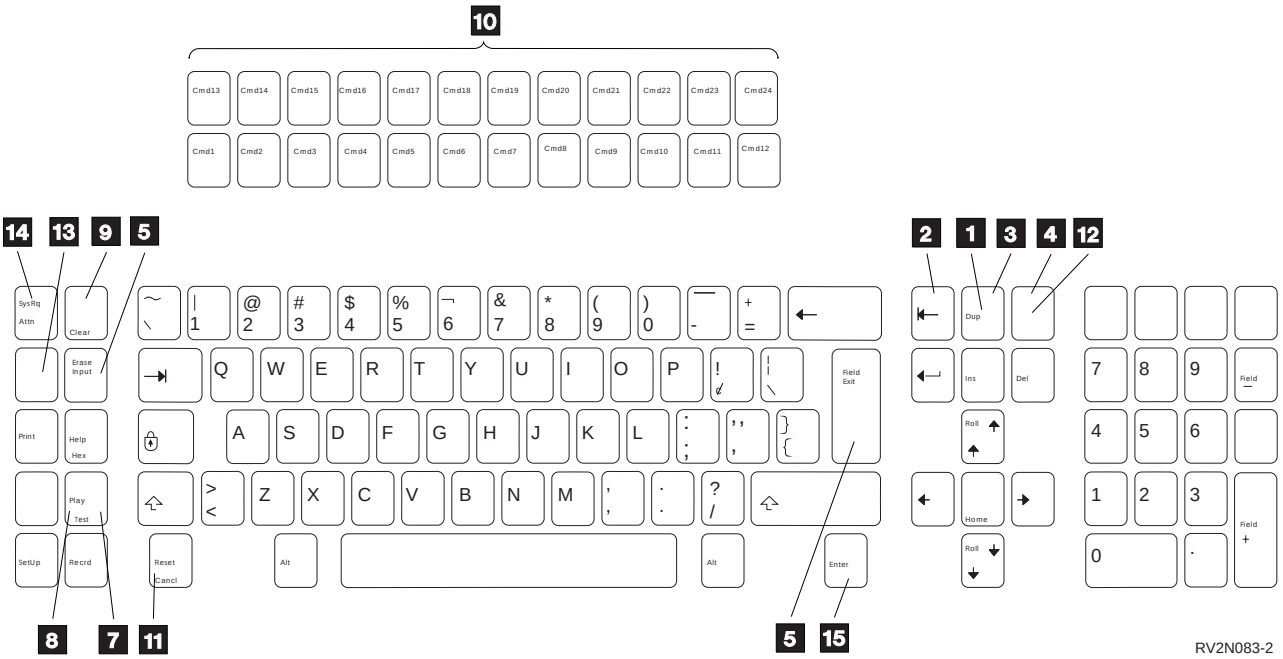


Figure L-6. 122-Key Typewriter Keyboard

Key Placement Differences between 3278 and 5251-011 Keyboards

You can select PA1, PA2, PA3, and erase input functions for the 5251-011 keyboard from the Select 3270 Emulation Option menu.

Figure L-13 on page L-8 and Figure L-14 on page L-9 provide a description of the callouts.

Note: This keyboard is supported by the 5251-011, 5291, and 5292 displays.

