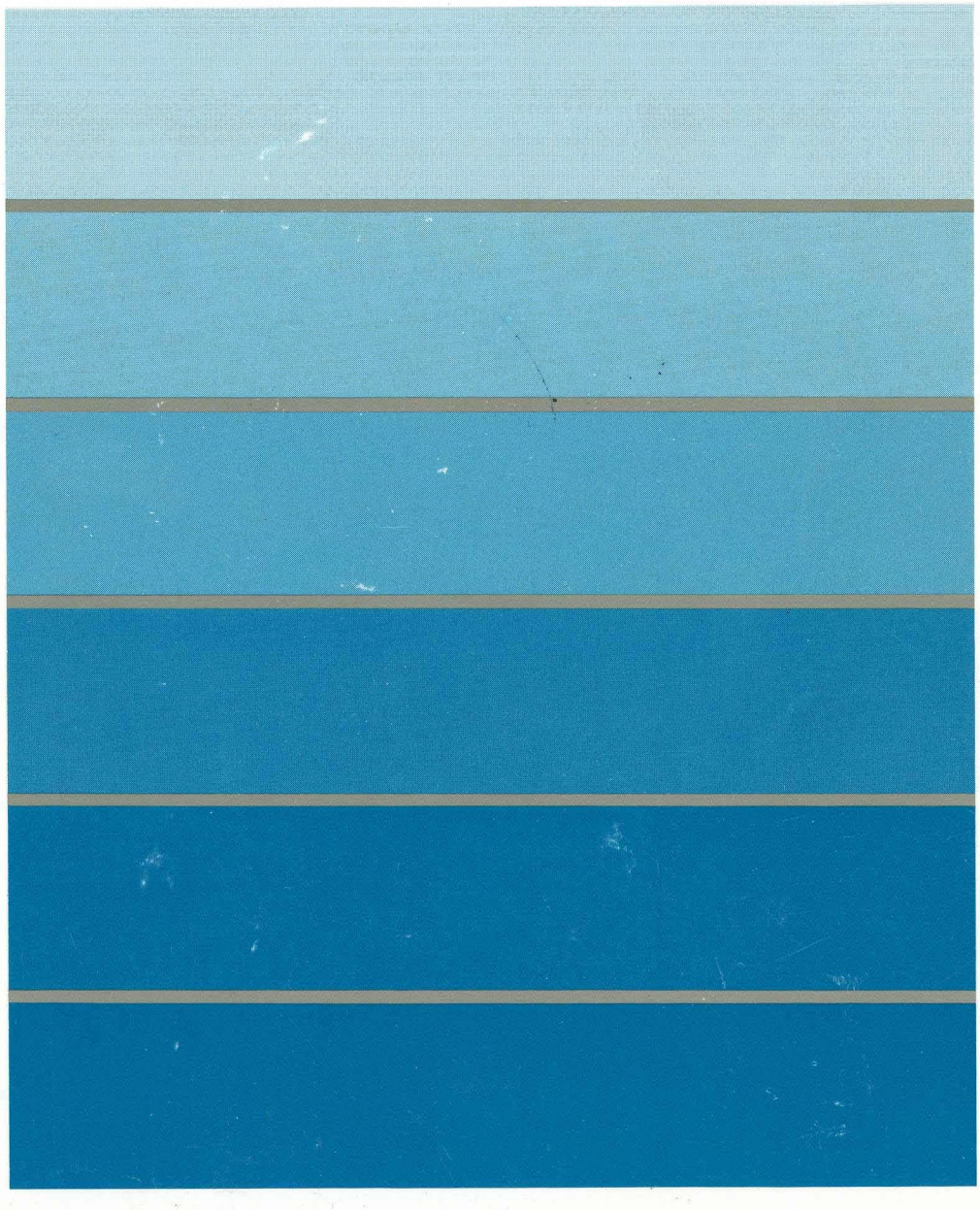
3270 Information Display System

3174 Subsystem Control Unit

Asynchronous Emulation Adapter

Introduction



3270 Information Display System

3174 Subsystem Control Unit

Asynchronous Emulation Adapter

Introduction

GA23-0331-1

File Number
36/38/370/4300/8100/3174-09

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Second Edition (October 1988)

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Choosing the Right Book from the 3174 Library

The 3174 library contains information for installing, customizing, operating, maintaining, and programming the data stream for the 3174 control unit. The list below shows the manuals you need to perform these tasks.

To Organize Library Materials:

Binders and Inserts, SBOF-0089
Binder, SX23-0331
Inserts, SX23-0332

To Become Familiar with the 3174:

Master Index, GC30-3515
3270 Information Display System Introduction, GA27-2739

To Prepare Your Site for the 3174:

Site Planning, GA23-0213
Physical Planning Template, GX27-2999

To Set Up and Operate the 3174:

Models 1L, 1R, 2R, and 3R User's Guide, GA23-0337
Models 51R, 52R, and 53R User's Guide, GA23-0333
Models 81R and 82R User's Guide, GA23-0313

To Plan for and Customize the 3174:

Customizing Guide, GA23-0214
Central Site Customizing User's Guide, GA23-0342

To Install Features or Convert Models on the 3174:

Encrypt/Decrypt Adapter Customer Installation and Removal Instructions, GA23-0262
Fixed Disk and Diskette Drive Customer Installation and Removal Instructions, GA23-0263
Terminal Multiplexer Adapter Customer Installation and Removal Instructions, GA23-0265
Model Conversion Customer Setup Instructions, GA23-0295
IBM Token-Ring Network 3270 Gateway Customer Installation and Removal Instructions, GA23-0329
Storage Expansion Feature Customer Installation and Removal Instructions, GA23-0330
Communications Adapter Customer Installation and Removal Instructions, GA27-3830
Asynchronous Emulation Adapter Customer Installation and Removal Instructions, GA23-0341

To Plan for and Use the Asynchronous Emulation Adapter Feature:

Asynchronous Emulation Adapter Introduction, GA23-0331
Terminal User's Reference for Expanded Functions, GA23-0332

To Use the Multiple Logical Terminals Function:

Terminal User's Reference for Expanded Functions, GA23-0332
Customizing Guide, GA23-0214

To Perform Problem Determination:

Customer Extended Problem Determination, GA23-0217
Status Codes, GA27-3832

To Obtain Data Stream Programming and Reference Information:

Functional Description, GA23-0218
Data Stream Programmer's Reference, GA23-0059
Character Set Reference, GA27-2837

To Perform Maintenance (Service Personnel):

Models 1L, 1R, 2R, and 3R Maintenance Information, SY27-2572
Models 51R, 52R, and 53R Maintenance Information, SY27-2573
Models 81R and 82R Maintenance Information, SY27-2584

To Find Translations of Safety Notices:

Safety Notices, GA27-3824

Preface

How To Use This Book

You should read this book completely before you begin assessing your asynchronous communication requirements and planning for the setup of the AEA feature and for the customizing of the 3174 Subsystem Control Unit. Then follow the planning and setup tasks outlined in Chapter 2 and refer to Case Studies in Chapter 3 for examples of system analysis and implementation that you can adapt to your configuration.

How This Book Is Organized

This book has five chapters and two appendixes:

- Chapter 1, "Asynchronous Emulation Adapter Overview," contains a physical and a functional description of the Asynchronous Emulation Adapter.
- Chapter 2, "Planning and Using Asynchronous Communications," describes the tasks required for Asynchronous Emulation Adapter setup, customizing, operation, and problem handling.
- Chapter 3, "Case Studies," describes three example computer environments with data communication requirements that are satisfied by the addition of Asynchronous Emulation Adapters. The case studies give you an idea of how to analyze, implement, and check your particular subsystem's configuration.
- Chapter 4, "Modem and ASCII Terminal Setup Reference," describes how to set up ASCII terminals and modems.
- Chapter 5, "EIA 232 Cabling Specification," describes the signals and pin assignments for EIA 232 interface cables that connect an Asynchronous Emulation Adapter port to a terminal (display station or printer), to a computer, or to a modem.
- Appendix A, "3174 Attachment Diagrams," provides worksheets to help with customization and site planning.
- Appendix B, "ASCII Emulation," provides more detailed information about Digital Equipment Company (DEC) VT100 Emulation, IBM 3101 Emulation and ASCII Printer Emulation.

Related Publications

IBM 3174 Publications

IBM 3270 Information Display System:

3174 Subsystem Control Unit Site Planning, GA23-0213

3174 Subsystem Control Unit Customizing Guide, GA23-0214

3174 Subsystem Control Unit Customer Extended Problem Determination, GA23-0217

3174 Subsystem Control Unit Functional Description, GA23-0218

3174 Subsystem Control Unit Terminal User's Reference for Expanded Functions, GA23-0332

3174 Subsystem Control Unit Models 51R, 52R, and 53R User's Guide, GA23-0333

3174 Subsystem Control Unit Models 1L, 1R, 2R, and 3R User's Guide, GA23-0337

3174 Subsystem Control Unit Asynchronous Emulation Adapter Customer Setup Instructions, GA23-0341

Data Stream Programmer's Reference, GA23-0059

Other Publications on Asynchronous Communication

IBM 3101 Product Description, GA18-2033

IBM 3161/3163 ASCII Display Station Description, GA18-2310

IBM 3162 ASCII Display Station Description

IBM 3164 Color Display Station Description, GA18-2317

IBM 5841 Modem Guide to Operations, GA27-3649

IBM 5842 Modem Guide to Operations, GA27-3638

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Chapter 1. Asynchronous Emulation Adapter Overview

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The Asynchronous Emulation Adapter (AEA) feature consists of both hardware and microcode installed in the 3174 Subsystem Control Unit. This adapter expands the connection capability for IBM 3270 terminals (display stations or printers), allowing them to connect to American National Standard Code for Information Interchange (ASCII) hosts, and public data networks, as well as allowing ASCII display stations and printers to connect to IBM hosts.

Physical Description

The AEA feature includes:

- An adapter card that contains a microprocessor, storage, and control logic
- An input/output (I/O) panel with eight Electronics Industries Association (EIA) 232D connectors for modem or direct ASCII terminal or host connection
- A diskette with microcode for the AEA
- A wrap plug for testing.

A second 1.2-megabyte (MB) diskette drive must be installed in the 3174 to support downloading of the operational microcode. This diskette drive may also be used for any other devices that require the downloading of microcode.

Model Support

The AEA feature is supported in the following 3174 models:

- Models 1L, 1R, 2R, and 3R:

  A maximum of three AEAs can be installed in these 3174 models, providing a total of 24 asynchronous ports.

  For Systems Network Architecture (SNA) control units, the maximum number of 3270 host addresses (including 3270 and ASCII terminals) is 184. For non-SNA control units, the maximum number of 3270 host addresses (including both 3270 and ASCII terminals) is 32.

  Note: 3174 Models 1L, 1R, and 2R cannot have both the Asynchronous Emulation Adapter feature and the IBM Token-Ring Network 3270 Gateway feature.

- Models 51R and 52R:

  One AEA can be installed in these models of the 3174, providing a total of eight AEA ports.

  These ASCII attachments are in addition to the maximum of sixteen 3270 terminals available on the control unit.

  Note: 3174 Models 51R and 52R cannot contain both the Asynchronous Emulation Adapter feature and the IBM Token-Ring Network 3270 Gateway feature. In addition, the AEA feature is not available in a 3174 Model 53R.

Functional Description

This section contains a description of the following functional areas of AEA operation:

- Asynchronous Emulation Adapter
- Modems
- Flow control
- Connection management
- Security
- Languages supported
- Performance considerations
- Online tests, error logs, and alerts
- PC File Transfer
- ASCII Display Host Addressable Printer

Asynchronous Emulation Adapter

The AEA supports full-duplex, character-mode, asynchronous transmission of 7-bit ASCII (ANSI[1] 3.4, 1977) data. One or two stop bits, and odd, even, mark, space, or no parity are supported. Autobaud detect and XON/XOFF, DTR, or CTS asynchronous flow controls are supported.

Each port provides an EIA 232D electrical interface and supports transmission speeds of 300, 600, 1200, 2400, 4800, 9600, and 19 000 bits per second (bps) through modems over switched and nonswitched communication facilities or without modems via direct connection. The Asynchronous Emulation Adapter provides three major modes of operation:

3270 Terminal Emulation Allows ASCII terminals to emulate an IBM 3178 Display Station Model C2, 3279 Color Display Station Model 2A, or 3287 Printer Model 2 for connection to an IBM host.

ASCII Terminal Emulation Allows an IBM 3270 display station to emulate an IBM 3101 Display Station, or a Digital Equipment Corporation (DEC) VT100, and allows an IBM 3270 printer to emulate an ASCII printer; 3270 terminals can thereby connect to ASCII hosts or public data networks.

ASCII Pass-Through Allows ASCII terminals to connect through the 3174 control unit to ASCII hosts or to public data networks.

[1] American National Standards Institute

Figure 1-1 shows an overview of connection paths provided by the AEA. Only two AEAs are shown to illustrate distinctly the different connection paths; ASCII terminals and hosts may be connected to the same AEA.

Path 1 shows the traditional path between 3270 terminals and the 3270 host.

Path 2 shows that the AEA feature provides a connection between ASCII terminals and the 3270 host. This mode of operation is called *3270 terminal emulation*. The AEA converts an ASCII protocol to the 3270 protocol, and sends the data through a 3270 host interface adapter to the 3270 host. Likewise, the AEA converts 3270 protocol to an ASCII protocol, and sends the data to the ASCII terminal. The AEA feature enables ASCII display stations to emulate (that is, to appear to the 3270 host to be) either an IBM 3178 Model C2 or an IBM 3279 Model 2A (four-color display). ASCII printers can emulate an IBM 3287 Model 2.

Path 3 shows that the AEA feature provides a connection between 3270 terminals and ASCII hosts. This mode of operation is called *ASCII terminal emulation*. The AEA converts 3270 protocol to an ASCII protocol, and sends the data to the ASCII host. Likewise, the AEA converts ASCII protocol to 3270 protocol, and sends the data to the 3270 terminal. The AEA feature enables 3270 display stations to emulate either an IBM 3101 or a DEC VT100 display station. IBM 3270 printers can emulate ASCII printers.

Path 4 shows that the AEA feature provides a connection between ASCII terminals and ASCII hosts, or public data networks. The AEA does not do any protocol conversion in this mode of operation. This mode of operation is called *ASCII pass-through*.

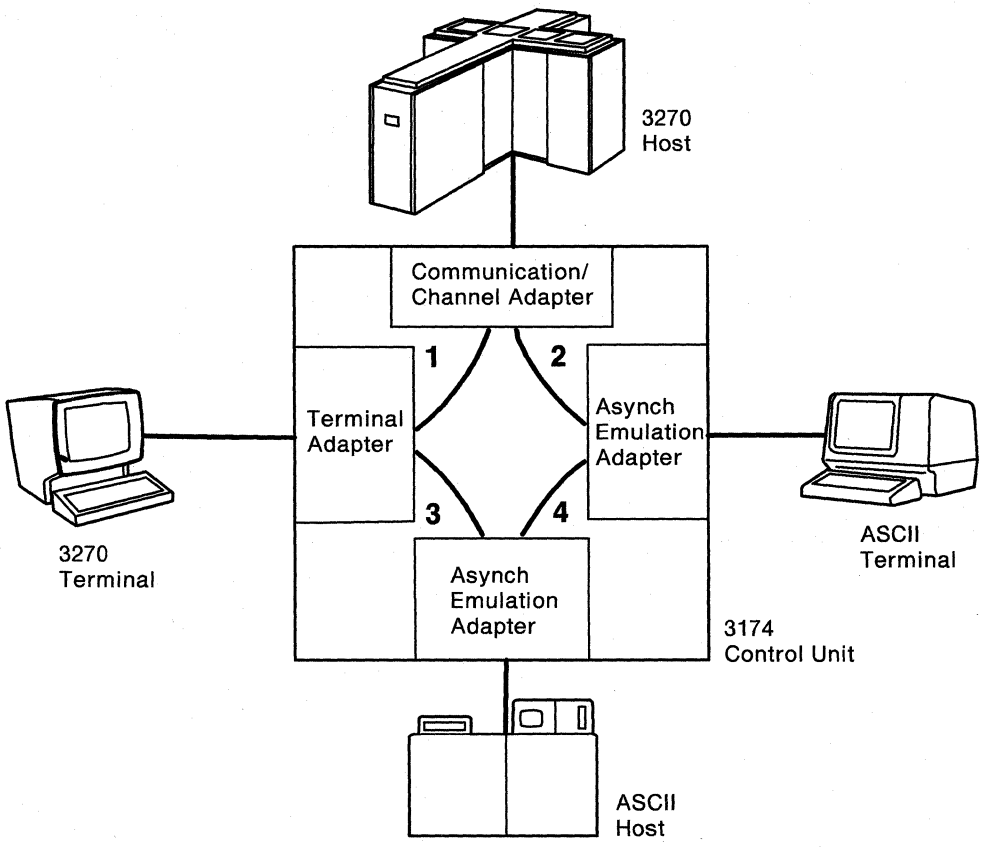

Figure 1-1. Overview of 3270 and ASCII Terminal Emulation

3270 Terminal Emulation

Figure 1-2 shows the flow of data between asynchronous terminals and an IBM 3270 host. Two AEAs are shown to illustrate a variety of connection possibilities.