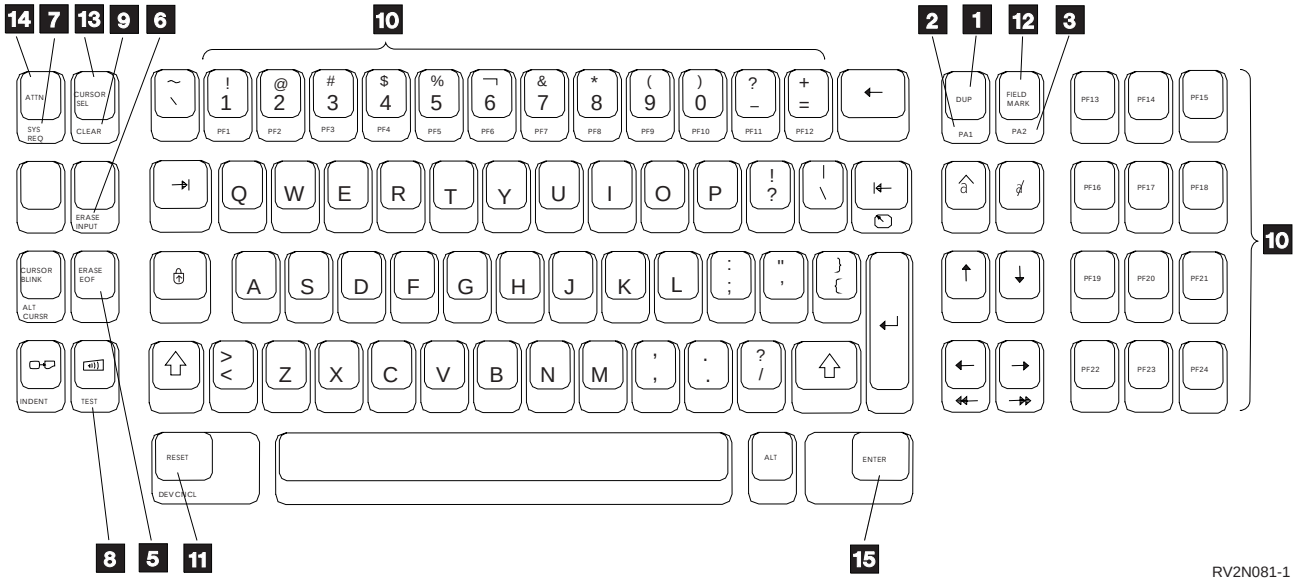


Figure L-7. 3278 Keyboard Compared to the 5251-011 Keyboard

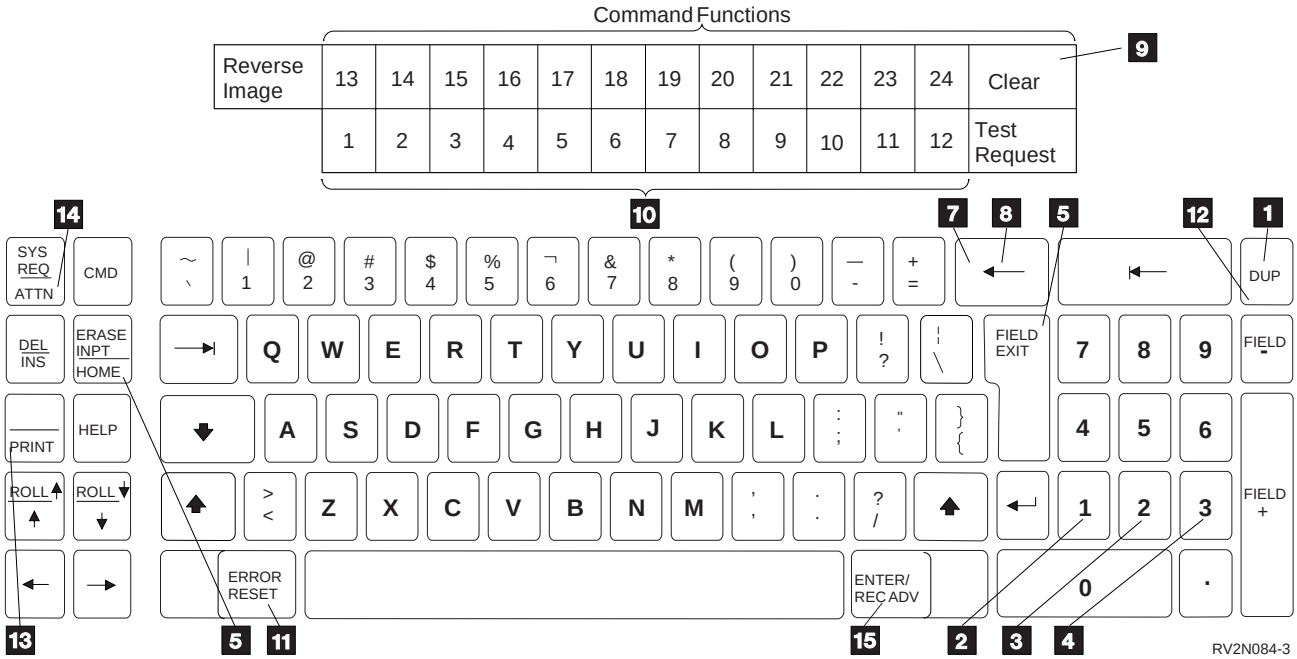


Figure L-8. 5251-011 Keyboard

DBCS-Capable Keyboards

Key Placement Differences between 3278 and 5576-001 Keyboards

You can select PA1, PA2, PA3, and erase input functions for the 5576-001 keyboard from the Select 3270 Emulation Option menu.

Figure L-13 on page L-8 and Figure L-14 on page L-9 provide a description of the callouts.