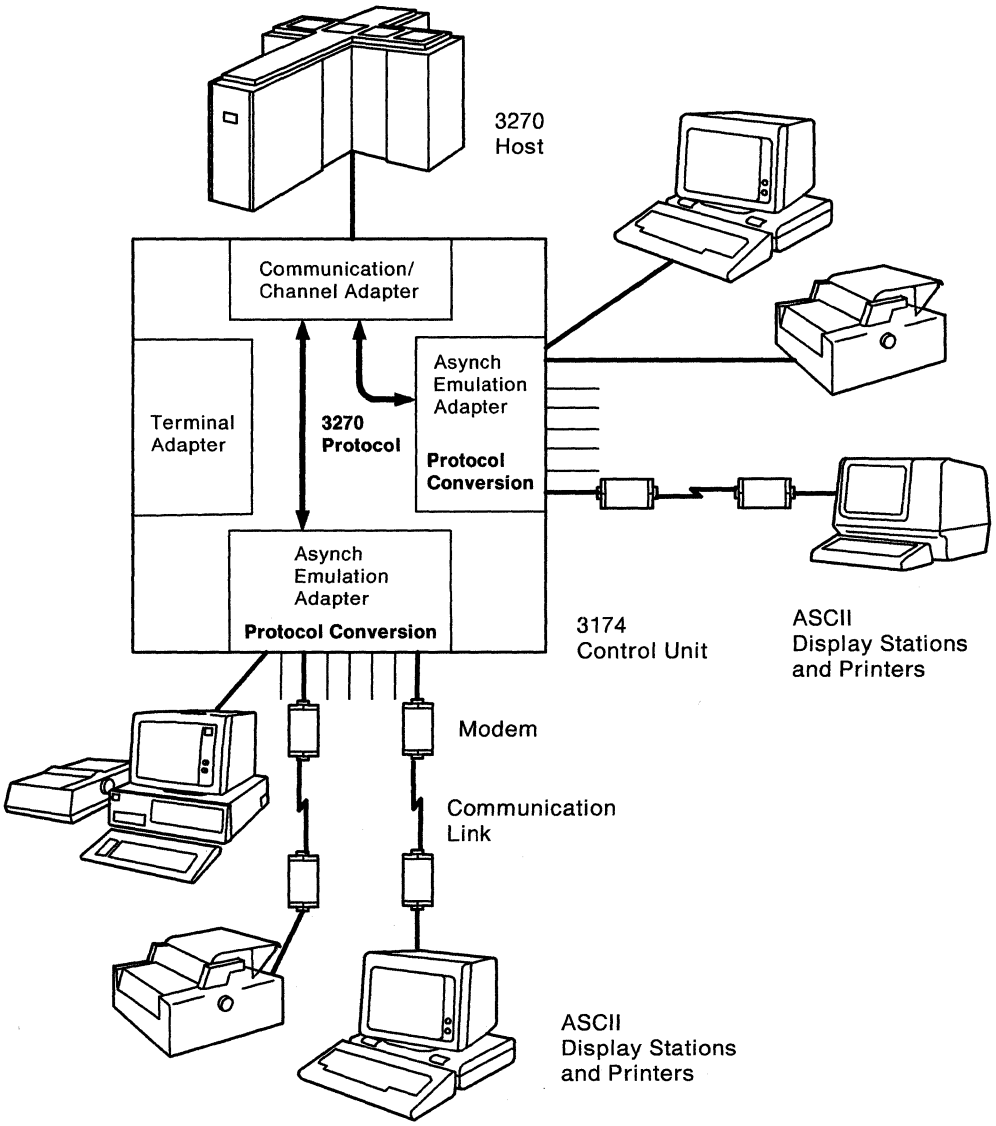

Figure 1-2. 3270 Terminal Emulation

Display Stations: The following ASCII display stations are supported for 3270 Terminal Emulation:

- ADDS Viewpoint[2] A2 and Viewpoint/78
- ANSI 3.64 Terminal[3]
- DEC VT52, VT100, VT220 (emulating a VT100), and VT241 (two colors only)
- Esprit[4] Executive 10/78
- Hazeltine[5] 1500
- Hewlett-Packard[6] 2621B
- IBM PC/FTTERM Color[7]
- IBM PC/FTTERM Mono[8]
- IBM 3101, 3151 (as a 3161 or a 3162 depending on the model), 3161, 3162, 3163 (supported as a 3161), and 3164 (supported for 3279 2A emulation — four colors)
- Lear Siegler ADM 3A Dumb Terminal[9], ADM 5 Dumb Terminal, ADM 11, ADM 12, and ADM 1178
- TeleVideo[10] 912 and 970.

IBM Personal System/2™ computers and IBM Personal Computers that meet the attachment requirements and that use a program that emulates one of the supported display stations, are supported for 3270 Terminal Emulation.

Non-IBM personal computers that use a program that emulates one of the supported display stations are supported. Non-IBM display stations that meet the requirements for attachment may connect to the AEA under the provisions of the IBM Multiple Supplier Systems Bulletin. To attach to the AEA, display stations must:

- Support a line speed of 300, 600, 1200, 2400, 4800, 9600, or 19 200 bits per second (bps) on an EIA 232D interface (transmit and receive speeds must be equal)
- Operate in duplex, character mode
- Support 7-bit code as defined by ANSI 3.4
- Support on XON/XOFF, DTR, or CTS flow control (a printer must be able to print at the full line speed if it does not use flow control)

---

2 Trademark of Applied Digital Data Systems, Inc.

3 A terminal that conforms to the ANSI 3.4 control sequences supported by the AEA.

4 Trademark of Esprit Systems, Inc.

5 Trademark of Hazeltine Systems, Inc.

6 Trademark of Hewlett-Packard Company.

7 IBM PC/HOST File Transfer and Terminal Emulator Program Color (IBM PC/FTTERM Color)

8 IBM PC/HOST File Transfer and Terminal Emulator Program Monochrome (IBM PC/FTTERM Mono)

9 Lear Siegler, ADM, and Dumb Terminal are trademarks of Lear Siegler, Inc.

10 Trademark of TeleVideo Systems, Inc.

Personal System/2 is a trademark of the International Business Machines Corporation.

- Match one of the displays listed above with respect to:
  - The control sequences used for 3270 emulation, such as:
    - Cursor positioning
    - Line erase
    - Screen erase
    - Highlighting (if available)
    - Status line control (if available)
    - Printer port sharing (if available)
    - Terminal setup and reset.
  - The keys used by the keyboard map to send codes or control sequences to the 3174
  - End-of-line (line-wrap) and end-of-screen (screen-wrap) conditions
  - Screen size (must have at least a 24 by 80 – character screen).

The customer is responsible for determining whether the emulation program provides identical function and operation as the emulated supported display station.

The ASCII terminal and its associated AEA port must be set up to operate with the same ASCII protocol parameters, such as line speed, parity, number of stop bits, data stream type, etc. With autobaud and autoparity the user will press a carriage return followed by a period and another carriage return; the AEA analyzes the received characters and adjusts the line speed and parity of the port to match the line speed and parity of the terminal.

For some terminals, the operator indicator status line is displayed on line 25. For other displays, users can type in an escape sequence to display the operator indicator status line on line 24. The operator indicator status line can be toggled on and off when the 24th line is used.

Keyboard: The user can choose a universal keyboard map or a specific keyboard map designed for each supported ASCII terminal; a keyboard map is a translation table that associates the keystrokes on the ASCII terminal keyboard to the corresponding, equivalent keystrokes on the 3270 terminal keyboard being emulated. For users of several different ASCII terminals, the universal keyboard map eliminates the need to remember each specific keyboard map. The specific keyboard maps minimize keystrokes for frequently used 3270 keyboard functions and take advantage of the ASCII keyboard's layout and nomenclature. Refer to the *3174 Terminal User's Reference for Expanded Functions* for details on keyboard maps.

For greater efficiency, ASCII display station keyboards are not locked during a screen write. This capability enables keystrokes to be entered while the screen is being updated.

Note: If the 3174 is customized for RPQ 8K0808 keyboards, 3270 terminal emulation will not work for ASCII display stations.

Printer: The IBM 4201 Proprinter™ Proprinter II, 4202 Proprinter XL, 4207 Proprinter X24, and 4208 Proprinter XL24 are supported for 3270 Terminal Emulation. The serial feature on these printers is required for them to attach to the AEA.

Proprinter is a trademark of the International Business Machines Corporation.

The general requirements for ASCII printers to be supported for 3270 Terminal Emulation (LU1 SNA character string [SCS] mode and LU3 3270 Information Display System data stream compatibility [DSC] mode) are as follows:

- Asynchronous (serial) transmission
- EIA 232D electrical interface
- Duplex, character mode
- Seven-bit code defined by ASCII (ANSI 3.4, 1977)
- Equal transmit and receive speeds; the speed must be one that is supported on the emulation adapter
- Support of the maximum line length sent by the application program or local copy function
- Support of the required ASCII commands:
  - Carriage Return (Control M; hex 0D)
  - Line Feed (Control J; hex 0A)
  - Bell (Control G; hex 07)

In addition:

- Carriage return must not generate a line feed, nor can a line feed generate a carriage return.
- The printer must not be dependent on any delay characters to allow mechanical motion.
- The printer must be ready to print; the AEA will not initialize an ASCII printer emulating a 3270 printer.
- If the printer does not support a flow control that is supported by the AEA (XON/XOFF, CTS, or DTR), it must be ready to print at the full speed of the line.

ASCII printers operating in 3270 Terminal Emulation can be used as host printers, shared printers, and local copy printers.

ASCII Display Host Addressable Printer: A printer attached to an auxiliary port on a display connected to a 3174 AEA port can be defined as a second logical unit (LU) on the 3174 AEA port. The display and its attached printer appear as two distinct LUs to the host application(s). The host application(s) can communicate with both the display and the printer at the same time.

The following conditions apply to a display terminal with an attached printer.

- A printer connected to an auxiliary port on a display must be defined to the 3174.
- Input from devices that are connected to the auxiliary port of a display is not explicitly supported; any such input is assumed to be for the display.
- Terminal users may suspend and resume the Printout to the systems auxiliary port by pressing a **Suspend Print** or a **Resume Print** key sequence.

- Only the following display terminals are enabled for attached printer operation:
  - ADDS Viewpoint A2
  - VT101 (as a VT100)
  - VT131 (as a VT100)
  - VT220 (as a VT100)
  - VT241
  - IBM 3151, 3161, 3162, 3163, or 3164 ASCII Display Stations
  - Lear Siegler 11, 12, and 1178
  - IBM PC/FTTERM Color or Monochrome
  - TeleVideo 970

Host Attachment: The IBM host is attached to the 3174 by one of the host attachment interfaces available on the 3174; the host attachment interface can be the Channel Adapter, the Communication Adapter, or the Token-Ring Adapter (3174 Model 3R).

At customization, a specific host destination (usually the IBM host) can be assigned to the ASCII display stations. If the host destination is not specified, the display station user is presented with the Connection Menu, from which a host attachment can be selected.

ASCII Terminal Emulation

Figure 1-3 shows the flow of data between 3270 terminals and an asynchronous (ASCII) host.

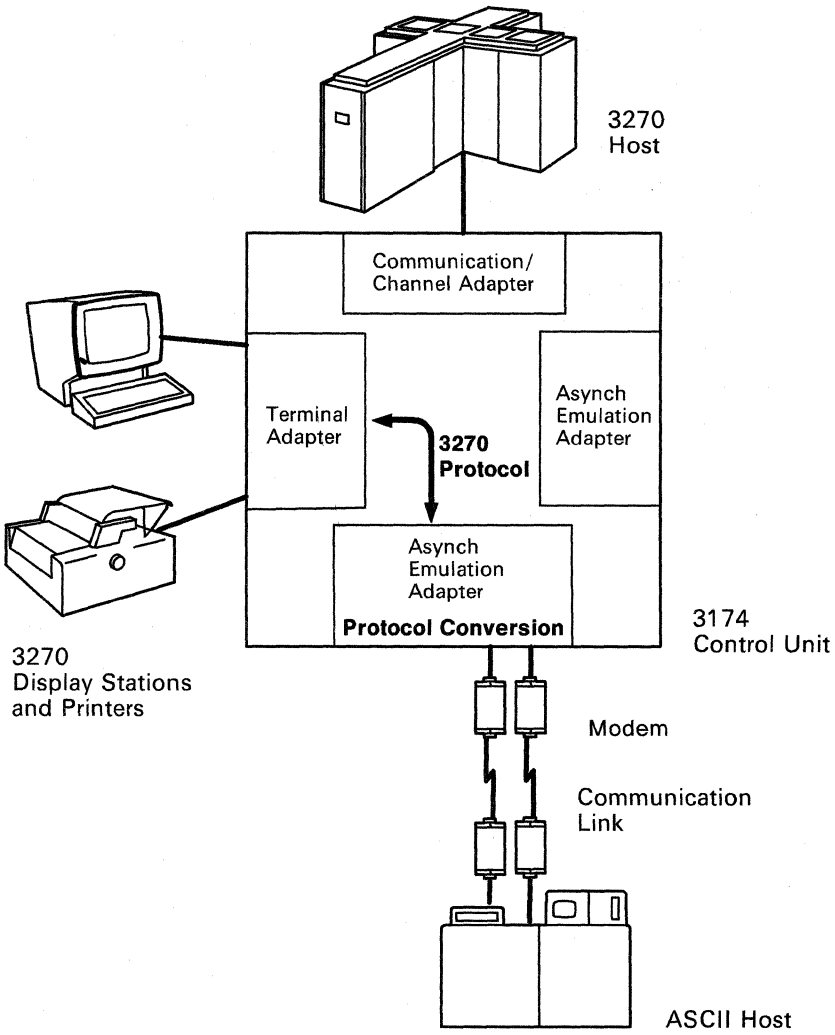

Figure 1-3. ASCII Terminal Emulation

Display Stations: Any IBM 3270 Control Unit Terminal (CUT) display station with a 1920-byte or greater buffer, or an IBM 3270 PC in CUT mode, can emulate an IBM 3101 or a DEC VT100 display station.

Note: In ASCII-emulation mode, some keystroke sequences are generated differently on an IBM PC, PS/2, 3270 PC, or 3194 Display Station, that uses an IBM 3270 terminal emulator. Examples of this are the ASCII control code key sequences that are emulated using ALT followed by another key.

ASCII display emulation provides the following support:

- Duplex character mode data transmission
- 24 lines at 80 characters per line
- Operator indicator line
- Mapping of the 3270 display keyboard
- Data stream mapping
- Function keys
- Typematic keys
- ALT key (3101)
- Caps lock key (VT100)
- CTRL key (VT100)
- Break key (long or short for VT100)
- ASCII display keyboard setup options that have equivalent 3270 keyboard setup functions
- Specification via control unit customization of terminal setup options that can be supported on the 3270 display.

IBM 3101 functions and keys not supported are:

- Half-duplex transmission and functions associated with half-duplex operation
- Block mode and keys active in block mode
- Reverse video
- Local mode
- Transparent mode
- Auxiliary printer port and associated keys.

DEC VT100 functions and keys not supported are:

- Keys associated with setup mode that do not have equivalent 3270 keys
- Interlace mode
- Screen mode (reverse and normal)
- Select character set (see Table B-1 on page B-10)
- Invoke confidence test
- Attached printer and Hard Copy key
- Set column mode to 132
- Smooth scroll.

Keyboard: The IBM Typewriter, APL, and Text keyboard types are supported through special keyboard maps for the IBM 3101 and the DEC VT100 display stations; a keyboard map is a translation table that associates the keystrokes of one keyboard to the corresponding, equivalent keystrokes of another keyboard. In this case, the keyboard maps show what keystrokes on a 3270 keyboard are equivalent to those on either a 3101 or a VT100 keyboard. Refer to the *Terminal User's Reference Guide* for Expanded Function for additional details on mapping.

Notes:

1. Converged (122-key) and IBM Enhanced keyboards need a numeric keypad.
2. Keyboard modifications made using the Modified Keyboard Procedure are not supported.
3. RPQ 8K0808 keyboard is not supported.

Printer: The IBM 3262 Models 3 and 13, 3268 Model 2, 3287 Models 1 and 2, and 4224 Models 210 and 202 are supported for ASCII printer emulation. ASCII control sequences for the following functions are supported: line feed, form feed, carriage return, bell, and tab-skip to the next multiple of 8 characters. The 3270 printer in this mode can be used only as a host printer, and not as a local copy printer.

Host Attachment: ASCII host attachment can be provided through any AEA port via customizing. ASCII host links can support only one session at a time; when all ports are in use, requests for sessions are not honored until a session ends and a port is available.

A display user can attach to, or change, hosts by requesting the Connection Menu and selecting a host from the list displayed. The Connection Menu also provides host availability status information. If a path is available to that host, a connection will be made.