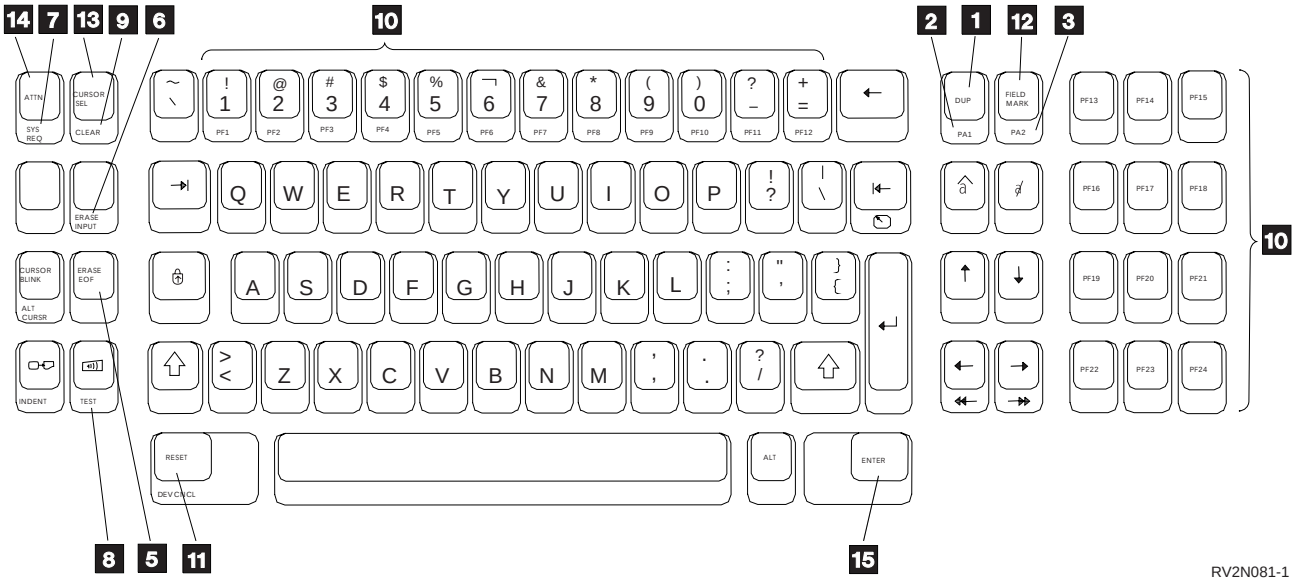


Figure L-9. 3278 Keyboard Compared to the 5576-001 Keyboard

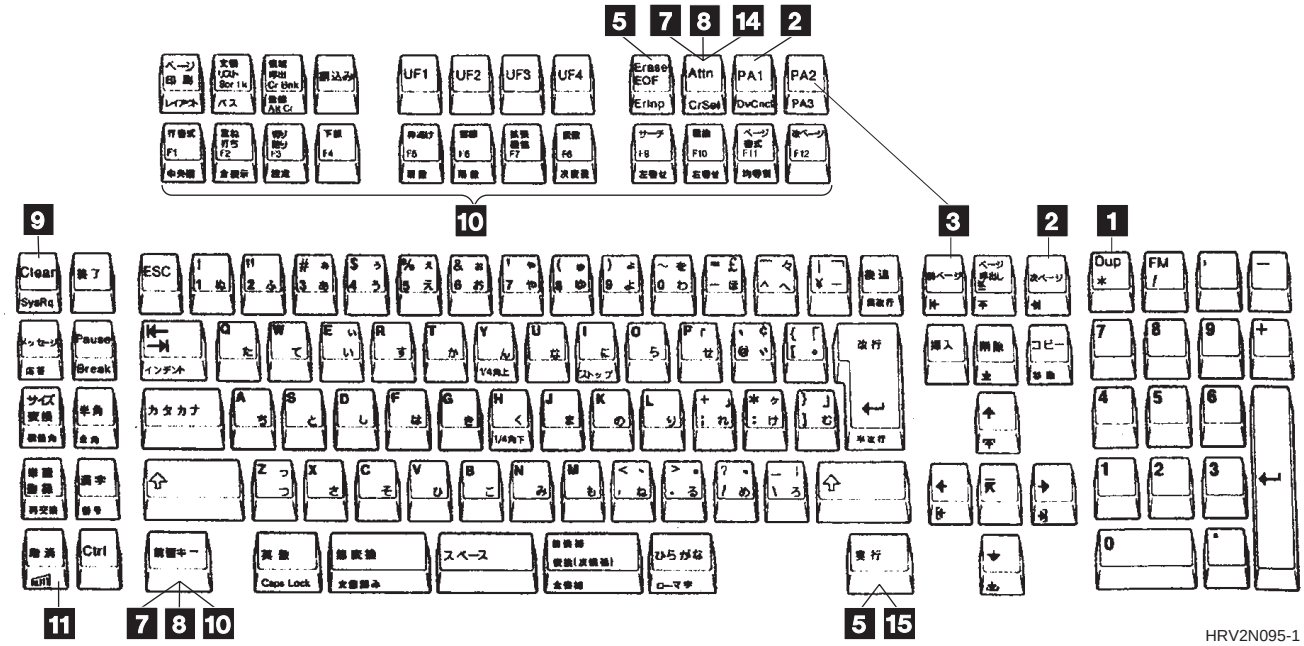


Figure L-10. 5576-001 DBCS Keyboard

Key Placement Differences between 3278 and 5576-002 Keyboards

You can select PA1, PA2, PA3, and erase input functions for the 5576-002 keyboard from the Select 3270 Emulation Option menu.

Figure L-13 on page L-8 and Figure L-14 on page L-9 provide a description of the callouts.

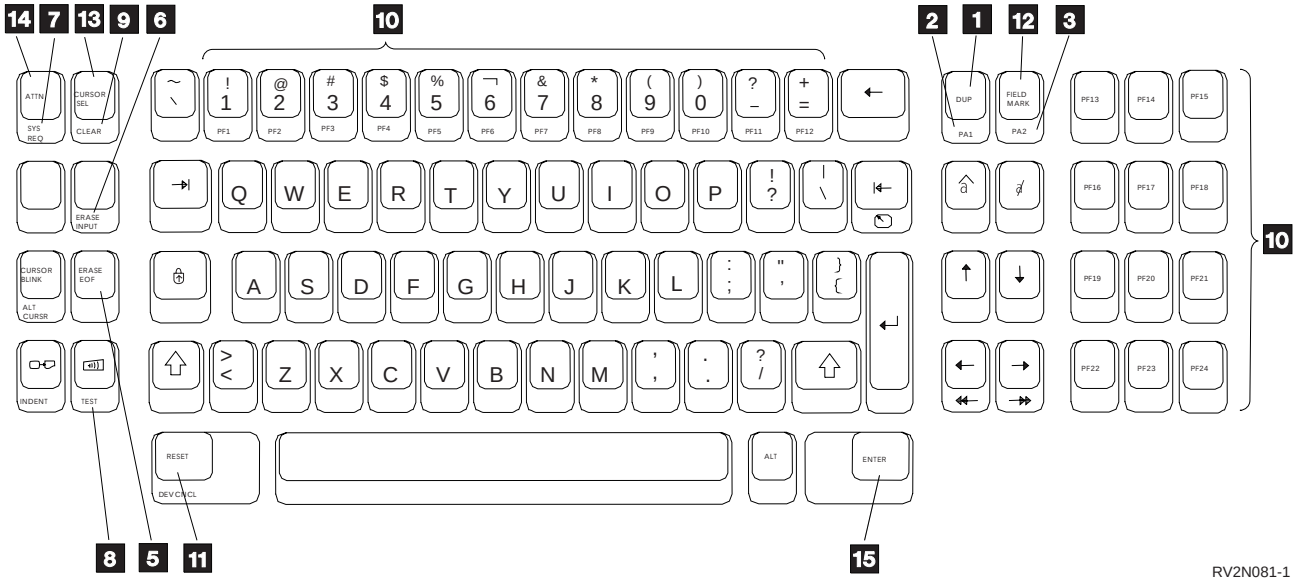


Figure L-11. 3278 Keyboard Compared to the 5576-002 Keyboard

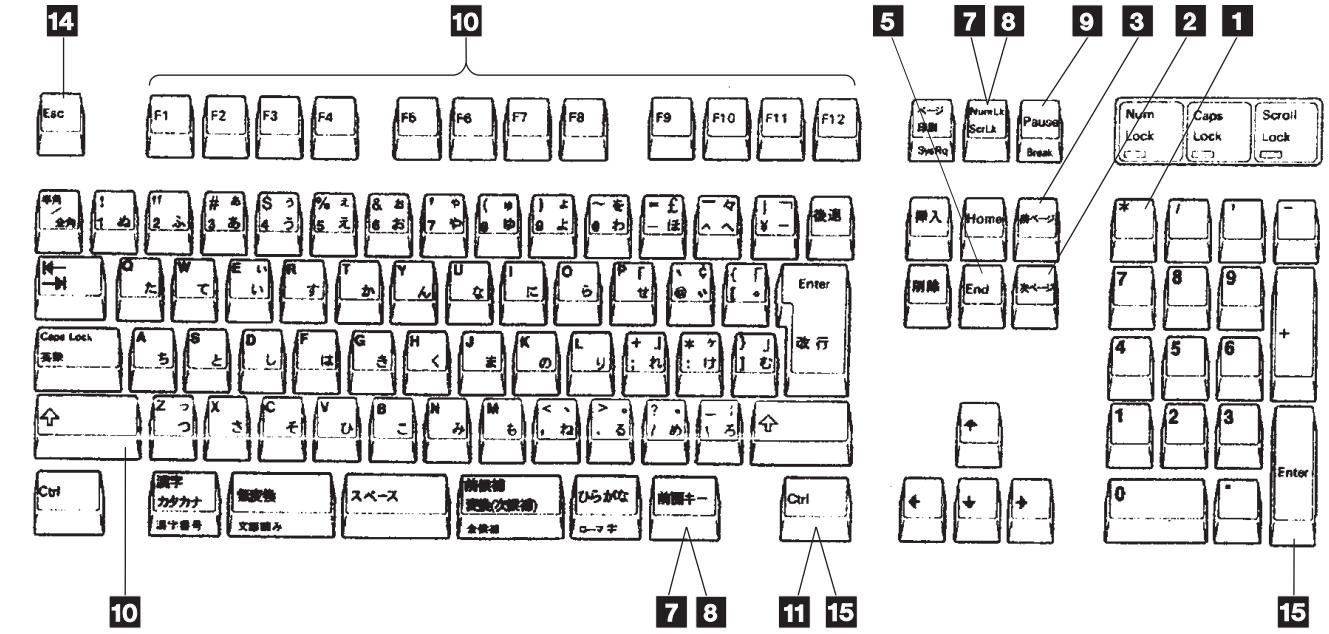


Figure L-12. 5576-002 DBCS Keyboard

Keyboard Differences Summary

Figure L-13 and Figure L-14 on page L-9 summarize the differences between the 3278 keyboard and the 5250-type keyboards, and show which keys are used to obtain 3278 functions on 5250-type keyboards during 3270 emulation. When the 5250-type keyboard columns show multiple keys, press the keys in the order shown, from left to right. When the Shift key is shown in combination with another key, hold the Shift key down while pressing the other key.