If Multiple Logical Terminal (MLT) support is available, a 3270 display station user can interact with, and remain connected to, up to five host sessions. The host sessions can be to a single IBM host, one or more ASCII host(s), or both. Access to hosts is made through either the Connection Menu or the Default Destination procedure (refer to the *3174 Customizing Guide*).

Each MLT session using the connection to an IBM host requires a session address; a session with an ASCII host does not need an IBM host address. The host connection and associated session address are defined during 3174 customizing. A SNA 3174 supports up to 184 session addresses; a non-SNA 3174 supports up to 32 session addresses. Users access these MLT sessions by using a Change Screen key sequence. This key sequence causes the display screen and keyboard ownership to be transferred to the next session in a round-robin manner. Host access to a particular session is processed independently of the other session states. Refer to the *3174 Terminal User's Reference for Expanded Functions* for more information on MLT operation.

ASCII Pass-Through

Figure 1-4 on page 1-13 shows the flow of data between ASCII terminals and an ASCII host.

The AEA can provide the connection between an ASCII terminal and an ASCII host. At customizing, a specific ASCII host destination can be assigned to the ASCII display stations. If the host destination is not specified, the display station user is presented with the Connection Menu, from which a host attachment can be selected.

Flow controls supported by the adapter will prevent potential data overruns if supported by the host connection. If an overrun does occur, the session is disconnected, and a message is sent to the display station operator. Error checking is the responsibility of the ASCII host.

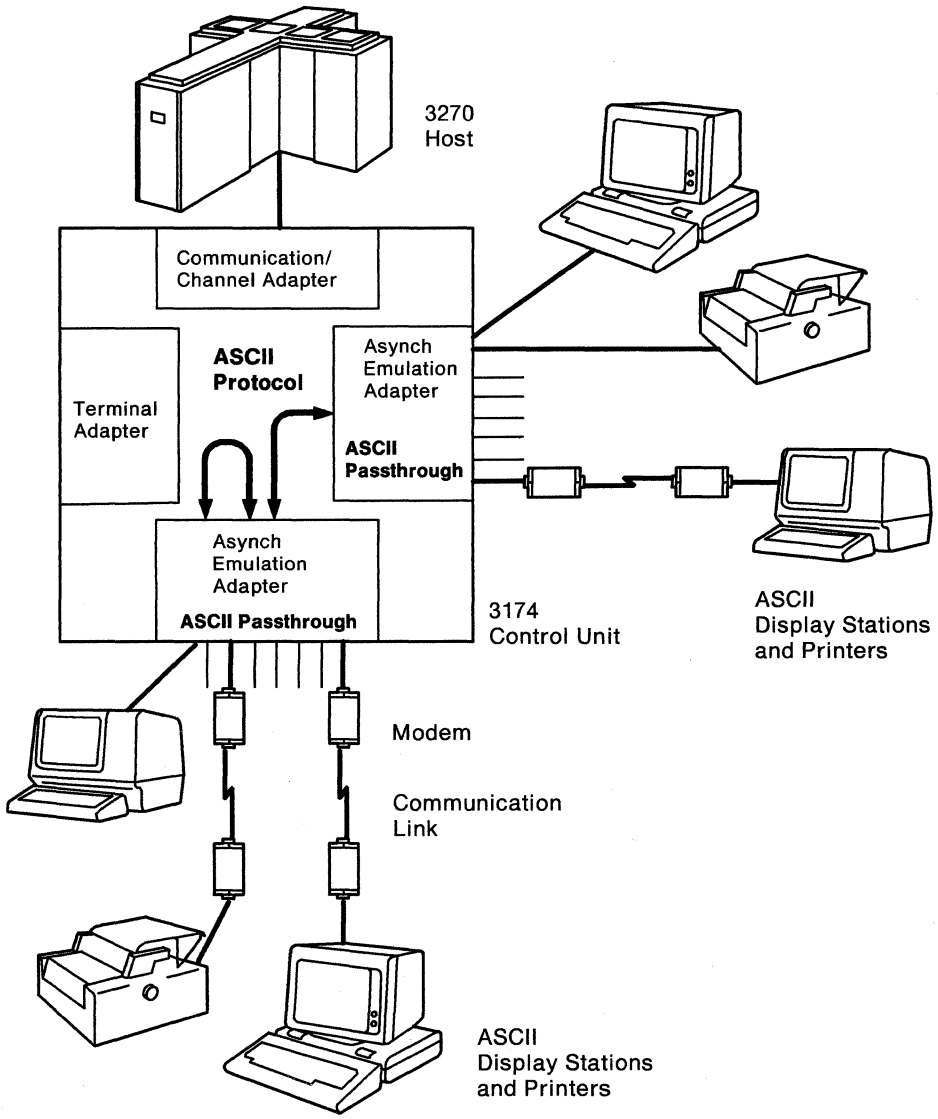

Figure 1-4. ASCII Pass-Through

Modems

The AEA feature supports nonswitched line, switched line, and limited-distance modems that provide duplex asynchronous operation and equal transmit and receive speeds, and that conform to EIA 232D specifications. The AEA feature also supports auto-call[11] modems that conform to the EIA 232D specifications and to the IBM Attention Command Set (AT), the Hayes[12] AT command set, the Micom[13] auto-dial procedure, or the AEA manual calling[14] requirement.

Flow Control

Transmitter on/transmitter off (XON/XOFF), data terminal ready (DTR), and clear to send (CTS) asynchronous flow controls are supported. XON/XOFF flow control is the only flow control supported for switched lines. ASCII control character DC1 is used by the terminal to signal the host to start transmitting data. ASCII control character DC3 signals the host to stop transmitting data. Nonswitched lines can use XON/XOFF or DTR flow control. Direct lines can use XON/XOFF or CTS flow control.

Connection Management

The user connects to IBM and ASCII hosts through the Connection Menu or the Default Destination procedure as specified during customizing. Switched-line connections to ASCII hosts can be made via dial digits stored in the control unit or entered from the display keyboard. Connections are held until the next connection is established. With MLT, each connection is held until the user terminates that connection. Messages appear on the display station's screen in the event of a connection outage.

Security

The security features provided with AEA support are Control Unit Access Password, Idle Time-Out, and Switched Disconnect Time-Out. The AEA feature also supports SNA connection outage notification.

Security cannot be provided for host subsystems or applications (such as the Information Management System [IMS]) that retain data between sessions in the expectation that the same logical unit will come into session again.

If sensitive data is sent over external communication facilities, an encryption scheme, such as that provided by the Encrypt/Decrypt feature, should be used.

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[11] An auto-call modem accepts dial digits from the AEA over the data leads. In AEA operation, auto-call is a feature whereby dial digits (an ASCII host phone number) are stored in the 3174 control unit. These digits are sent to the auto-call modem when the user requests a connection to the ASCII host.

[12] Trademark of Hayes Microcomputer Products, Inc.

[13] Trademark of Micom Systems, Inc.

[14] In AEA operation, manual calling means that the terminal user enters the modem commands and dial digits from the keyboard in order to initiate a connection to an ASCII host.

Control Unit Access Password

A control unit access password can be specified at customization. The AEA will prompt any display user that uses a switched port for the password. The 3174 will break the connection if the user supplies the wrong password.

Idle Time-Out

Idle Time-Out (ASCII ports only) can be specified at customization. The main objective of this time-out is to terminate sessions that have been inactive for the specified time, thereby avoiding excessive charges for connections through the telephone network. However, the Idle Time-Out also reduces the chance of someone using a session that has been left unattended or has not been properly terminated.

Switched Disconnect Time-Out

The Switched Disconnect Time-Out pertains only to non-SNA applications. Some non-SNA applications have a time-out for inactive or non-communicating sessions; a session is terminated by the application if the time of inactivity exceeds the time-out. When a switched connection breaks, the 3174 disallows the affected port access to the IBM host for the duration of the Switched Disconnect Time-Out (specified at customization); this time-out should exceed the host's inactive session time-out, and thereby allow the host application to terminate the session before the port can be used again for 3270 Emulation. However, the port can be used for ASCII Terminal Emulation and ASCII Pass-Through. By blocking access to the IBM host, the Switched Disconnect Time-Out prevents any possibility of unauthorized access to an IBM host session.

Outage Notification

When a switched connection to a 3270 SNA host breaks, SNA control units send an UNBIND request to the 3270 host; the host application can then terminate the session.

Language Support

Only U.S. English screens and keyboards are supported. Therefore, the 3174 must be configured for U.S. English 3270 host applications.

Performance Considerations

Response time depends on many variables, including the number and types of terminals attached, the transaction rates and contents, and system parameters such as response unit (RU) lengths and pacing. An AEA can handle about 5000 bytes per second (burst input rate) before character overruns occur.

Online Tests, Error Logs, and Alerts

Online tests provide AEA status and error information. The Asynchronous Emulation Adapter online test (Test 12) contains a set of five selectable options for testing AEA ports and configuring modems. Refer to the *3174 User's Guide* for detailed information.

Errors relating to asynchronous station operation are logged, alerts are sent to the host, and network statistics are gathered in the same way as for 3270 terminals.

File Transfer (FTTERM)

The Asynchronous Emulation Adapter supports file transfer between the IBM Host and an IBM PC running the IBM PC/HOST File Transfer and Terminal Emulator Program (FTTERM). This program gives the user of an IBM PC full-screen 3270 terminal emulation and file transfer capability when operating in protocol conversion mode with the 3174.

Chapter 2. Planning and Using Asynchronous Communications

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To plan and set up a communication network, you should be familiar with network components and configurations. Also, you must know the specific terminology that is used in AEA customization and operation. Under "AEA Terminology and Concepts" are examples of 3270 and ASCII Terminal Emulation with the basic components required for data communication. These examples should help you understand the terminology, concepts, and functions of asynchronous communication with the AEA feature.

In addition, this chapter describes the major planning and setup tasks required to customize, set up, and operate the 3174 Subsystem Control Unit with the Asynchronous Emulation Adapter (AEA) feature. A customization overview is also provided.

AEA Terminology and Concepts

The first example (see Figure 2-1) shows a 3270 Terminal Emulation configuration in which a remote ASCII terminal is connected over telephone lines to an IBM host. The components of the configuration are labeled, and the specific AEA customizing terms that apply to these components are shown below, in **bold**.

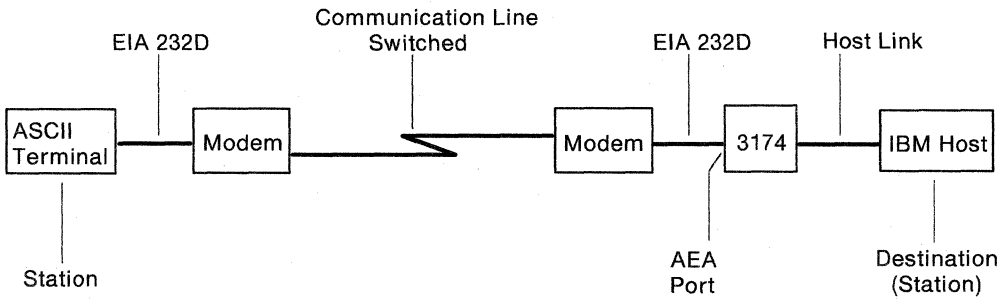

Figure 2-1. 3270 Terminal Emulation Example

The **ASCII terminal** is called a *station*. In general, a display station, printer, or host (IBM or ASCII) involved in asynchronous communication through the AEA is called a *station*. In AEA customizing, ASCII terminal stations are identified by a range of characteristics, including *station type* (such as IBM 3101, DEC VT100, Hewlett-Packard 2621B), *destination* (in this case, the IBM host), *flow control type* (in this case, Xon/Xoff), *line speed,* and *parity*.

Modems convert the digital signals from terminals or computers to analog communication signals at one end of the line, and convert the analog communication signals back to digital signals at the other end of the line. In AEA customizing, the modem attached to an AEA port is identified by its *modem type*; the four modem type designations are *Hayes, Micom, IBM,* and *Other*. Limited-distance modems (LDM) do not have a modem type designation. The Hayes, Micom, IBM, or equivalent auto-call modems are required only for dialing out from the 3174 to an ASCII host or public data network. In Figure 2-1, an auto-call modem would be useful at the terminal end of the line; at the 3174 end of the line, an auto-call modem is not required to process calls coming in to the 3174. The modem attached to the remote ASCII terminal must use the same speed and modulation technique as the associated modem attached to the AEA port. Also, the remote modem's type is not relevant to AEA configuration.

The **Communication line** transmits data between modems. In this example, the communication line is a *switched* line. Switched lines (also called dial lines) use the same equipment and transmission lines that are used for voice (telephone) communication. A connection must be established between the terminal and the host before data can be transmitted. To establish a connection with the IBM host, the remote ASCII terminal user must dial (call) the 3174 just as with voice communication. A user dials the 3174 phone number either by using a telephone connected to the nearby modem, or by using a communication application program and either selecting the number from a automatic call directory or entering the dial digits at the keyboard.

The 3174 then makes the IBM host connection, either immediately or after selection from the Connection Menu.

ASCII terminals can also be connected to the 3174 either *directly* or via *non-switched* lines. In Figure 2-1 on page 2-2, if the ASCII terminal is no more than 15 meters (50 feet) away from the 3174, it can be connected directly to an AEA port; the two modems and the communication line are not needed for direct connection.

Unlike switched lines, nonswitched lines (also called leased lines or dedicated lines) do not require dialing to establish communication; the line is permanently connected instead of being routed through switching equipment.

The user should be aware that for nonswitched connections the AEA does not determine whether the connecting device is present or not. While this provides a more flexible interface, connections are sometimes made to nonexisting or powered-off devices. For ASCII host lines, if the user gets a nonswitched connection where the ASCII host is powered off or not connected, the characters will not be echoed (the ASCII host is responsible for character echoing). The user should return to the Connection Menu, disconnect, and try the connection again. This time the AEA will try another host line if one is defined and available.

In this example, an **AEA *port*** connects a modem to the 3174. In AEA customizing, ports are identified by their *port type*; the port type reflects the kind of communication line or connection supported between the terminal and the 3174; the port types that can be used by ASCII stations are designated *Switched, Direct,* and *Non-switched*. The AEA port type in Figure 2-1 on page 2-2 is a *switched* port.

In general, a **destination** is a host to which a terminal user has access. A *default destination* can be specified at customizing; the default destination is the host to which an ASCII terminal is connected when the user calls into an AEA port on the 3174. If a default destination is not specified, or if the default destination cannot be connected, the user is presented with a *Connection Menu* that consists of a list of host destinations from which the user can select a particular host or application.

The second example (see Figure 2-2 on page 2-4) shows an ASCII Terminal Emulation configuration in which a 3270 terminal is connected to a remote ASCII host. The components of the configuration are labeled, and the specific AEA customizing terms that apply to these components are shown below, in **bold**; only those components that differ from the 3270 Terminal Emulation example are described.

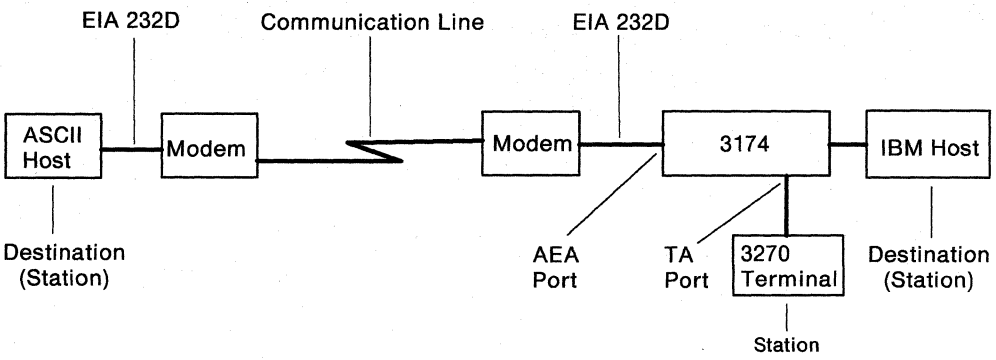

Figure 2-2. ASCII Terminal Emulation Example

In AEA customizing, a **3270 terminal** involved in asynchronous communication is also called a *station*. In AEA customization, 3270 terminal stations are identified by their station type (display station or printer) and their destination configuration.

In AEA customizing, the port type of *coax* is designated for **Terminal Adapter (TA) ports** that connect 3270 terminal stations.

The modem attached to an **AEA port** used for calling out to an ASCII host over switched lines must be a Hayes, Micom, IBM, or equivalent auto-call modem.

In general, a **destination** is a **host** to which a terminal user has access. A *default destination* can be specified at customizing; the default destination is the host to which a 3270 terminal station is connected when the user switches on the terminal, or toggles the Normal/Test switch. If a default destination is not specified, the user is presented at connection time with a *Connection Menu* that consists of a list of host destinations from which the user can select a particular host or application. In this example, IBM host could be the default destination; the ASCII host would then have been reached through the Connection Menu.