Explanatory notes follow the table.

	Function	3278 Key	IBM Enhanced Key[1]	PS/2 Key[1]
1	Duplicate	DUP PA1	Dup	SHIFT Ins
2	Program attention 1	DUP PA1	SHIFT Delete[2] or Option 1	Page Down or 3 PgDn[3] or Option 1
3	Program attention 2	FIELD MARK PA2	SHIFT Erinp[2] or Option 2	Page Up or 9 PgUp[3] or Option 2
4	Program attention 3	Not supported[4]	SHIFT Page Down[2] or Option 3	Option 3 or define key with CFGWSF command
5	Erase to end of field	ERASE EOF	Erinp[2] or Field Exit key	SHIFT Ctrl[3,5]
6	Erase input fields[6]	INSERT MODE	Option 4	Option 4
7	System Request for SND (SNA)	ALT SYS REQ	Alt Print SysRq or Option 7	Alt Pause or Option 7
8	Test Request (BSC)	ALT TEST	Alt Print SysRq or Option 6	Alt Pause or Option 6
9	Clear screen	ALT CURSOR SEL CLEAR	Clear	Pause
10	Program function 1 - 12	ALT PF1 through ALT PF12	F13 F1 through F24 F12	F1 through F12
	Program function 13 - 24	PF13 through PF24	SHIFT F13 F1 through SHIFT F24 F12	SHIFT F1 through SHIFT F12
11	Reset[7]	RESET DEV CNCL	Reset Device Cncl or Option 5 (BSC) Option 6 (SNA)	Ctrl or Option 5 (BSC) Option 6 (SNA)
12	Field mark	FIELD MARK PA2	SHIFT Home[2,8]	Define key with the CFGWSF command
13	Cursor Select	CURSOR SEL CLEAR	Alt Delete[2]	Define key with the CFGWSF command
14	Attention	SYS REQ ATTN	SetUp Attn	Esc
15	Enter	Enter	Enter or Enter	Enter or Enter
	End 3270 emulation	Power off	Option 99	Option 99

RV2N096-2

Figure L-13. 3278, IBM Enhanced, and PS/2 Keyboard Differences Summary

	Function	122-Key Typewriter Key [1]	5291 Key [1]	5576-001 Key [1]	5576-002 Key [1]
1	Duplicate	Dup	Dup	Dup	
2	Program attention 1	SHIFT +	CMD 1 [2] or Option 1	PA1 or or Option 1	or Option 1 [9]
3	Program attention 2	+ Dup [2] or Option 2	CMD 2 [2] or Option 2	PA2 or or Option 2	or Option 2 [9]
4	Program attention 3	+ (PA3) [2] or Option 3	CMD 3 [2] or Option 3	Option 3	Option 3
5	Erase to end of field	Erase Input [2] or Field Exit key	CMD ERASE INPUT HOME [2] or Field Exit key	Erase EOF or +	End
6	Erase input fields [6]	Option 4	Option 4	Option 4	Option 4
7	System Request for SND (SNA)	Alt Play Test or Option 7	Cmd + Option 7	Attn SysRq or Option 7	NumLk Scrlk or Option 7
8	Test Request (BSC)	Alt Play Test or Option 6	Cmd + Option 6	Attn SysRq or Option 6	NumLk Scrlk or Option 6
9	Clear screen	Alt Clear	Cmd + +	Clear SysRq	Pause Break
10	Program function 1 - 12	Cmd1 through Cmd12	Cmd ! through +	F1 through F12	F1 through F12
	Program function 13 - 24	Cmd13 through Cmd24	Cmd + ! through +	[10] F1 through F12	+ F1 through + F12
11	Reset [7]	Reset Cancel or Option 5 (BSC) Option 6 (SNA)	Error Reset or Option 5 (BSC) Option 6 (SNA)	or Option 5 (BSC) Option 6 (SNA)	Ctrl or Option 5 (BSC) Option 6 (SNA)
12	Field mark	(Field Mark) [2,8]	CMD DUP [2,8]	Use translation table parameters. See Appendix D.	Use translation table parameters. See Appendix D.
13	Cursor Select	(Cursor Select) [2]	CMD PRINT [2]	Use STREML3270 CSRSLT parameter to emulate.	Use STREML3270 CSRSLT parameter to emulate.
14	Attention	SysRq Attn	SYS REQ ATTN	Attn SysRq	ESC
15	Enter	Enter	ENTER/ RECADV		Ctrl [5] or Enter
	End 3270 emulation	Option 99	Option 99	Option 99	Option 99

RV2N097-2

Figure L-14. 122-Key Typewriter, 5251-011, 5576-001, and 5576-002 Keyboard Differences Summary

Notes for Keyboard Differences Summary:

1. The Options referred to in these figures are those on the Select 3270 Emulation Option menu.
2. These keys are only supported on the following devices:
   - Any locally attached display
   - Displays attached to a 5394 or 5494 controller
   - Personal computer displays using the work station function

   These keys are also supported on the above devices in a display station pass-through environment if the source system is an AS/400 system that provides support for these keys. These keys are not supported on any 5250 data entry keyboards.
3. You can use the Configure Workstation Function (CFGWSF) command to define this key.
4. The PA3 key is only on the 3277 data entry keyboard.
5. Use the Control key on the right side of the keyboard.
6. Do not use the 5250 Erase Input key to run the 3278 erase input function. The results are not predictable. The display will indicate that the function was used; however, some input fields will not be erased. If you accidentally press the 5250 Erase Input key, select option 4 (Erase input) from the Select 3270 Emulation Option for SNA menu. This option runs the emulation erase input function. You can then continue with normal operation.
7. The 3278 Reset key unlocks a locked keyboard and resets insert mode. The 5250 Error Reset key resets insert mode.
8. Emulation of the Field Mark key is also available by using the translation table parameters. See Appendix D for additional information.
9. PA1 and PA2 are not valid on DBCS 5250 WSF. However, once a 3270 emulation session has been established, the user can assign keys for these functions from the Select 3270 Emulation Option for SNA menu. The default specifications for PA1 and PA2 on the STREML3270 display are valid.
10. On the 5576-001 keyboard, the key combination you use to obtain Program Functions 13 through 24 differs depending on whether you are using DBCS 5250 PC emulation or DBCS 5250 WSF. Under 5250 PC emulation, program functions 13 through 24 are obtained by using the F1 through F12 keys in combination with the Alt key, as shown in the figure. With DBCS 5250 WSF, you use the Shift key instead of the Alt key.

Keyboard Function Differences

The functions of the following 5250 keys may differ from the corresponding 3278 functions:

- The 5250 Tab, Back Tab, and New Line keys position the cursor to the home address when no input fields exist. The home address on the 3278 is always row 1, column 1. The home address on the 5250 varies according to the position of the cursor when the keyboard was unlocked.
- The 5250 Dup key fills the remainder of an input field with a special asterisk-overscore. Disregard the additional characters that appear on the 5250 display. The 3270 device emulation recognizes that the Dup key was pressed, and does the function specified.
- For display stations attached to 5294 and 5251 (Model 12) controllers, a 5250 command key or Page (Roll) key causes an error message if pressed while in the insert mode. You must press the Enter key before exiting an input field to perform the enter function and to reset the insert mode.
- The 5250 Help key provides the message help for system messages. Position the cursor under the message and press the Help key to display the message help.
- The Home key returns the cursor to the home position. On the 5250, the home position is where the cursor was positioned when the keyboard was unlocked. On the 3278, the home position is either:
  - Row 1, column 1 if there are no input fields on the display
  - The first input position if the display contains an input field

  During 3270 emulation, the Home key positions the cursor as it would on a 3278 if you are using one of the following devices:
  - Any locally attached display
  - Displays attached to a 5394 or 5494 controller
  - Personal computer displays using the work station function
- The 5250 Field Exit key advances the cursor to the next input field and erases the remaining positions in the field you exited from. Use the Field Exit key to perform the 3270 Erase EOF (end-of-field) key function. The 5250 Field Exit key moves the cursor to the next input field, the 3270 and 5250 Erase EOF keys do not.
- On the 5250, pressing the Tab key causes the cursor to skip over all protected fields to the next input field. On the 3278, pressing the Tab key causes the cursor to skip over protected numeric fields to the next protected non-numeric or unprotected field.

  On both 5250 and 3278 devices, if you enter a character in the last position of an unprotected field, the cursor is repositioned as though you had pressed the Tab key.

- The 5250 Page Down and Page Up keys display additional data that will not fit on one display. During 3270 emulation, the page keys make a different set of input fields available for additional input when the maximum number of input fields on the display is exceeded. For more information, refer to Table L-2 on page L-12.
- You can also assign PF and PA functions to the page keys by specifying their use on the STREML3270 command or from the Select 3270 Emulation Option for SNA menu.
- The system does not support the ability to alternate between a block or underline cursor. The cursor always appears as an underline.
- You can start a 3270 display emulation session by entering the Start 3270 Display Emulation (STREML3270) command with the value *YES specified for the numeric lock (NUMLCK) parameter. During this session, if you are using a data entry keyboard with the cursor located in a numeric only field, you must press the NUM key followed by the minus sign (–) key to get a 5250 minus sign character to appear. To get a 3278 minus sign character to appear, simply press the minus sign key.

Display Differences

When you operate a 5250 display using 3270 display station emulation, you should be aware of the following:

Maximum Number of Fields

The maximum number of fields allowed to be displayed during a 3270 display emulation session is 2500. The 3274 Control Unit does not restrict the maximum number of fields.

Field Advance

When you enter a character into the last position of an input field that is followed by a protected alphanumeric field, you must enter a cursor movement to advance to the next unprotected field. The cursor always skips to the next unprotected field when you exit an input field.

Numeric Lock

If you have entered the Start 3270 Display Emulation (STREML3270) command with the value *YES specified for the numeric lock (NUMLCK) parameter during a 3270 display emulation session, you can enter the following characters in a numeric field:

- Commas
- Spaces
- Periods
- Numbers 0 through 9
- Plus signs
- Minus signs

You can enter alphabetic characters during a 3270 display emulation session by specifying *NO for the NUMLCK parameter. The 3274 allows you to override the numeric field on the display and enter alphabetic characters with the use of the Shift key on a typewriter keyboard or the alpha key on a data entry keyboard.

Selectable Fields

A field is selectable if it has an attribute indicating it is selectable and also has a blank, greater than sign, question mark, null, or ampersand in its first position. On a 3270 display, you can determine whether a field is selectable or not by changing the character in the first position of the field. However, during 3270 display emulation, you cannot change whether the field is selectable or not by altering the contents of the first input field position.

Display Indicators

Depending on the type of display you are using, the 5250 has the following indicators located either at the right side of the display or at the bottom of the display:

- Message waiting: Notifies you that there is a message on the display station message queue.
- Keyboard shift: Signifies that the keyboard is in upper shift.

Screen Size Support

3270 display emulation supports the following screen sizes:

- 1920-character (24 x 80) on all 5250 display stations.
- 3564-character (27 x 132) on 3180 (Model 2), 3197 (Models D1, D2, W1, W2), 3477, 3487 (Models HA, HC, HG, HW), and 3488.

  Note: The support of the 3564-character screen by the 3488 is dependent on the type of personal computer display that is attached.

Color Support

The following four colors are available on the 3179, 3197 (Model C1 or C2), 3476 (Model EC), 3477 (Model FC, HC), 3487 (Model HC), 3488 (Model HC), or 5292 display station when you use 3270 emulation without extended attributes:

Table L-1. Colors for Display Stations

Color	3270 Attribute
Green	Unprotected, normal display
Red	Unprotected, intensified display
Blue	Protected, normal display
White	Protected, intensified display

Note: Fields may blink if you use the switch on the 5292 to turn off the color.

Extended attributes can support the following colors on a 3179, 3197 (Model C1 or C2), 3477 (Model FC, HC), 3487 (Model HC), 3488 (Model HC), or 5292 display station:

- green
- white
- red
- blue
- turquoise
- yellow
- pink

You can receive color if you have a color display station and if the host system sends color attributes in the extended data stream.

Notes:

1. Turquoise and yellow fields always have column separators. The column separator can be disabled on the 3487 color display. Display stations 3487 and 3488 have a hardware setup option that allows the user to specify column separators as yes or no. On some displays, such as the 3477, column separators appear as periods.
2. Blinking fields are only available in red.
3. Fields may blink if you use the switch on the 5292 to turn off the color.
4. The set attributes order is rejected by 3270 BSC emulation. See Appendix K for information on SNA Set Attribute support.

Maximum Number of Input Fields

When the modified data tag (MDT) is on, the maximum number of input and output fields allowed on one display is restricted depending on the support provided by the control unit to which the display station is attached (see Table L-2).