Station Sets

In many instances, much of the information about an individual station is the same for a group of stations. Customizing provides a way to assign stations of the same type and destination to a *station set* and to assign station characteristics on a "set" basis. All stations in a station set have the same terminal type and share the same characteristics. This customizing feature is designed to expedite the customizing of stations. Refer to "Customization Overview" on page 2-10 for more information.

Port Sets

As with station sets, much of the information about ports is the same for a group of ports. Customization provides a way to assign ports of the same type to a *port set* and to assign port characteristics on a "set" basis. All ports in a port set provide access to the same station sets, and have the same port type and modem type. This customizing feature is designed to expedite the customizing of both AEA ports and those Terminal Adapter ports involved in asynchronous communication; it is also the basis for setting up *port pools*. A port pool is a group of ports (a port set) that offers multiple access points to the same resource. When the control unit receives a request to connect to a host, it scans the port set for a nonbusy (available) port. If one is found, it is selected as the port through which the connection is processed. Refer to "Customization Overview" on page 2-10 for more information.

Planning and Setup Tasks

You must coordinate customizing and site planning activities. Those responsible for customizing the 3174 and for site planning must plan and implement their activities together. Each must be aware of the function and purpose of the addition of the AEA feature.

Analyze Your Communication Requirements

You must identify which 3270 and ASCII stations attach to the 3174. In addition, you must decide how the ASCII stations will be connected to the 3174; ASCII stations can be connected either directly or through switched (dialed) or nonswitched telecommunication lines.

When choosing what kind of lines to use, consider that although auto-call modems are more expensive than ordinary modems, switched lines requiring auto-call modems are less expensive to rent and use than nonswitched lines. Over time, therefore, the expense of auto-call modems will be recovered by the savings realized on switched line costs.

Nonswitched lines are used to provide immediate access to a dedicated resource and to provide users with more reliable data communication. Nonswitched lines may be conditioned by the common carrier (the company that supplies communication services) to reduce transmission errors and signal distortion, and to increase the speed capability of the line. Switched lines cannot be conditioned.

You must carefully evaluate your communication requirements when deciding on switched or nonswitched lines.

Remember that each asynchronous communication line can support only one session at a time. Therefore, if you have eight users of an ASCII host, and they all need to be connected all day to the same resource, your subsystem will require eight communication lines to that resource. This may be an unlikely circumstance, so you will need to do a traffic analysis to compute how many lines are required to support the users of a particular resource. For these eight users, you would need to evaluate the amount of connect-time per user per hour. You may find that three or four AEA ports are sufficient to achieve a very low probability that users will encounter an *all ports busy* condition.

Create a System Specification

Planners must work from an overall 3174 subsystem specification or layout plan, and they must work together. You should provide such a subsystem specification that will consist of 3174 Attachment Diagrams that identify all the attached 3270 (synchronous) and ASCII (asynchronous) displays, printers, and hosts. Provided in Appendix A are sample 3270 and ASCII Attachment Diagrams that you should copy, fill out, and give to your subsystem's planners. The diagrams account for a 3174 control unit that has up to thirty-two 3270 devices connected to the Terminal Adapter (direct-attached or through a multiplexer), and up to 24 ASCII devices (local and remote terminals or hosts). These diagrams provide much of the information required to fill out customization worksheets.

Things to Do

You can proceed to the tasks below after you have:

- Identified all the 3270 and ASCII attachments that will use the AEA feature
- Resolved your data communication requirements
- Ordered the AEA feature.

Skip any tasks that do not pertain to your situation. You may want to check off each item as you complete it.

___ Copy and fill out the 3174 Attachment Diagrams (Appendix A) and give copies to those responsible for customizing the 3174 and preparing the site.

___ Order communication lines.

___ Subscribe to an information service.

___ Order EIA 232D cables.

___ Order modems.

___ Order test equipment.

___ Prepare the site.

___ Customize the 3174.

___ Set up AEA hardware (when not installed at the IBM facility).

___ Check out the system – Phase 1 (3174 hardware checkout).

___ Check out the system – Phase 2 (customization checkout).

___ Check out the system – Phase 3 (operational checkout).

Each item in the list is discussed in the following paragraphs.

Fill Out the 3174 Attachment Diagrams

The 3174 Attachment Diagrams are provided so that you can identify all the 3270 and ASCII displays, printers, and hosts that will be connected to the 3174 control unit. Follow the instructions that accompany each attachment diagram, and use the completed attachment diagrams to complete customizing and site planning worksheets.

Order Communication Lines

Contact your communication service (either the telephone company or your in-house communication department), and order the number and kind of communication lines that meet your data communication requirements.

Subscribe to an Information Service

Information Services advertise in many trade magazines and journals; call the service and request a subscription. They will provide you with the resource phone number, a user ID and password, and asynchronous communication protocol configuration information. This information will include such items as line speed, parity, number of stop bits, and host data stream type (VT100 or 3101). You will use this information when customizing the AEA ports that will access this information service.

Order EIA 232D cables

IBM does not provide EIA 232D cables with the AEA feature. You must order or assemble these cables. The cable's wiring must conform to the cabling specification described in Chapter 5, "EIA 232D Cabling Specification" on page 5-1. Make sure that your vendor provides cables that match this specification. Refer to *3174 Site Planning* for additional information.

Order Modems

For auto-dialing out from the 3174 over switched lines, use Hayes, Micom, IBM, or equivalent intelligent modems. The documentation provided with these modems describes how to configure the modem for your specific operations. For answering calls from remote ASCII terminals, ordinary switched modems can be used. Refer to "Modem Specifications and Setup" on page 4-2 for modem specifications and configuration switch settings. For nonswitched connections over in-house wiring, limited-distance modems can be used.

Order Test Equipment

The following equipment may be needed to monitor or test AEA operation:

- Test headset or test telephone to check telecommunication lines to remote resources.
- Datascope and a break-out box to examine EIA 232D leads.
- EIA connector gender changer. To run EIA 232D cable wrap tests with the wrap plug supplied with the AEA feature, you may need an EIA connector changer that changes the gender of the end of the cable.

Prepare the Site

Refer to *3174 Site Planning* for such details of site preparation as modem power and equipment rack space requirements. Plan also to terminate the telecommunication lines somewhere near the modems.

Site planning worksheets must be filled out in accordance with the 3174 Attachment Diagrams.

Customize the 3174 for AEA Operation

Some of the major customizing activities required for AEA operation are described under "Customization Overview" on page 2-10. Refer to the *3174 Customizing Guide* for detailed information. The customization worksheets must be filled out in accordance with the 3174 Attachment Diagrams.

Set Up AEA Hardware

The 3174 must be accessible from the front and back to install the AEA, the back panel(s), and a ground strap. Customer setup and checkout instructions are provided with the AEA feature.

System Checkout

System checkout consists of three phases:

1. Customer setup and EIA 232D cable checkout
2. Customization and modem checkout
3. Operational checkout.

Phase 1 – Customer Setup and EIA 232D Cable Checkout

The steps to take in Phase 1 are:

1. After hardware setup is completed, run offline diagnostics (Alt 2 IML and Alt 1 IML tests) as described in the customer setup instructions that accompany the AEA feature. These tests verify the proper operation of the 3174 and the AEA.
2. Attach EIA 232D cables to the AEA ports.
3. Check the continuity of EIA 232D cables; for cables wired for connection to a modem, the wrap plug is attached to the end of an EIA 232D cable,[1] and ALT 1 IML wrap tests are run on the selected AEA port[2] (refer to the *3174 User's Guide* for test procedures). The procedure should be repeated for each such cable. You should repair or replace any cable attached to a port that failed a wrap test and run the test again.

Phase 2 – Customization and Modem Checkout

The steps to take in Phase 2 are:

1. Connect EIA 232D cables to modems, limited-distance modems, or "null modems."[3]
2. Connect communication lines to the modems.
3. Connect ASCII stations to the other end of the communication line.
4. IML the 3174 with customized microcode.
5. Configure and test modems using online test 12 (refer to "Modem Specifications and Setup" on page 4-2 and the *3174 User's Guide* for more information).

Phase 3 – Operational Checkout

In this phase, with all stations attached and the 3174 IMLed, exercise normal 3270 communications and any AEA modes of operation that apply.

The steps to take in Phase 3 are:

1. Sign on from 3270 display stations, and try to access the IBM host. This step verifies normal, IBM terminal/computer operations.
2. If applicable, switch on a directly attached ASCII display station, and check for the Connection Menu[4], terminal type prompt, or IBM host screen, whichever applies. (Press carriage return, or press carriage return, 'period', then press carriage return again.)

   Try to access the IBM host; communication between an ASCII terminal and an IBM host exercises 3270 Terminal Emulation.

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1 To run EIA 232D cable wrap tests with the wrap plug supplied with the AEA feature, you may need an EIA connector gender changer that changes the gender of the end of the cable.

2 Wrap tests work only on cables wired for connection to modems; wrap tests do not work on cables wired for direct connection of terminals or computers.

3 A null modem is a device with two 25-pin D-shell connectors that attaches to the station end of a standard, straight-through, pin-for-pin EIA 232D cable. The null modem does the crossing-over of the appropriate EIA 232D leads required for the direct connection of a terminal or computer to an AEA port (see Chapter 5, "EIA 232D Cabling Specification" on page 5-1).

4 Refer to the *3174 Terminal User's Reference for Expanded Functions* for Connection Menu procedures.

3. From a 3270 display station (if ASCII Terminal Emulation is configured), request the Connection Menu[4] (if necessary), and verify that the IBM and ASCII hosts are listed. Try to access an ASCII host.
4. Request a connection to the IBM host from a supported remote ASCII display station, or one configured to emulate a supported station. Communication between the ASCII terminal and the IBM host exercises 3270 Terminal Emulation and all the hardware components of remote access.
5. If applicable, request a connection to an ASCII host from an ASCII display station to exercise ASCII Pass-Through.

Customization Overview

The control unit requires information about the stations attached to the AEA. Unlike coax-attached stations, most of this information must be provided through customizing because ASCII stations do not have a standardized way of identifying themselves to the control unit at connection time. Information about the AEA ports, their use by 3270 stations, and the ASCII stations must be provided to the control unit through customizing.

Station Sets and Port Sets

In many instances, much of the information about stations and ports is the same for groups of stations and ports. Customizing provides a way to put stations and ports into *station sets* and *port sets*, respectively, and to assign station and port characteristics on a "set" basis. All members of a set share the same characteristics. This customizing feature is designed to expedite the customizing process; it is also the basis of defining port pools.

Examples:

1. Eight ports on a single AEA are to be used to connect to IBM 3163 display stations over in-house lines running at 9600 bps. The display stations can be grouped into a station set that defines the common station type, line speed, parity, default destination, and other station characteristics. The ports can be grouped into a port set that defines the common port type as *nonswitched*. Lastly, the station set would be assigned to the port set.
2. Twelve ports (eight on one AEA, four on another) are to be used to provide access to a public data base through auto-dialing IBM modems. The ASCII host that has the public data base would be a station set that defines the host's attributes, such as the phone number for the host, line speed, parity, and flow control type. The ports can be grouped into a single port set (named, for example, "CALL OUT") that defines the common port type as *switched*, and the common modem type as *IBM*.
3. If VT100s, 3163s, and PCs emulating 3101s all called in to a pool of 20 AEA ports, they would be defined in three station sets all pointing at the same port set: "CALL IN."
4. A switched port set may be used for both incoming calls from displays and for outgoing calls to hosts. The port sets, CALL OUT and CALL IN (in examples 2 and 3), could be combined into one port set, "IN OUT".

Defining port sets and station sets for fixed connections (coax, nonswitched, or direct ports) is usually straightforward: ports that connect stations with the same attributes[5] are assigned to a port set, and stations of the same type are described in a single station set that is assigned to that port set.

Note: Separate port sets must be defined for ASCII host station sets and ASCII terminal station sets that are connected to the AEA either directly or over nonswitched lines.

[5] For customizing purposes, two stations have the same attributes if all the station set questions have the same answers.

Switched connections offer a wider range of possible configurations; this makes customization for switched connections more complex. Again, stations that have the same attributes are defined in a station set. Several different station sets can be assigned to a single port set. The port set thus becomes a pool of ports that can be used by stations of different types.

When defining port sets, remember that the control unit distinguishes the station sets within a port set by their station type. This has several specific implications:

- Display station sets assigned to one port set **must** have different station types. When a display station calls in, the control unit determines its station set by the user's response to the station type prompt.
- Display station sets assigned to one port set **must** have identical attachment parameters (speed, parity, stop bits); they must all use the same speed/parity or autobaud so that the control unit knows what to expect when stations call in.
- ASCII Host Station sets assigned to one port set **do not** require identical attachment parameters (speed, parity, or stop bits) within a port set.
- Printers and display stations must be in different port sets. When a call arrives, the control unit must know whether the call is made from a display or a printer. The printer cannot respond to a station type prompt.
- A display with an attached printer is treated as a Display; however, the user must inform the 3174 that the display has an attached printer at the time of connection.

In general, assigning as many ports as possible into a single switched port set improves the probability of a port's being available. For example, if an eight-port pool for outgoing calls to hosts and an eight-port pool for incoming calls from display stations are combined into one 16-port pool, the outgoing calls can use any available (idle) ports that had been formerly assigned to the incoming port pool. Conversely, the incoming calls can use any available ports that had been formerly assigned to the outgoing port pool.

A reason for limiting the size of port sets is to reduce terminal prompting; if two station sets with different line speeds are assigned to the same port set (line speed must be specified in customizing as *auto*), users are required to enter autobaud sequences and to respond to a station type prompt. These steps can be avoided if separate port sets are defined for the different station sets.

The station set names for hosts appear in the Connection Menu. If more than one display station type can connect to a port, their station set names appear in a *terminal type menu* when the display station connects to the 3174. Users of the system need to understand these station set names, so station set names should be chosen that are self-explanatory. For example, "VAX System 4" is more specific and understandable than "A-Host."

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In the following case studies, we present sample computer environments with data communication requirements that are satisfied by the addition of Asynchronous Emulation Adapters (AEA). The first case study examines ASCII Terminal Emulation; 3270 terminals require access to a nearby ASCII host. The second case study examines 3270 Terminal Emulation; remote ASCII terminals require access to an IBM host. The third case study examines both ASCII Terminal Emulation and 3270 Terminal Emulation.

General Design Conventions

The following design conventions are observed throughout these case studies:

- When applicable, asynchronous traffic is distributed across several 3174 Subsystem Control Units; this convention optimizes resource availability and improves the consistency of overall system performance. The even distribution of asynchronous traffic across control units may also serve to expedite and standardize customizing of the affected control units; if the control units are physically and functionally equivalent, then only one control unit needs to be manually customized; copies of the customization can be made and used (with minor modifications, such as the channel address of the control unit) on the other control units.
- Ports that serve the same function are grouped together; this simplifies the planning, drawing, and understanding of the subsystem's configuration.
- Room for system expansion is provided.

Case Study Format

We start with an overall description of the computer environment and the communication requirements. We analyze the requirements for the entire system, divide the load across several control units as homogeneously as possible, state specific design qualifications, and then concentrate on how to customize and test **one** of those control units. This control unit is a piece of the overall system solution; however, its physical layout and customization represent a model or prototype that must be put into effect at each control unit equipped for asynchronous communication.

ASCII Terminal Emulation Case Study

In this case study, we set up communication between 3270 terminals and a local ASCII host. The 3270 terminals can also access an IBM host.

System Description and Communication Requirements

One hundred twenty 3178 display terminals are connected to an IBM 3090 with a VM operating system. Forty-five 3270 terminal users scattered throughout the building need access to a DEC host in the engineering department on the third floor. About one hour per terminal per day is spent using the DEC application called *VAX VMS*. Occasionally, a few of the terminals will need an application called *PARTS*. Both applications support VT100s.

What We Have to Do

Design a configuration that uses the AEA feature to meet this requirement. Decide what connection mechanism to use, how many lines are needed, what controllers will be affected, and how many AEA features to install. Allow for some expansion in the future.

Fill out the 3174 Attachment Diagrams and use them to complete the Site Planning and Customization worksheets. Enter the data into customization panels. IML a customized control unit, and check out the system.

Specific Design Qualifications

ASCII traffic will be distributed across three 3174s; each 3174 will support 15 ASCII users.

Traffic analysis indicates that five AEA ports per control unit will provide an acceptable level of port availability for the 15 users of VAX VMS. Remember, one port supports only one ASCII host session at a time. The Idle Time-Out can be increased (default = 15 minutes), because port availability should not be a problem.

VAX VMS and PARTS are considered different destinations; these applications control their own ports. On one control unit (CU1), two additional ports are allocated to PARTS. The other two control units (CU2 and CU3) will not have any ports allocated to PARTS.

Limited-distance (nonswitched) modems are capable of handling communication between the 3174s and the DEC host.

Hardware Requirements

- 17 DEC ports (seven for CU1 users, and five each for CU2 and CU3 users) and 17 EIA 232D cables
- 17 limited-distance modem pairs
- 17 twisted-pair cable runs to connect LDM pairs
- Three Asynchronous Emulation Adapters and 17 EIA 232D cables.

3174 Attachment Diagrams

Once we have determined the number of ports needed, the modem type(s), and the method of connecting stations to the AEA ports, we can diagram the layout of the system and identify station sets and port sets. A system layout consists of a 3270 Attachment Diagram and an ASCII Attachment Diagram. These diagrams are a useful reference for both site planning and customization activities.

See Figures 3-1 and 3-2 for sample attachment diagrams for CU1. We have filled in portions of the diagrams; these portions are printed in bold italic. The diagrams have been filled in by (1) identifying the stations and station sets, (2) identifying the ports and port sets, and then (3) indicating the assignment of station sets to port sets.

3270 Attachment Diagram

For the 3270 Attachment Diagram, we have:

1. Written in the names of the available hosts (VM SYS 2, VAX VMS, and PARTS) and numbered VAX VMS and PARTS as station sets 2 and 3, respectively.
2. Written in the 3270 station type (3D) and drawn an arrow down to Terminal Adapter port 14 to show that these ports are used by the 3270 displays that require access to the DEC host.

   Note: Terminal Adapter/Multiplexer ports 15–31 do not have access to the DEC host; they operate as they did before the addition of the AEA feature.
3. Written in the Default Destinations (1 = VM SYS 2). The arrow shows that all 3270 displays have the same number and sequence of Default Destinations.
4. Added brackets around those stations of the same type and default destination configuration, and assigned these stations the station set name 3178 TERMS.
5. Added brackets around the ports to which the 3178 display stations are connected, and assigned these ports the port set name PSA3178.
6. Added an arrow to show that the station set 3178 TERMS is served by port set PSA3178.

3270 Attachment Diagram

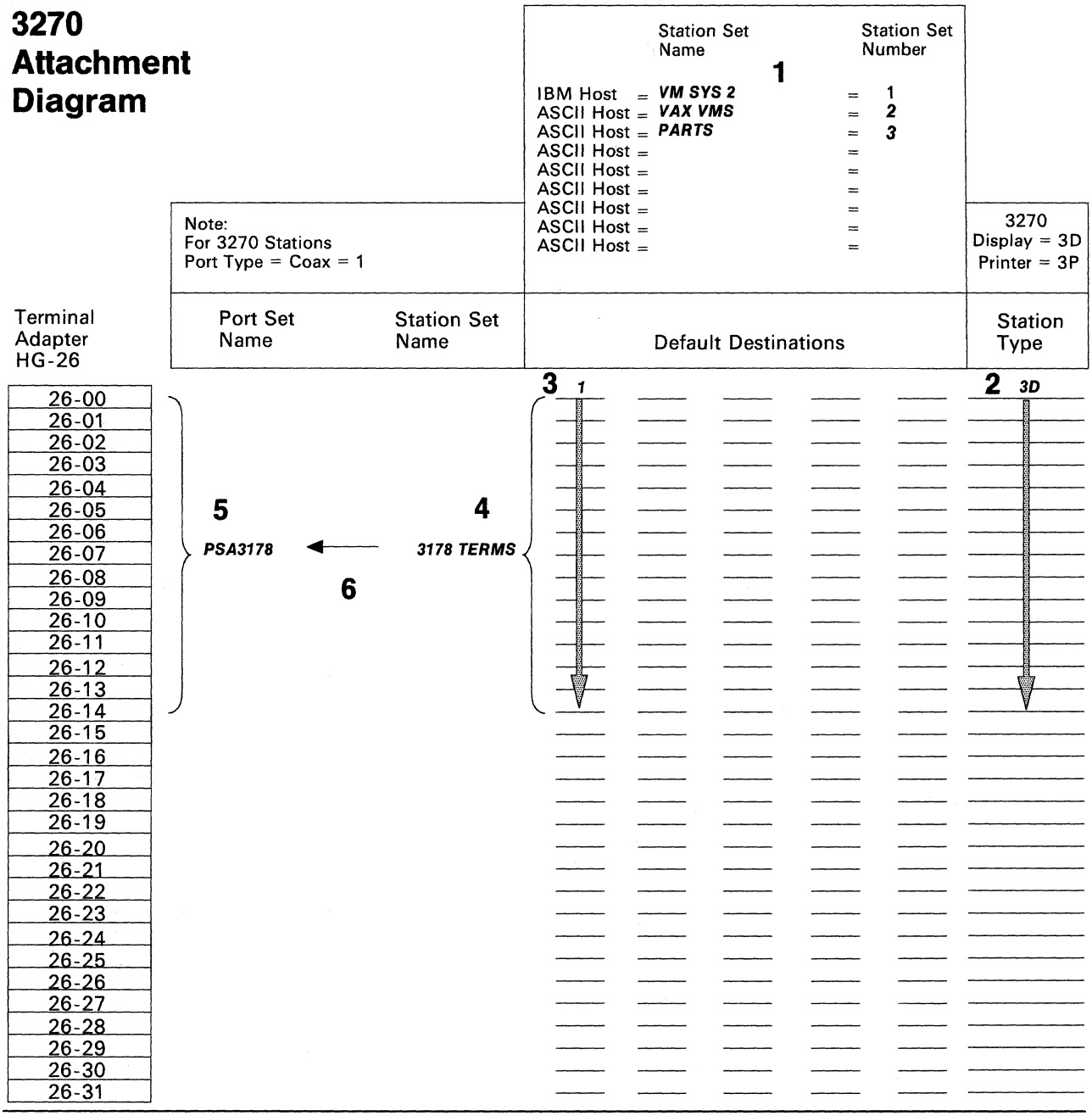


Figure 3-1. ASCII Terminal Emulation—3270 Attachment Diagram

ASCII Attachment Diagram

For the ASCII Attachment Diagram, we have:

1. Written in the names of the available hosts (VMSYS2, VAX VMS, and PARTS), and numbered VAX VMS and PARTS as station sets 2 and 3, respectively.
2. Written in the ASCII station types (AH and AH); default destination does not apply (NA) to an AH.
3. Added brackets around each AH, and assigned the station set names VAX VMS and PARTS. These names will be displayed in the Connection Menu, so they should be understandable by the application users.
4. Written in the port type (4) for AEA ports 21-00 through 21-04, and 21-06 and 21-07.

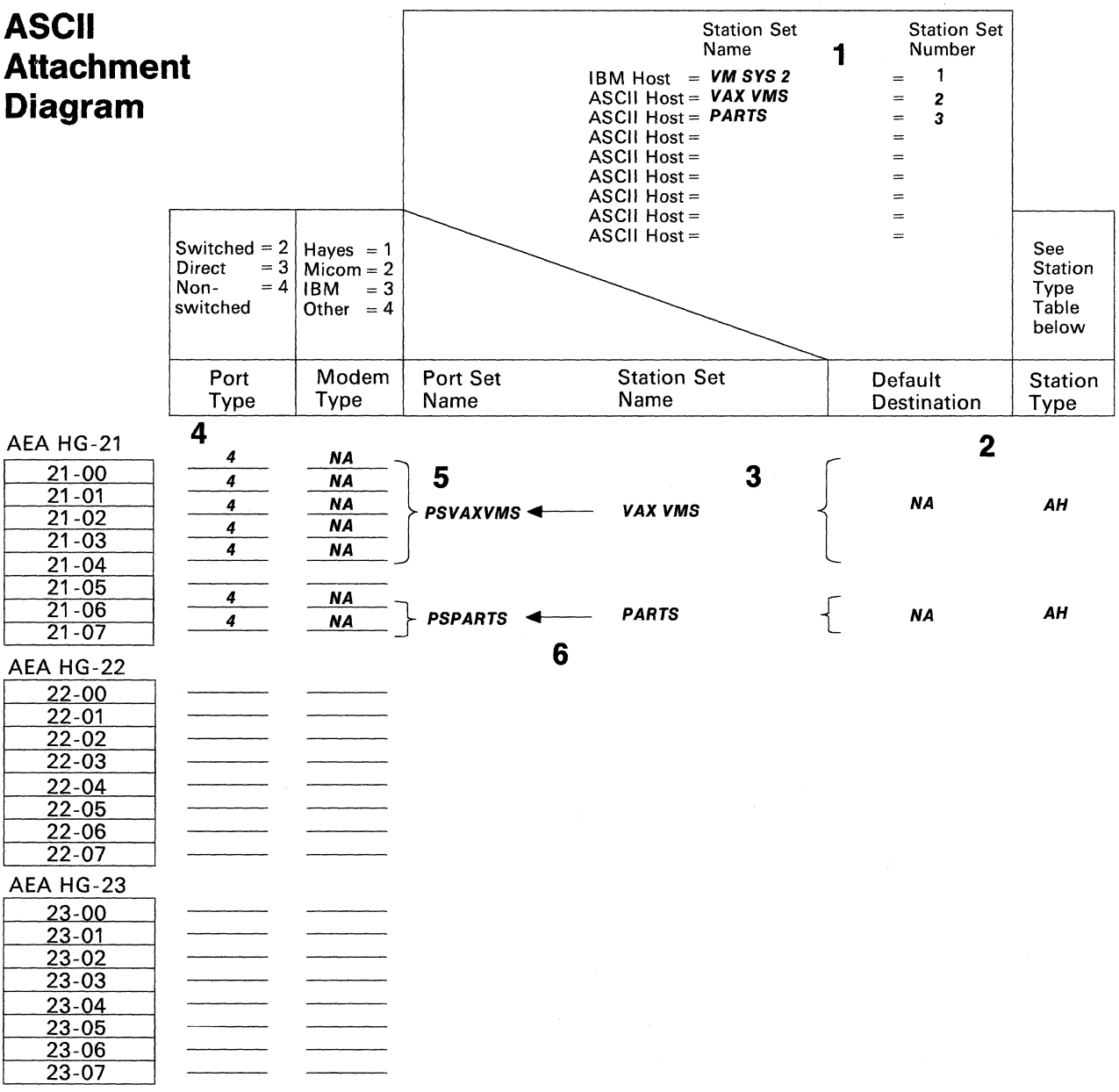
   Note: Limited-distance modems are not assigned a Modem Type (NA).
5. Added a bracket around each group of AEA ports that not only have the same port type but will be assigned to a designated DEC application; all ports in our system have the same port type, but five ports (21-00 through 21-04) have been allocated to VAX VMS, and two ports (21-06 and 21-07) have been allocated to PARTS. These two groups of ports must be in different port sets; we have assigned them the port set names PSVAXVMS and PSPARTS.
6. Added arrows to show that station sets VAX VMS and PARTS are served by port sets PSVAXVMS and PSPARTS, respectively.

Hardware Setup

Listed are the major tasks required for hardware setup:

1. Rewire the three control units so that the fifteen 3270 terminals that require access to the DEC host are connected to ports 00 through 14 on each control unit.
2. Install one AEA in CU1, CU2, and CU3. Follow the setup and checkout procedures in the setup instructions provided with the AEA feature.
3. Set up and check out EIA 232D cables, limited-distance modems, twisted-pair cabling, and any required distribution frame cross-connections.

ASCII Attachment Diagram



Station Type Table

ASCII Host	= AH	IBM PC-FTTERM Color	= FC	Lear Siegler ADM 11/12	= L1	TeleVideo 912	= T1
ASCII Printer	= AP	IBM PC-FTTERM Mono	= FM	Lear Siegler ADM 3A/5	= L3	TeleVideo 970	= T7
ADDS Viewpoint A2	= A2	Hewlett-Packard 2621B	= H2	Lear Siegler ADM 1178	= L7	DEC VT100	= V1
ADDS Viewpoint/78	= A7	IBM 3101	= I1	ANSI 3.64 Terminal	= S1	DEC VT241	= V2
Hazeltine 1500	= E1	IBM 3161/3163	= I3			DEC VT52	= V5
Esprit Executive 10/78	= E7	IBM 3164	= I4				

Figure 3-2. ASCII Terminal Emulation—ASCII Attachment Diagram

Customization Requirements

The AEA customization worksheets for CU1 are shown here. The customization for CU2 and CU3 differ from that for CU1 only in that devices on CU2 and CU3 will not have access to PARTS.

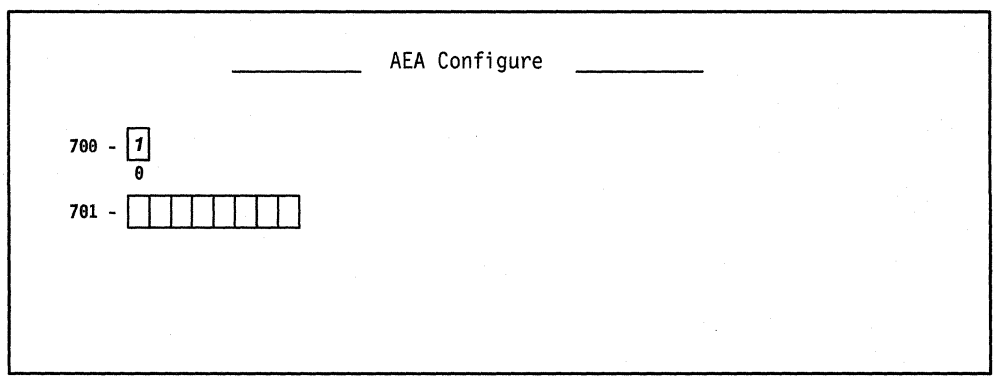
Customization involves filling out the customization worksheets, Alt 1 IMLing the control unit, entering customization mode, and then entering the worksheet data onto a series of panels. Using the 3174 Attachment Diagrams as a guide, we have filled out the following worksheets:

- AEA Configuration
- AEA Port Set
- AEA Port to Port Set Map
- AEA Station Set
- AEA Default Destination.

For detailed information on how to fill out the worksheets and customize the control unit, refer to the *3174 Customizing Guide*.

AEA Configure Worksheet

On the following worksheet, we have filled in question 700 with a 1, and we have left question 701 (password) blank.



AEA Port Set Worksheet

Shown below are names of Port Sets these names are arbitrary but must consist of no more than 8 characters (including blanks). For 3270 stations, port type is always 1 (coax) and modem type is irrelevant. The 3174 Attachment Diagrams indicate that we have three port sets:

PSA3178 Port set for Terminal Adapter ports that require access to the DEC host. Session Limit is 1, Port Type is 1 (coax), and Modem Type is irrelevant. Note that PSA3178 is port set 1.

PSVAXVMS Port set for AEA ports attached to the VAX VMS application on the DEC host. Session Limit is irrelevant, Port Type is 4 (non-switched), and because we are using limited-distance modems, Modem Type need not be specified. Note that PSVAXVMS is port set 2.

PSPARTS Port set for AEA ports attached to the PARTS application on the DEC host. Session Limit is irrelevant, Port Type is 4 (non-switched), and Modem Type need not be specified. Note that PSPARTS is port set 3.

AEA Port Set

	Name	Session Limit	Port Type	Modem Type
1	*PSA3178*	*1*	*1*	—
2	*PSVAXVMS*	*0*	*4*	—
3	*PSPARTS*	*0*	*4*	—
4		—	—	—
5		—	—	—
6		—	—	—
7		—	—	—
8		—	—	—
9		—	—	—
10		—	—	—
11		—	—	—
12		—	—	—
13		—	—	—
14		—	—	—
15		—	—	—
16		—	—	—

AEA Port to Port Set Map Worksheet

On the worksheet shown below, we have assigned ports to a port set by writing the number of the port set (1, 2, or 3) on the line corresponding to the port number that is to be in a particular port set. We have filled in:

- 1 for those ports in PSA3178

  Terminal Adapter ports 0 – 7 and 8 – 14 are mapped to port set PSA3178.

- 2 for those ports in PSVAXVMS

  AEA ports 0 – 4 are mapped to port set PSVAXVMS.

- 3 for those ports in PSPARTS.

  AEA ports 6 and 7 are mapped to port set PSPARTS.

AEA Port to Port Set Map

DCA (HG = 26)	0	1	2	3	4	5	6	7
(0-7)	1	1	1	1	1	1	1	1
(8-15)	1	1	1	1	1	1	1	—
(16-23)	—	—	—	—	—	—	—	—
(24-31)	—	—	—	—	—	—	—	—

	0	1	2	3	4	5	6	7
AEA 1 (HG = 21):	2	2	2	2	2	—	3	3
AEA 2 (HG = 22):	—	—	—	—	—	—	—	—
AEA 3 (HG = 23):	—	—	—	—	—	—	—	—

AEA Station Set Worksheets

Referring to the 3174 Attachment Diagrams, we see that we have four station sets: VM SYS 2, VAX VMS, PARTS, and 3178 TERMS. An AEA station set worksheet has been filled out for each station set (Figures 3-3 through 3-6). We have not answered all the questions on the AEA Station Set Worksheets; the questions we have not answered are either not relevant for a station set, or have acceptable defaults.

VM SYS 2 The IBM host must be assigned to a station set. In Figure 3-3, we have filled in the worksheet number (1) in the upper left corner of the worksheet, and have written in responses to questions 721 and 722.

721 Station set name. We have specified VM SYS 2 as the name of the IBM host station set; it will appear in the Connection Menu.