Table L-2. Maximum Number of Input Fields

Device	Maximum Number of Fields (N)
3X74 Control Unit	960
5250 Local Control Unit	255
5250 pass-through from System/36 or System/38	126
5251 Remote Control Unit	126
5294 Remote Control Unit	230
5394/5494 Remote Control Unit	255
Client Access running work station function	254

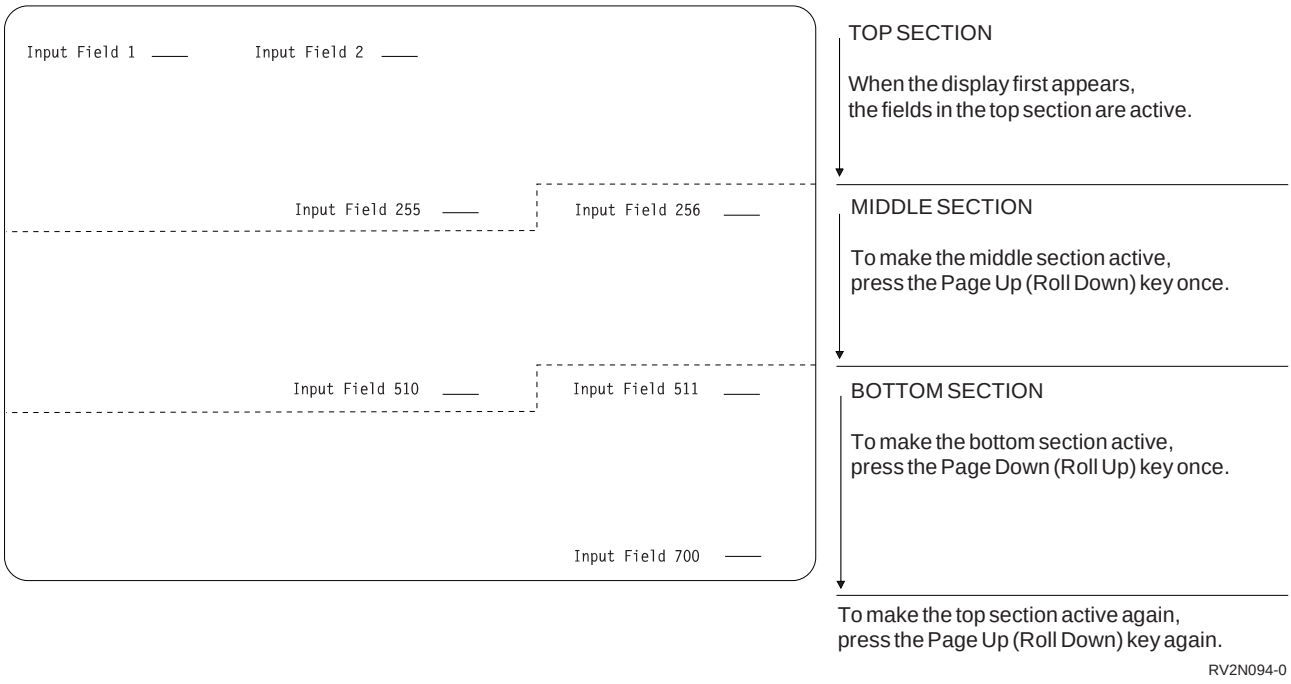


Figure L-15. Input Sections for Display Emulation

The emulation utility automatically divides a display that contains more than the maximum number of input fields into sections. It makes one section of the display input-capable at a time starting with the section where the cursor is located. The other sections can be made input-capable by using the page keys. This allows you to enter input into all the input fields just as you did on the 3278.

When the number of input and output fields (N) with MDT on is greater than N, a split display occurs even though the display may contain fewer than N input fields.

Sections that are not input-capable at the time are displayed with column separators. You can page back and forth

between the sections as many times as you choose before pressing the Enter key or a function key to send the display to the host system.

The page keys enable you to move between the sections of input-capable fields. The cursor does not reposition after you press the page key. A section of input-capable fields does not wrap from the bottom to the top of the screen

Figure L-15 on page L-12 is an example of a screen at a 5250 local display station that contains 700 input and output fields when MDT is on.

Note: The following applies to displays attached to a 5251 (Model 12), 5294, 5394 (Release 2 and earlier), or 5494 controller. It also applies while running from a display station pass-through session on non-AS/400 systems or AS/400 systems (Version 2 Release 2 or earlier).

If you enable the real Cursor Select key to use during a 3270 device emulation session, the maximum number of input fields that can be displayed could be reduced by one-quarter. This occurs if each input field can be selected. For example, if a screen containing 230 selectable input fields is displayed at a 5250 display attached to a 5294 controller, and the real Cursor Select key is disabled, then all 230 fields are input-capable. If this same screen is displayed and the Cursor Select key is enabled, then approximately 172 (3/4 x 230 = 172) fields are input-capable. You still have the capability to scroll between groups of selectable input fields using the page keys.

The real Cursor Select key is disabled if you choose to emulate the Cursor Select key. The Cursor Select key is emulated if you do one of the following:

- Enter the STREML3270 command with:
  - PAGEUP(*CSRSLT)
  - PAGEDOWN(*CSRSLT)
  - CSRSLT(*F-key)
- Assign the Page Up key the *CSRSLT value from the Change Assigned Keys for 3270 Emulation display.
- Assign the Page Down key the *CSRSLT value from the Change Assigned Keys for 3270 Emulation display.
- Assign the Cursor Select key function to an *F-key from the Change Assigned Keys for 3270 Emulation display.

Specifying Uppercase or Lowercase

You specify whether characters appear in uppercase only or mixed uppercase and lowercase on the emulated keyboard (EMLKBD) parameter of the Create Host Device Description (CRTDEVHOST) command. Specify the *LOWER keyword to use both lower and uppercase alphabetic characters. Specify the *UPPER keyword to use uppercase characters. If you specify *UPPER, the 5250 display station converts all alphabetic characters to uppercase. The default is *UPPER. You can also change this value using the CHGDEVHOST command.

Note: Be aware that you may produce unpredictable results if you specify *UPPER with the intention to run 3270 display emulation at the following devices:

- TELNET server device
- Remote attach device
- Host Command Facility (HCF) device

Certain host applications may be case sensitive. Data returned to the host is uppercase only; if the application is case sensitive, the returned input may be rejected.

Specifying the Keyboard and Character Sets

For remote work stations, the keyboard identification you specify in the KBDTYPE parameter of the STREML3270 command must match the keyboard support of the work station. It must also match the character set of the data sent from the host system. If you specify the incorrect keyboard, some of the characters will not display as expected.

For system printers, the character set you specify in the character set (CHRSET) parameter of the STRPRTEML command must match that of the data you receive from the host system and that of your printer. If you specify the incorrect character set, some of the characters will not print as expected.

Refer to the *Local Device Configuration* book for a description of keyboard language types.

Graphic Character Set and Code Page Transformation: 3270 device emulation performs graphic character set and code page transformation between the host system graphic character set identifier (GCSID) and the AS/400 GCSID.