722 Station type. We have specified 3H as the IBM (3270) host station type.

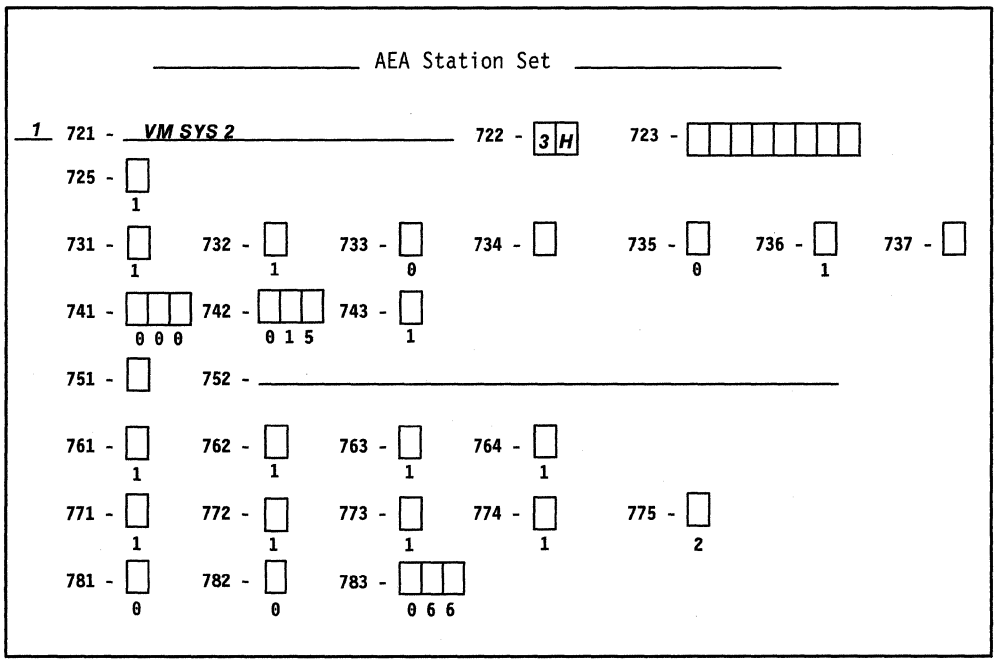


Figure 3-3. AEA Station Set Worksheet—VM SYS 2

VAX VMS

This is a DEC application that represents a unique destination. In Figure 3-4 we have filled in the worksheet number (2) in the upper left corner of the worksheet, and have written in responses to questions 721, 722, 723, 733, 735, 742, 751, and 764.

721 Station set name. We have specified VAX VMS as the name for this station set; it will appear in the Connection Menu.

722 Station type. We have specified AH for the ASCII host station type.

723 Port set name. We have specified PSVAXVMS as the port set associated with station set VAX VMS.

733 Line speed. We have specified 6 to indicate a line speed of 9600 bps.

735 Parity. We have specified 1 to indicate that odd parity will be used.

742 Idle time-out. We have increased the idle time-out (default = 15 minutes) to 30 minutes because port availability will not be a problem.

751 Data stream supported by the ASCII host. We have specified 1 to indicate that the ASCII host supports VT100 data stream.

764 Margin bell. We have specified 0 because margin bell is not useful with the applications that will be used.

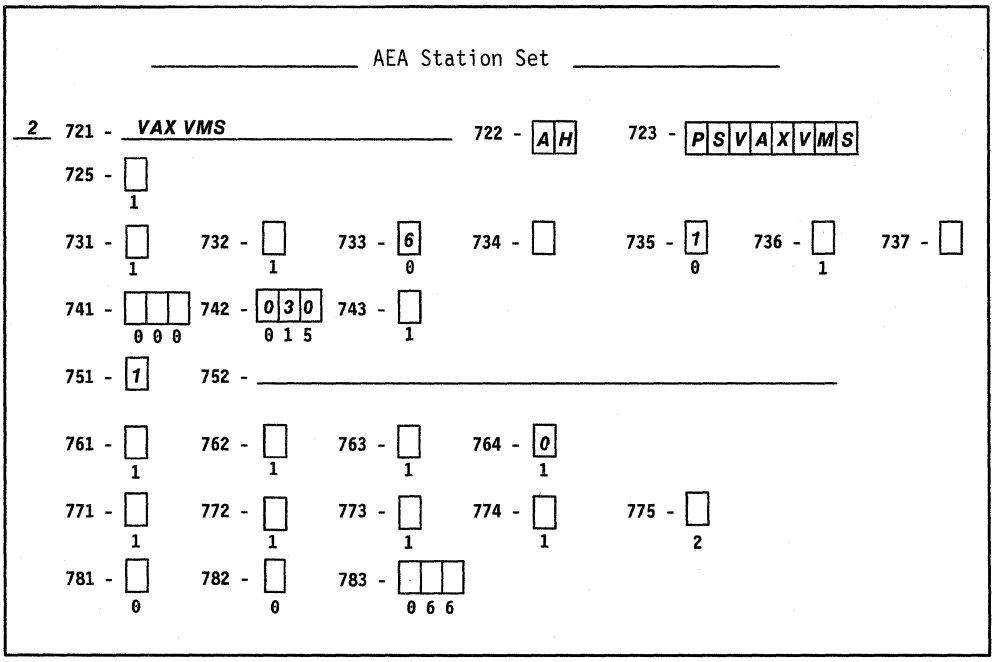


Figure 3-4. AEA Station Set Worksheet—VAX VMS

PARTS

This is another DEC application that represents a unique destination. In Figure 3-5, we have filled in the worksheet number (3) in the upper left corner of the worksheet and have written in responses to questions 721, 722, 723, 733, 735, 742, 751, and 762.

721 Station set name. We have specified PARTS as the name of the station set; this name will appear in the Connection Menu.

722 Station type. We have specified AH for the ASCII host station type.

723 Port set name. We have specified PSPARTS as the port set associated with station set PARTS.

733 Line speed. We have specified 6 to indicate a line speed of 9600 bps.

735 Parity. We have specified 1 to indicate that odd parity will be used.

742 Idle time-out. We have increased the idle time-out to 30 minutes to allow users more time to do other things.

751 Data stream supported by the ASCII host. We have specified 1 to indicate that the ASCII host supports VT100 data stream.

762 Wraparound option. We have specified a 0 because wraparound is not a useful function when using the PARTS application.

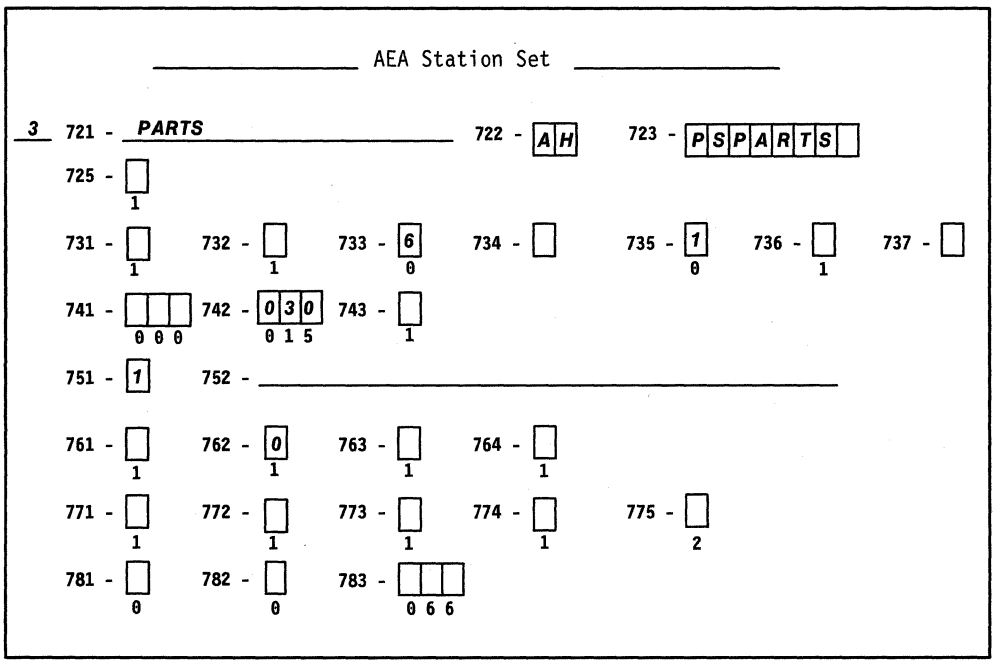


Figure 3-5. AEA Station Set Worksheet—PARTS

3178 TERMS This station set consists of those 3178 terminals with access to DEC applications. In Figure 3-6, we have filled in the worksheet number (4) in the upper left corner of the worksheet and have written in responses to questions 721, 722, and 723.

721 Station set name. We have specified 3178 TERMS as the name of the station set.

722 Station type. We have specified 3D for the 3270 display station type.

723 Port set name. We have specified PSA3178 as the port set associated with station set 3178 TERMS.

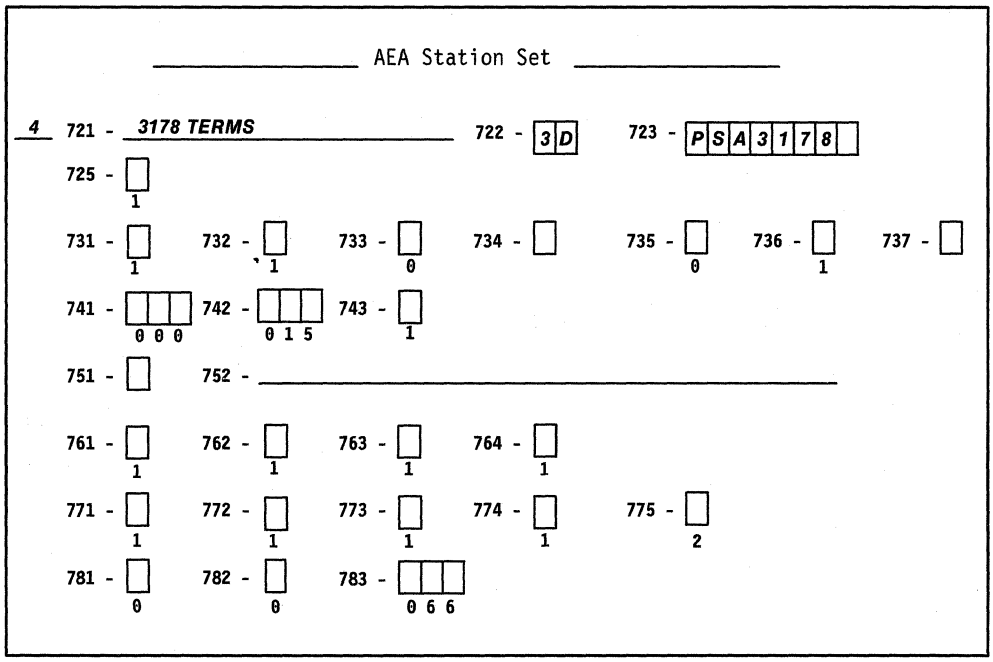


Figure 3-6. AEA Station Set Worksheet—3178 TERMS

AEA Default Destination Worksheet

On this worksheet, we have specified the IBM host, VM SYS 2, as AEA station set number 1; we have filled in the other station set names in the order that we had defined them on the AEA Station Set worksheets. In addition, we have added a **1** at the intersection of LT1 (logical terminal 1) and 3178 TERMS to indicate that when stations in station set 3178 TERMS are turned on, they will be connected to AEA Station Set Number 1, VM SYS 2.

AEA Default Destination

Station Set	Station Set Name	Session Limit	Session LT1	LT2	LT3	LT4	LT5
1	*VM SYS 2*						
2	*VAX VMS*						
3	*PARTS*						
4	*3178 TERMS*	*1*	*1*				
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Figure 3-7. AEA Default Destination Worksheet—ASCII Terminal Emulation

This is the end of filling out the worksheets. Refer to the *3174 Customizing Guide* for further customization procedures.

System Checkout and Operation

After customizing the control unit, IML the control unit with the newly customized Control diskette or fixed disk. Then, to check out the operation of your system:

1. Switch on a 3178 terminal and verify the connection to the IBM host.
2. Hold ALT, Press the Erase EOF key, Release ALT and the Erase EOF key, Press and release M. You should see the Connection Menu; this menu is a list of hosts that the terminal can access. In this case, we would see a Connection Menu like the one shown in Figure 3-8 on page 3-16.

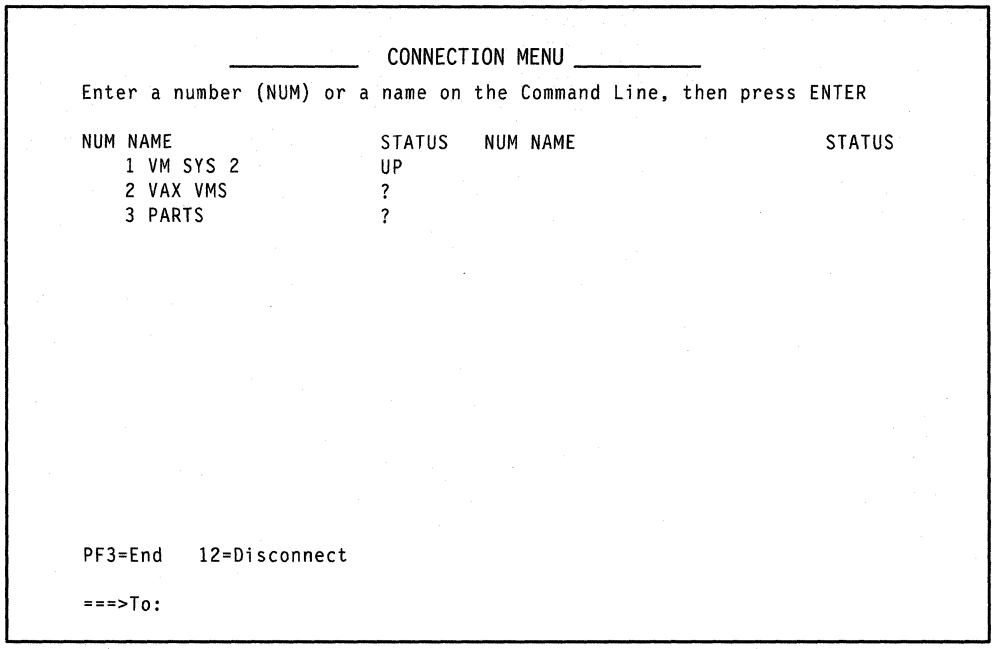


Figure 3-8. Connection Menu

3. Type in the number (NUM) of the host (or, in this case, the application) that you want to access, and press ENTER.

   Examples:

   Type **2** and press ENTER to select the VAX VMS application.

   Type **3** and press ENTER to select the PARTS application.

   Note: PARTS can be accessed only from CU1. Therefore, it will not appear in the Connection Menu for control units CU2 and CU3.

4. When READY is displayed at the top of the screen, the display station is ready to access your host application. For information on keyboard maps and terminal operations, refer to *3174 Terminal User's Reference for Expanded Functions*.

3270 Terminal Emulation Case Study

In this case study, we will set up communication between remote ASCII terminals and a channel-attached IBM host.

System Description and Requirements

A large MVS/VTAM/TSO/IMS installation supports four hundred 3270 displays of various types on three mainframes. Night-time access is needed to two of the mainframes for 40 system programmers who have PCs with 5842 modems at home. Use of this service will be infrequent but intensive when needed. Twelve of the PCs use FTTERM and have color monitors, and attached printers. A VT100 emulator will be used with the other PCs.

What We Have to Do

Design a configuration that uses the AEA feature to meet this requirement. Decide what connection mechanism to use, how many lines are needed, what control units will be affected, and how many AEA features to install. Outline operational and security procedures. Complete Site Planning and Customization worksheets to implement your solution. Enter the data into customization panels. IML a customized control unit and check out the system.

Specific Design Qualifications

1. To support the possibility that all 40 users may need IBM host access at the same time, we need to provide 40 AEA ports. Allowing for growth, we will need six AEAs.
2. ASCII traffic will be distributed across six 3174s: three of the 3174s are connected to one IBM host, and three are connected to the other IBM host. Therefore, each set of three 3174s will support 20 ASCII users.
3. One AEA port is needed for each ASCII user. Therefore, for 40 users, seven ports per AEA will support the traffic. To provide room for system growth, we will configure eight AEA ports, but use only six or seven.
4. Switched communication is supported by IBM 5842 auto-call modems attached to the AEA ports.
5. IBM hosts are SNA hosts, so there are no host address limitations.

Hardware Requirements

- Six Asynchronous Emulation Adapters (one per 3174)
- 40 EIA 232D cables
- 40 modems
- 40 telephone circuits

[1] Trademark of Digital Equipment Corporation.

3174 Attachment Diagrams

Once we have determined the number of ports needed, the modem type(s), and the method of connecting stations to the AEA ports, we can diagram the layout of the system and identify station sets and port sets. A system layout consists of a 3270 Attachment Diagram and an ASCII Attachment Diagram. However, because the 3270 terminals are not involved in this configuration, we need only to fill out an ASCII Attachment Diagram. These diagrams are a useful reference for both site planning and customization activities.

See Figure 3-9 on page 3-19 for a sample ASCII Attachment Diagram. We have filled in portions of this diagram; these portions are printed in bold italic. The diagram has been filled in by (1) identifying the stations and station sets, (2) identifying the ports and port sets, and then (3) indicating the assignment of station sets to port sets.

ASCII Attachment Diagram

For the ASCII Attachment Diagram, we have:

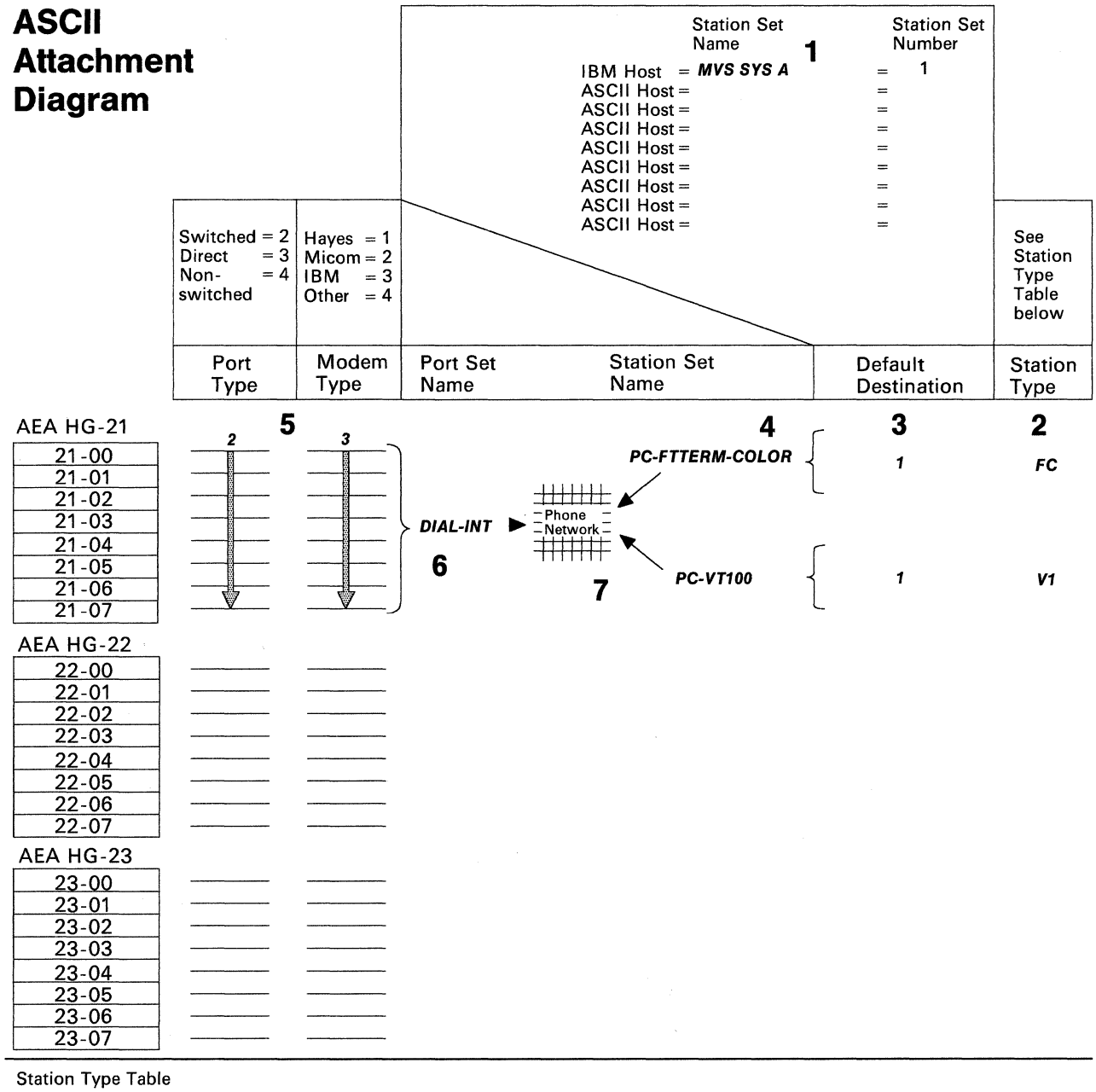
1. Written in the name of the available host, MVS SYS A. The host is already numbered as Station Set 1.
2. Written in the ASCII station types: FC and V1. FC is the station type for the group of FTTERM PC terminals, and V1 is the station type for the group of PC's running VT100 terminal emulators.
3. Written in the Default Destination: 1 = MVS SYS A.
4. Added brackets around those stations of the same type and default destination, and assigned these stations the Station Set names PC-FTTERM-COLOR and PC-VT100.
5. Written in the Port Type (2) and Modem Type (3) for AEA ports 21-00 through 21-07; the arrows indicate the repetition of the previous Port or Modem Type.
6. Added a bracket around this group of AEA ports with the same Port and Modem Type, and assigned it the Port Set name, DIAL-INT.
7. Drawn a switched-line, phone network symbol, and added arrows to show that Station Sets PC-FTTERM-COLOR and PC VT00 are served by the switched ports of Port Set, DIAL-INT.

Hardware Setup

Listed are the major tasks required for hardware setup:

1. Install one AEA in each of six control units (CU1 through CU6). Follow the setup and checkout procedures in the setup instructions provided with the AEA feature.
2. Set up and check out EIA 232D cables, modems, and telephone connections.

ASCII Attachment Diagram



Station Type Table

ASCII Host	= AH	IBM PC-FTTERM Color	= FC	Lear Siegler ADM 11/12	= L1	TeleVideo 912	= T1
ASCII Printer	= AP	IBM PC-FTTERM Mono	= FM	Lear Siegler ADM 3A/5	= L3	TeleVideo 970	= T7
ADDS Viewpoint A2	= A2	Hewlett-Packard 2621B	= H2	Lear Siegler ADM 1178	= L7	DEC VT100	= V1
ADDS Viewpoint/78	= A7	IBM 3101	= I1	ANSI 3.64 Terminal	= S1	DEC VT241	= V2
Hazeltine 1500	= E1	IBM 3161/3163	= I3			DEC VT52	= V5
Esprit Executive 10/78	= E7	IBM 3164	= I4				

Figure 3-9. 3270 Terminal Emulation—ASCII Attachment Diagram

Customization Requirements

The AEA customization worksheets for CU1 are shown below. The customization for CU2 through CU6 is identical to that for CU1.

Customizing involves filling out the customization worksheets, Alt 1 IMLing the control unit, entering customization mode, and then entering the worksheet data onto a series of panels. Using the ASCII Attachment Diagram, we have filled out the following worksheets:

- AEA Configuration
- AEA Port Set
- AEA Port to Port Set Map
- AEA Station Set
- AEA Default Destination.

Note: An ASCII terminal emulating a 3270 terminal requires a 3270 host address. Therefore, the Port Assignment Worksheet must also be filled out. For attached printer support each port must be assigned two host addresses and the controller must be configured for Multiple Logical Support (MLT) support. Refer to the *3174 Customizing Guide* for information on the Port Assignment Worksheet.

For detailed information on how to fill out the worksheets and customize the control unit, refer to the *3174 Customizing Guide*.

AEA Configure Worksheet

On worksheet shown below, we have filled in question 700 with a 1, and we have filled in 701 (password) with LETMEIN. ASCII terminals will be prompted for the control unit access password before they can log on to a host application.

```
                    AEA Configure

700 - 1
      0
701 - LETMEIN
```

AEA Port Set Worksheet

Shown below are names of Port Sets these names are arbitrary, but must consist of no more than 8 characters (including blanks). The ASCII Attachment Diagram indicates that we have one port set:

DIAL-INT Port set for the AEA ports used by remote ASCII terminals. Session limit is 1 (even though some devices may have an attached printer), Port Type is 2 (switched), and Modem Type is 3 (IBM). Note that DIAL-INT is port set 1.

AEA Port Set

	Name	Session Limit	Port Type	Modem Type
1	***DIAL-INT***	***1***	***2***	***3***
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

AEA Port to Port Set Map Worksheet

On the worksheet shown below, we have assigned ports to a port set by writing the number of the port set (1) on the line corresponding to the port number that is in the particular port set. We have filled in:

- 1 for ports 0-7 in Port Set DIAL-INT.

AEA Port to Port Set Map

DCA (HG = 26)	0	1	2	3	4	5	6	7
(0-7)								
(8-15)								
(16-23)								
(24-31)								

	0	1	2	3	4	5	6	7
AEA 1 (HG = 21):	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
AEA 2 (HG = 22):								
AEA 3 (HG = 23):								

AEA Station Set Worksheets

Referring to the 3174 ASCII Attachment Diagram, we see that we have three station sets: MVS SYS A, PC-FTTERM-COLOR, and PC VT100. An AEA Station Set Worksheet must be filled out for each station set (Figures 3-10 through 3-12). We have not answered all the questions on the AEA Station Set Worksheets; the questions we have not answered are either not relevant for a station set, or have acceptable defaults.

MVS SYS A The IBM host must be assigned to a Station Set. In Figure 3-10 we have filled in the worksheet number (1) in the upper left corner of the worksheet and have written in responses to questions 721 and 722.

721

Station set name. We have specified MVS SYS A as the name of the IBM host station set; it will appear in the Connection Menu.

722

Station type. We have specified 3H as the IBM (3270) host station type.

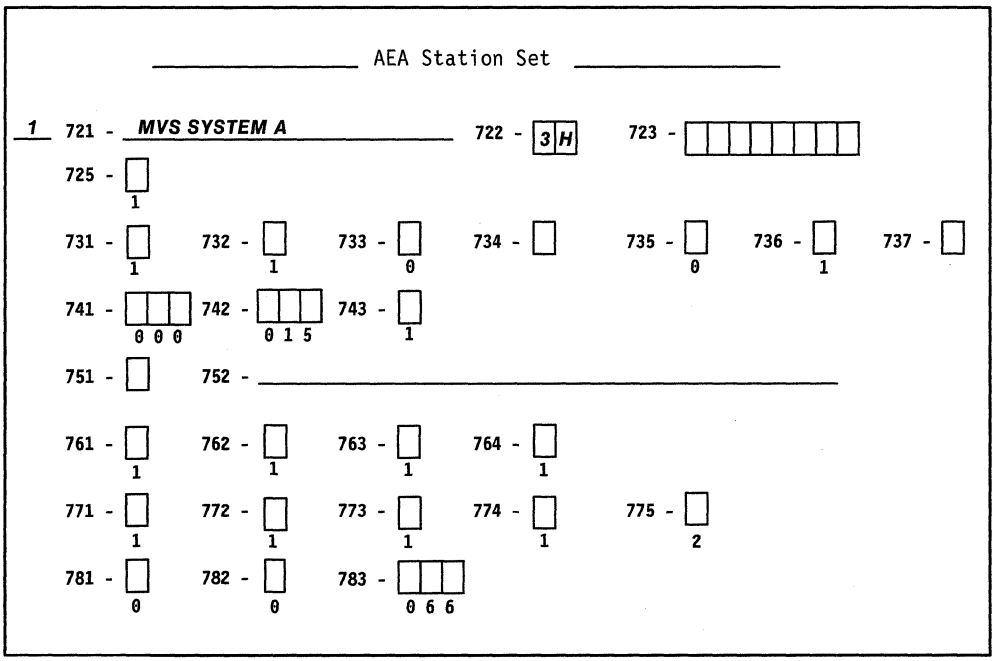


Figure 3-10. AEA Station Set Worksheet—MVS SYSTEM A

PC-FTTERM-COLOR This is the remote PC with a color monitor and attached printer running FTTERM that requires access to MVS SYS A. In Figure 3-11, we have filled in the worksheet number (2) in the upper left corner of the worksheet and have written in responses to questions 721, 722, 723, 737, 742, and 781.

Note: We have accepted the default values for questions 733 (line speed = autobaud) and 735 (parity = auto) because calls will be coming in at different speeds.

721 Station set name. We have specified PC-FTTERM-COLOR as the name of the station set.

722 Station type. We have specified FC as station type to indicate that these IBM PCs are using FTTERM with color displays.

723 Port set name. We have specified DIAL-INT as the port set associated with station set PC-FTTERM-COLOR.

737 Maximum modem line speed. We have specified a 4 to indicate a maximum modem line speed of 2400 bps (maximum speed supported by the IBM 5842).

742 Idle time-out. We have increased the idle time-out (default = 15 minutes) to 60 minutes because port availability will not be a problem; a separate port is provided for each user.

781 Attached printer prompt. We have responded to this question with a 1, causing the user to be asked whether he has an attached printer.

```
DO YOU HAVE A PRINTER ATTACHED TO THIS TERMINAL?
(1=YES, 0=NO) = = = = = > _
```

The user's answer to this prompt will determine whether or not the AEA will manage the attached printer.

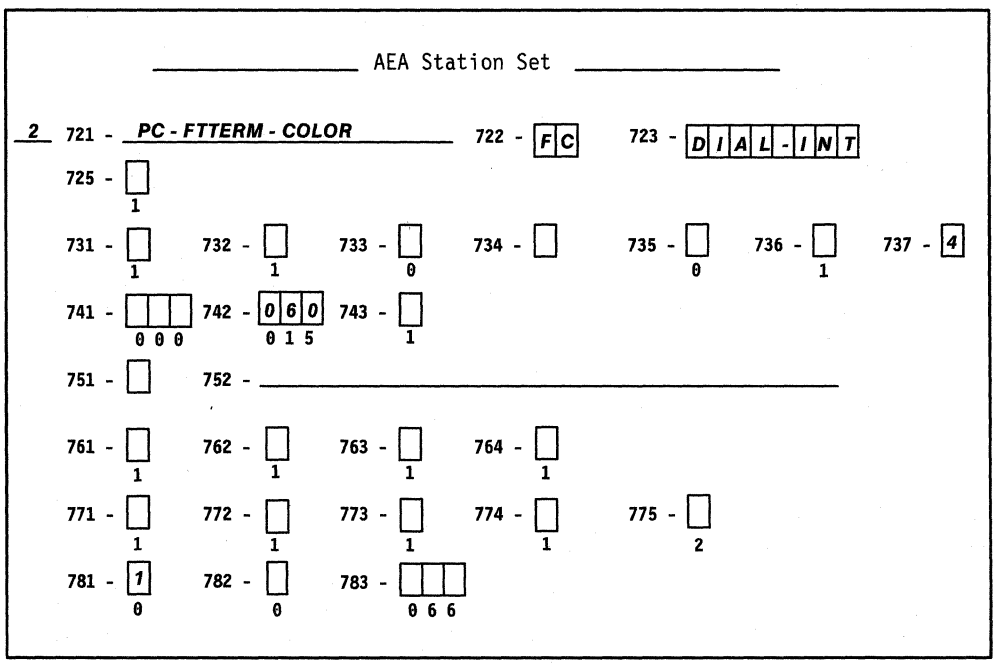


Figure 3-11. AEA station Set Worksheet—PC-FTTERM-COLOR

PC-VT100

These are the remote PC's running a DEC VT100 Emulation Program that require access to MVS SYS A. In Figure 3-12 we have filled in the worksheet number (3) in the upper left corner of the worksheet, and have written in responses to questions 721, 722, 723, 737, and 742.

Note: Questions 733 and 735 are again left at their default values. All display stations assigned to the same port set must have the same settings for line speed, parity, and stop bits.

721 Station set name. We have specified PC-VT100 as the name of the station set.

722 Station type. We have specified V1 as station type to indicate that these are PCs running a VT100 Emulation Program.

723 Port set name. We have specified DIAL-INT as the port set associated with station set PC-VT100.

737 Maximum modem line speed. We have specified a 4 to indicate a maximum modem line speed of 2400 bps (maximum speed for this station set), VT100.

742 Idle time-out. We have increased the idle time-out (default = 15 minutes) to 60 minutes because port availability will not be a problem; a separate port is provided for each user.