For this transformation to take place, both the graphic character set and code page used by the host and the graphic character set and code page used by the AS/400 system must be specified to the emulation program.

No architected interface with the host exists to enable the exchange of graphic character set and code page information between the host and the AS/400 system. Instead, the emulation program obtains this information from a table stored on the AS/400 system. The table links host and AS/400 system values for graphic character set and code page with a specific **country keyboard language identifier**. The country keyboard language identifier is the three-letter code associated with a keyboard language type.

For a display emulation session, the emulation program determines which country keyboard language identifier to use for character set/code page transformation from the keyboard language type (KBDTYPE) parameter on the STREML3270 command. If the value specified for the KBDTYPE parameter is *DSPDEV, the country keyboard language identifier is determined from the keyboard language type specified in the workstation display description. If the value specified for the

KBDTYPE parameter is *SYSVAL, the country keyboard language identifier is determined from the QKBDTYPE system value.

For a printer emulation session, the country keyboard language identifier is derived from the language character set (CHRSET) parameter on the STRPRTEML command. If this parameter defaults to *SYSVAL, then the country keyboard language identifier is determined from the QKBDTYPE system value.

For example:

- A user starts a display emulation session, specifying the KBDTYPE parameter value as *DSPDEV.
- The device is configured with the keyboard language type Canadian (French) Multinational (the country keyboard language identifier is CAI).
- From the table of transformation values the emulation program determines that for a keyboard type of CAI, the host uses the graphic character set 00697 and the code page 00260, and the work station uses the graphic character set 00697 and the code page 00500. In this instance, both the host and the AS/400 system use the same graphic character set to display data, but the character set is represented by different code pages on the host and the AS/400 system.
- The user enters data at the keyboard. Before the data is sent to the host, the emulation program determines the hexadecimal representation for each character on code page 00260, and transforms it into the hexadecimal representation for the same character on code page 00500.

If there is inconsistency between the host and AS/400 code pages, some characters may be displayed incorrectly. If the transformation performed by 3270 device emulation does not provide the desired result, it can be overridden by specifying a translation table on the emulation command.

If no transformation is desired, you can specify a translation table that translates to itself.

Restriction on Use of Row 1, Column 1 of the Display

The first character position (row 1, column 1) is reserved for an attribute character in some configurations. The first character position is reserved in sessions between a 5250 display station attached to a remote 5294 or 5251 (Model 12) Control Unit. The first character position is also reserved in a TELNET session. Make sure no applications use this position as an input field.

This restriction means that no field can wrap the display (continue from row 24, column 80 to row 1, column 1). When a 3270 display format that wraps the screen is displayed, an input field attribute replaces the character at row 1, column 1. If the starting cursor position is row 1, column 1, it is moved to row 1, column 2. Data is returned to the host system as if row 1, column 1 contained a null character.

Any characters placed in this position by the host system application are not visible to you. However, if the position is part of a protected (output) field with the modified data tag (MDT) off and with no highlighting or color, the position is visible.

You cannot enter any character into row 1, column 1 if the host system application uses that position as an input field. If you do not change the other characters of that field, you can return the entire field, including the first position, to the host system. Alternatively, if you change characters in an input field that includes row 1, column 1, then the original character that was not visible in the first position is compressed out of the transmitted data.

For example, assume the following is a 5-character input field starting at line 1, position 1 on the 3270 device:

```
A B C D E
```

When the field from the 3270 device is sent to the host system, it receives the following:

```
A B C D E
```

However, if you attempt to use the same 5-character field on the 5250 display, you can only enter 4 characters starting in column 2 (because column 1 is unavailable in this input field).

```
_ A B C D
```

When the field is sent to the host system, it receives these 4 characters:

```
  A B C D
```

Note: The restriction applies to nondisplay fields for all display stations. However, displayable input and output fields allow row 1, column 1 data for some devices. Colored fields that contain row 1, column 1 data appear green when displayed at these devices, except when displayed at a personal computer using the work station function. The restriction as described in this note applies to the following devices:

- Any locally attached display
- Displays attached to a remote 5394 or 5494 Control Unit
- Personal computer displays using work station function

The above device list also applies to a display station pass-through environment. The source system must be an AS/400 system containing the row 1, column 1 support.

Handling Null Characters

When a data stream is sent from an actual 3270 display station, all null characters are removed. Use the NULLS parameter of the STREML3270 command to handle nulls in the same manner when sent from a 5250 display station during 3270 display emulation. The possible settings are:

*REMOVE	Beginning and embedded nulls are removed.
*BLANK	Beginning and embedded nulls are changed to blanks.

Trailing nulls are always removed for both values. For example, assume the data consists of the following (0 indicates a null):

```
0a0bc000
```

The data stream sent from a 3270 display station or from a 5250 display station running 3270 device emulation with NULLS(*REMOVE) would contain:

```
abc
```

The data stream sent from a 5250 display station running 3270 device emulation with the default NULLS(*BLANK) would contain:

```
_a_bc
```

(where the underscore represents a blank). The setting NULLS(*REMOVE) is valid for the following devices:

- Any locally attached display
- Displays attached to a remote 5394 or 5494 Control Unit
- Personal computer displays using the work station function

The above device list also applies to a display station pass-through environment. The source system must be an AS/400 containing the nulls handling support.

Effect of 3270 Read Commands

A Read Buffer command transmits all the data in the addressed display buffer to the application program. A Read Modified command transmits all the modified fields to the application program. A Read Modified All command transmits all the modified fields and their addresses to the application program.

The system must respond to a host system Read Buffer or Read Modified command within a specific time limit during 3270 emulation. In some situations, the number of system operations required and the amount of time required to handle the command could cause the time limit to be exceeded.

If the time limit is exceeded, the host system can attempt several retries and drop the line. Depending on how often and how many retries the host system attempts, other sessions may appear pending. The session that services the Read command can also appear pending while the utility finishes the backlog of the host system activity.

If the host system drops the line, the emulation session or job does not end normally. This situation is most likely to occur on work station devices connected to the system through a remote line, or when the user has used the System Request key to obtain another session.

If the host system sends a Read Buffer command before you press an attention identifier (AID) key to send reentered data to the host system, the new characters are sent to the host system. However, the modified data tag (MDT) is not set on until you press an AID key.

Note: If the system receives a Read Modified or Read Buffer command from the host system for a remote display station, the data returned to the host system is the data on the display when the host system last changed it or when the operator last pressed the Enter key. If the host system sends a Read command, the data returned to the host system does not reflect the operator's most current changes if an operator is entering data on a display but has not yet pressed an AID key.

For more information on the Read Buffer and Read Modified commands, refer to the *3274 Information Display System/3274 Control Unit Description and Programmer's Guide*.

Effect of 3270 Write Command

3270 device emulation rewrites the entire display when a write data stream is received from a host system that changes the number or location of existing input fields on the display screen. You do not see this display rewrite on a 3270 display.

Effect of Local Copy Function

The start print request is ignored if you send a Write command with a start print request to a display device. The system does not support the local copy function.

Limitations on Support of 3270 Orders

Repeat-to-address (RA) buffer control orders, and new line (NL) and end-of-message (EM) orders are limitations on 3270 orders.

Repeat-to-Address (RA) Order: The repeat-to-address (RA) buffer control order cannot have any of the nonprinter orders as its repeat character. The null order is allowed.

New Line and End-of-Message Orders: The hexadecimal code for NL and EM printer orders are converted in the following ways when sent to a 3270 display station:

Emulation Device	NL	EM
3284, 3286, 3288 Printer	5	9
3287, 3289 Printer	Space	Space
3278 Display[1]	Hyphen	Hyphen

1 New line and end-of-message orders are not returned to the host system. The translated value is returned to the host on the read command.

Additional information on 3270 buffer control and printer orders may be found in the *3270 Information Display System/3274 Information Display System/3274 Control Unit Description and Programmer's Guide*.

Bibliography

The AS/400 books listed here provide additional information about topics described or referred to in this book. The books are listed with their full title and order number.

- *ISDN Support*, SC41-5403.

  Contains information on AS/400 connectivity to an integrated services digital network (ISDN) using the AS/400 integrated communications adapter.

- *Communications Management*, SC41-5406.

  Contains information on working with communications status, errors, performance, line speed, and storage requirements.

- *Communications Configuration*, SC41-5401.

  Contains general configuration information, including descriptions of network interface, line, controller, device, mode, and class-of-service descriptions, configuration lists and connection lists.

- *Remote Work Station Support*, SC41-5402.

  Contains information on using the following supports: DHCF, display station pass-through, 3270 remote attachment, remote work station configuration support, and 5394 on an SNA backbone.

- *SNA Upline Facility Programming*, SC41-5446.

  Provides programming information for using the OS/400 Systems Network Architecture (SNA) upline facility (SNUF) support with the AS/400 system.

- *Local Device Configuration*, SC41-5121.

  Describes how to configure devices that are locally attached to the AS/400 system, including devices attached to twinaxial, ASCII, and tape controllers.

- *Client Access/400 for DOS with Extended Memory Setup*, SC41-3500.

  Provides information for planning and installing Client Access, and configuring and diagnosing problems for individual Client Access users. This book is intended for users with personal computers using the DOS operating system.

- *Client Access/400 for OS/2 Setup*, SC41-3520.

  Provides information for planning and installing Client Access, and configuring and diagnosing problems for individual Client Access users. This book is intended for users with personal computers using the OS/2 operating system.

- *System/36 Environment Programming*, SC41-4730.

  Provides information to help identify the differences in the applications process in the System/36 environment on the AS/400 system.

- *CL Reference*, SC41-5722.

  Provides information on control language commands.

- *Programming Reference Summary*, SX41-5720.

  Contains information summaries of system values, DDS keywords, and summary charts.

- *System/38 Environment Programming*, SC41-3735.

  Provides information needed to migrate from a System/38, convert to an AS/400 system, and coexist in a network.

- *Work Management*, SC41-5306.

  Provides information about creating and using subsystems.

- *System Operation*, SC41-4203.

  Provides information about controlling jobs, handling errors, and working with devices and communications.

- *Basic System Operation, Administration, and Problem Handling*, SC41-5206.

  Provides information for the system operator on how to use the system unit control panel.

The following IBM publications provide additional information about topics covered in this book:

- *Security – Basic*, SC41-5301 and *Security – Reference*, SC41-5302 for complete information about site security.
- *ACF/VTAM Installation and Resource Definition,* SC23-0111
- *CICS/VS, 5740-XX1, 5746-XX3, 3270/8775 Guide*, SQ33-0096
- *Communications: SNA Hangeul 3270 PC Emulation Installation Guide*, K:SC18-2461. Provides information needed to set up the environment to use SNA Hangeul 3270 PC emulation.
- *Communications: SNA Hangeul 3270 PC Emulation Operation Guide*, K:SC18-2262. Provides information on how to use SNA Hangeul 3270 PC emulation.
- *Communications: SNA Japanese 3270 PC Emulation Installation Guide*, N:SC18-2461. Provides information on how to set up for SNA Japanese 3270 PC emulation.
- *Communications: SNA Japanese 3270 PC Emulation Operation Guide*, N:SC18-2462. Provides information on how to use SNA Japanese 3270 PC emulation.
- *Communications: SNA Traditional Chinese 3270 PC Emulation Installation Guide*, SC40-1347. Provides information needed to set up the environment to use Traditional Chinese 3270 PC emulation.
- *Communications: SNA Traditional Chinese 3270 PC Emulation Operation Guide*, SC40-1348. Provides information on how to use Traditional Chinese 3270 PC emulation.

- *A Guide to Using the Test Request Function on the IBM 3270 Information Display Systems; 3271, 3272, 3275, 3277, 3284, 3286, and 3288*, GA27-2774
- *SNA Formats*, GA27-3136
- *System/36 3270 Emulation User's Guide*, SC21-7912
- *System/38 3270 Emulation Reference Manual and User's Guide*, SC21-7961
- *Supplement to 3274 Description and Programmer's Guide, Error Messages for 3270 PC Attachment*, GA23-0137
- *Virtual Machine/Enterprise Systems Architecture: CP Planning and Administration*, SC24-5521
- *3270 Information Display System Data Stream Programmer's Reference*, GA23-0059
- *3270 Information Display System/3271 Control Unit/3272 Control Unit/3275 Display Station Description and Programmer's Guide*, GA23-0060
- *3270 Information Display System/3274 Information Display System/3274 Control Unit Description and Programmer's Guide*, GA23-0061, referred to in this book as *3274 Control Unit Description and Programmer's Guide*

Index

Numerics

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

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DSMMOM395I '.EDFEXMP' LINE 160: .br
DSMMOM397I '.EDFEXMP' WAS IMBEDDED AT LINE 192 OF 'RBAEGAB2'
DSMMOM397I 'RBAEGAB2' WAS IMBEDDED AT LINE 61 OF 'RBAEGMST'
DSMBEG323I STARTING PASS 2 OF 3.
DSMLBR529E 'KP' WOULD EXCEED MAXIMUM SIZE.
DSMMOM395I '.EDFEXMP' LINE 160: .br
DSMMOM397I '.EDFEXMP' WAS IMBEDDED AT LINE 192 OF 'RBAEGAB2'
DSMMOM397I 'RBAEGAB2' WAS IMBEDDED AT LINE 61 OF 'RBAEGMST'
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