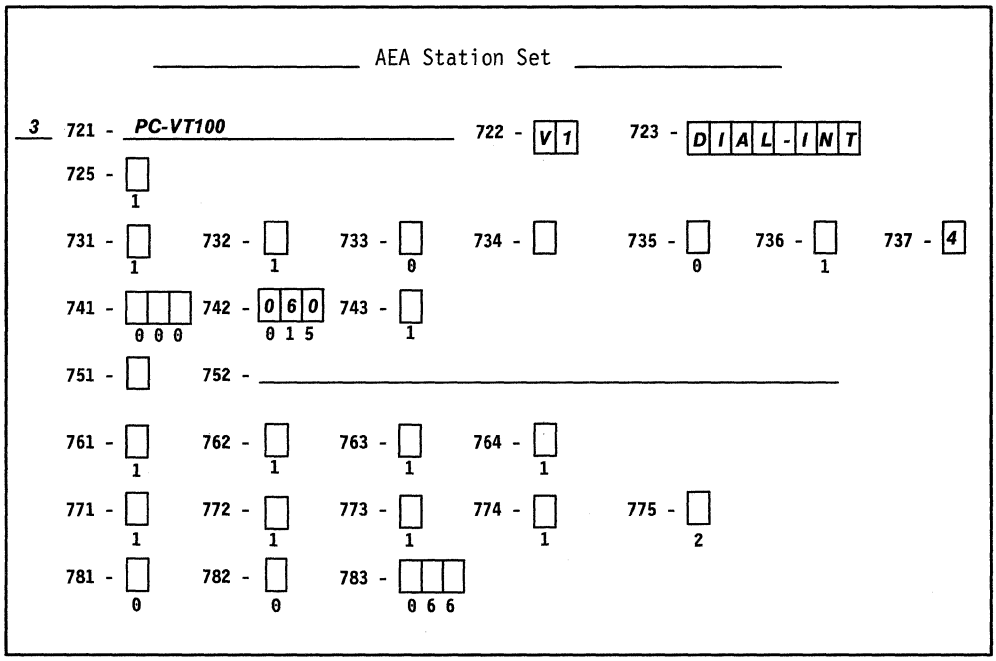


Figure 3-12. AEA Station Set Worksheet—PC-VT100

AEA Default Destination Worksheet

On this worksheet, we have specified the IBM host, MVS SYS A, as AEA station set number 1. We have filled in the other station set names in the order that we defined them on the AEA Station Set worksheets. We have added a **1** at the intersections of LT1 and PC-FTTERM-COLOR and LT1 and PC-VT100 to indicate that, when stations in these station sets dial in to the control unit, they will be connected to the AEA station set number 1, MVS SYS A.

AEA Default Destination

Station Set	Station Set Name	Session Limit	Session LT1	LT2	LT3	LT4	LT5
1	*MVS SYS A*						
2	*PC-FTTERM-COLOR*	*1*	*1*				
3	*PC-VT100*	*1*	*1*				
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Figure 3-13. AEA Default Destination Worksheet—3270 Terminal Emulation

This is the end of filling out the worksheets. Refer to the *3174 Customizing Guide* for further customizing procedures.

System Checkout and Operation

After customizing the control unit, IML the control unit with the newly customized Control diskette or fixed disk and the AEA Downstream Load (DSL) diskette. Then, to check out the operation of your system, dial in to the IBM host from a PC running FTTERM-COLOR, or a VT100 emulator. (Refer to the *3174 Terminal User's Reference for Expanded Functions* for information on the keyboard map and terminal operations).

3270 and ASCII Terminal Emulation Case Study

System Description and Requirements

A VM/PROFS system with channel-attached 3274s has a large number of another manufacturer's (OEM) protocol converters attached over BSC lines. 3270 terminals are attached to the 3274s; locally attached ASCII display stations emulating ADDS Viewpoint 78s and dial-in VT220 displays (emulating VT100s) are attached to the OEM protocol converters. Local non-SNA 3274s are to be replaced by 3174s. In so doing, some of the OEM protocol converters will be replaced by AEA features; only the VT220s will be connected to the AEAs. In addition, a number of inexpensive ASCII printers are needed to be used for local copy near some of the 3270 displays. Communication also needs to be set up between the 3270 terminals and a remote information service (INFOSERV). Finally, dial-out communication needs to be set up between the 3270 terminals and a remote ASCII host.

INFOSERVE The 3174 dialing out to a remote host requires access to a modem operating at 1200 bps. In Figure 3-14 on page 3-28, we have filled in the worksheet number (1) in the upper left corner of the worksheet and have written in responses to questions 721, 722, 723, 733, 735, 742, 751, and 752.

721 Station set name. We have specified ASCII HOST as the name of the station set.

722 Station type. We have specified AH as station type to indicate that this station can dial out to an ASCII host.

723 Port set name. We have specified DIAL-OUT as the port set associated with station set ASCII HOST.

733 Line speed. We have specified 3 to indicate a line speed of 1200 bps.

735 Parity. We have specified 4 to indicate that space parity will be used.

742 Idle time-out. We have specified 60 minutes for idle time-out because port availability will not be a problem; a separate port is required for each user.

751 Data stream support by the ASCII host. We have specified 1 to indicate that the ASCII host supports VT100 data stream.

752 ASCII host phone number. We have specified (as an example only) the phone number of the ASCII host. This number will be sent to an auto-call modem when a connection to this host is requested. This dial string can contain control characters the modem uses to perform certain operations (for example, "wait for second dial tone").

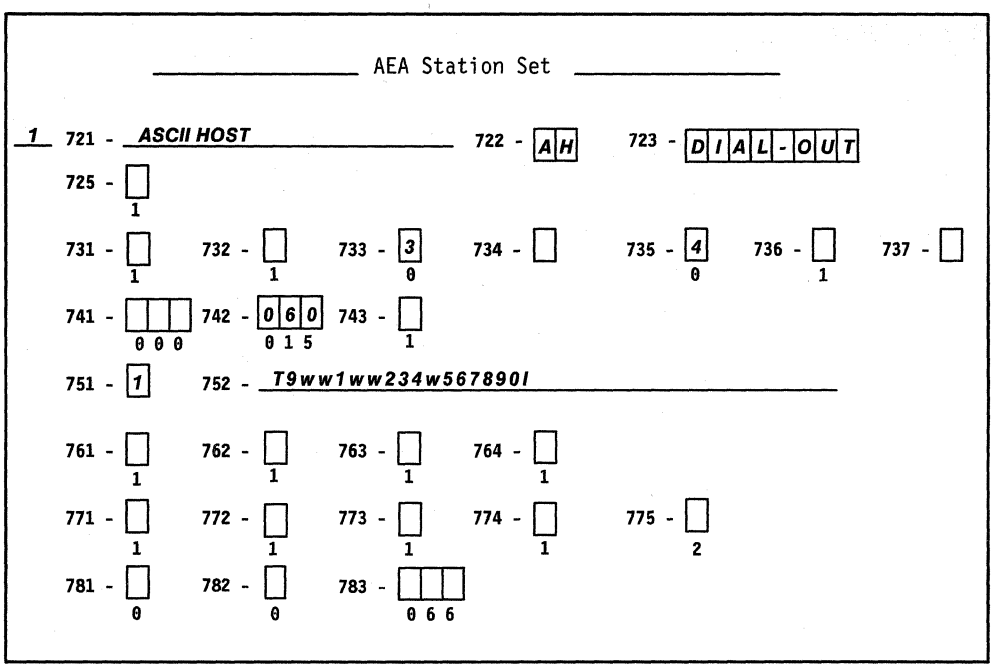


Figure 3-14. AEA Station Set Worksheet—ASCII HOST

What We Have to Do

Design a representative control unit configuration that addresses these requirements; complete only the 3174 Attachment Diagrams for one control unit (CU1).

Specific Design Qualifications

- Six control units are required to distribute data traffic evenly.
- VT220s will be prompted for a password.
- Systems analysis shows that the information service and the VT220s can be supported by 12 switched AEA ports per control unit; these ports will be used by 3270 terminals to dial out to the information service, or by remote VT220s to dial in to the IBM host. In addition, 12 AEA ports will be used for local ASCII printers.

Hardware Requirements

- 18 AEAs (three for each control unit)
- 12 auto-call modems (per control unit) to support dialing out to the information service and dialing in from the VT220s
- 12 limited-distance modem pairs per control unit for ASCII printers
- 24 EIA 232D cables per control unit for LDMs and auto-call modems
- Twisted-pair wiring to each ASCII printer.

3174 Attachment Diagrams

Once we have determined the number of ports needed, the modem type(s), and the method of connecting stations to the AEA ports, we can diagram the layout of the system and identify station sets and port sets. A system layout consists of a 3270 Attachment Diagram and an ASCII Attachment Diagram. These diagrams are a useful reference for both site planning and customization activities.

See Figures 3-15 and 3-16 for sample attachment diagrams for CU1. The diagrams have been filled in by (1) identifying the stations and station sets, (2) identifying the ports and port sets, and then (3) indicating the assignment of station sets to port sets.

3270 Attachment Diagram

For the 3270 Attachment Diagram, we have:

1. Written in the names of the available hosts (VM/PROFS and INFOSERV), and numbered INFOSERV as station set 2.
2. Written in the 3270 station type (3D), and drawn an arrow down to Terminal Adapter port 27 to show that these ports are used by 3270 displays.
3. Written in the Default Destination (1 = VM/PROFS). The arrows show that all 3270 displays have the same default destination.
4. Added a bracket around these stations of the same type and default destination configuration, and assigned to them the station set name 3270 TERMS.
5. Added brackets around the ports to which the 3270 display stations are connected, and assigned these ports the port set name PS3270.
6. Added an arrow to show that the station set 3270 TERMS is served by port set PS3270.

3270 Attachment Diagram

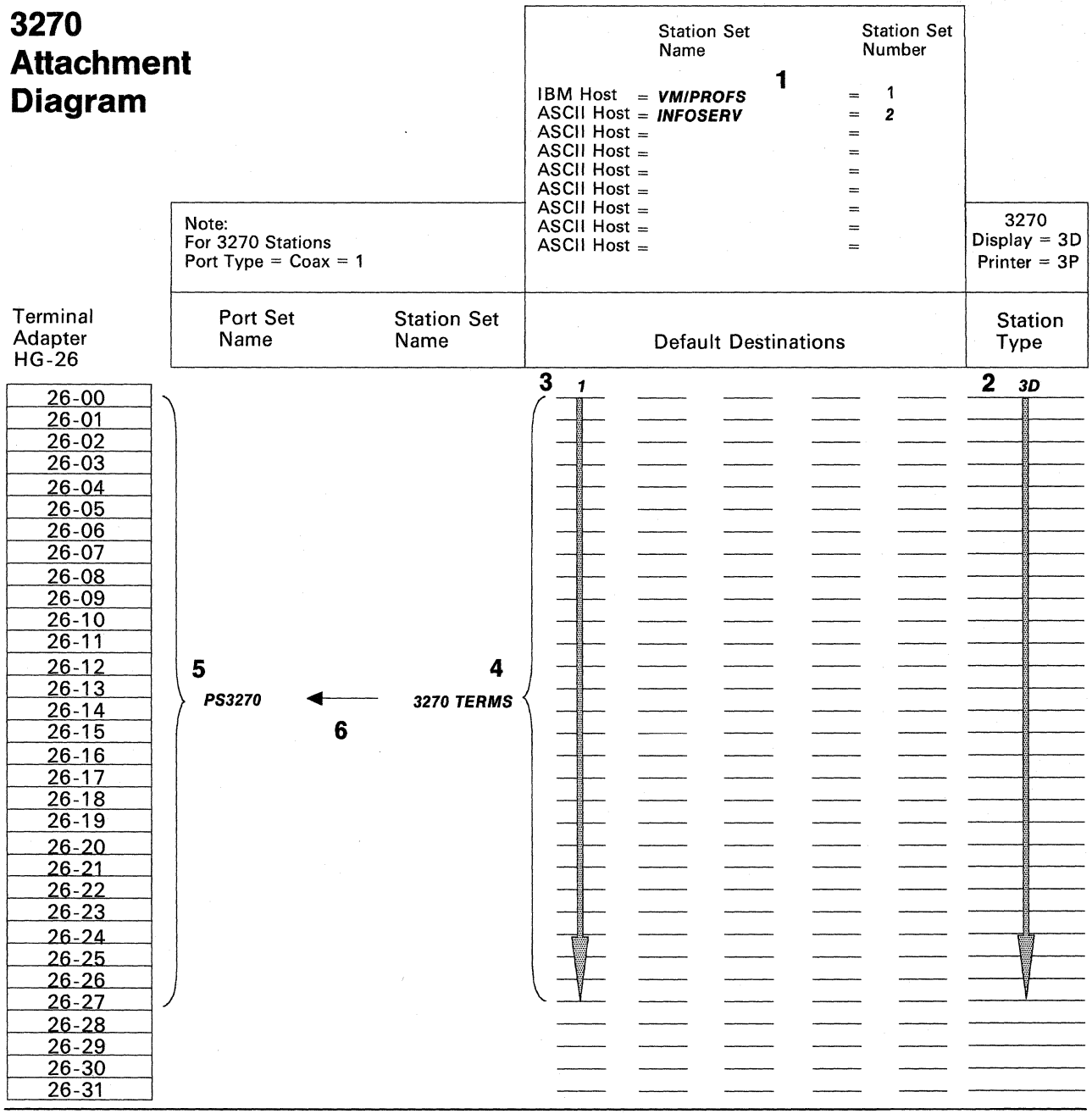


Figure 3-15. 3270/ASCII Terminal Emulation—3270 Attachment Diagram

ASCII Attachment Diagram

For the ASCII Attachment Diagram, we have:

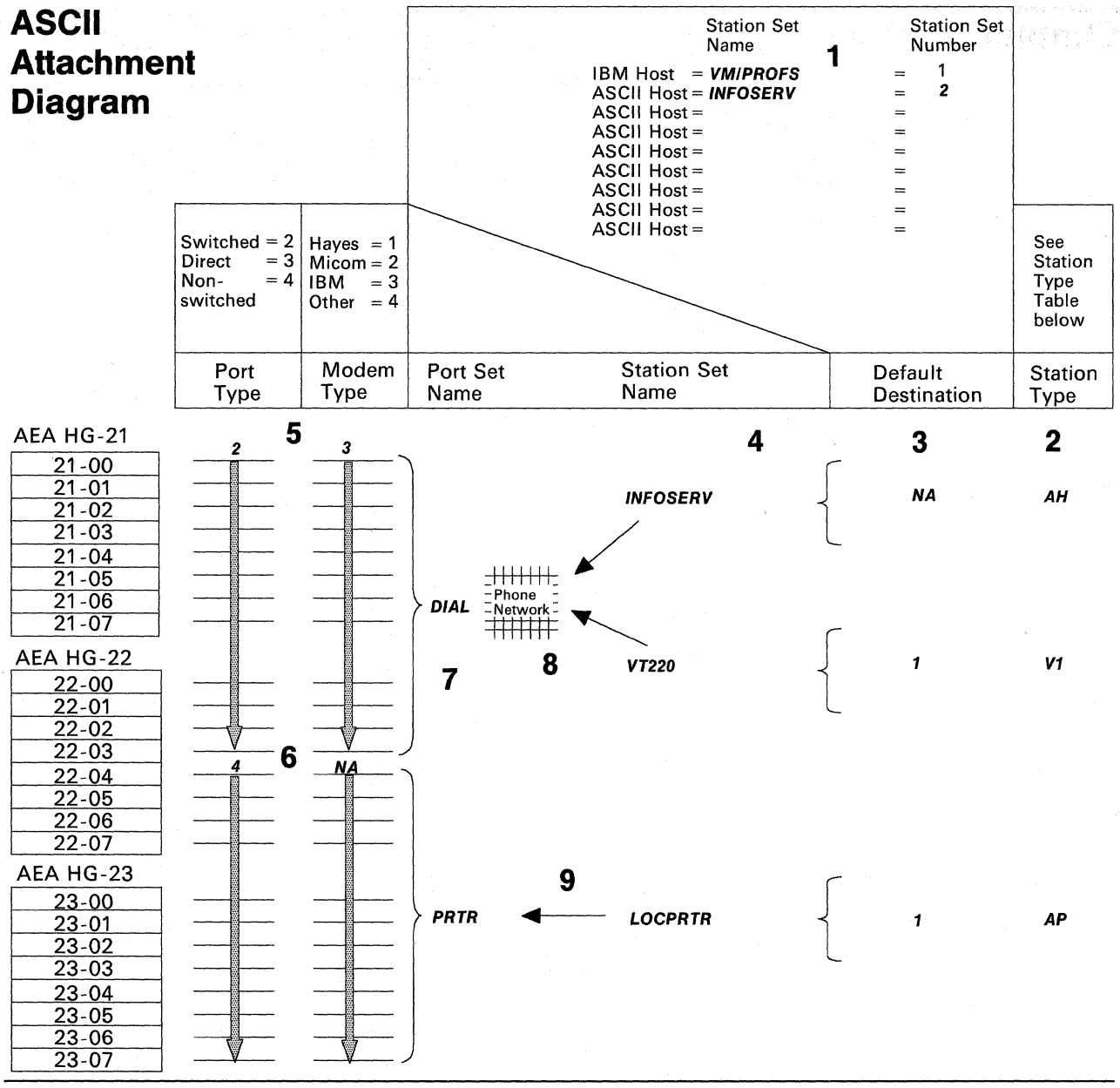
1. Written in the names of the available hosts (VM/PROFS and INFOSERV), and numbered INFOSERV as station set 2.
2. Written in the ASCII station types (AH, V1, and AP); V1 is the station type for the group of VT220 terminals, and AP is the station type for the 12 ASCII printers.
3. Written in the Default Destination (1 = VM/PROFS); default destination does not apply (NA) to an AH.
4. Added brackets around those stations of the same type and default destination, and assigned these stations the station set names INFOSERV, VT220, and LOCPRTR.
5. Written in the Port Type (2) and Modem Type (3) for AEA ports 21-00 through 22-03 (12 ports); the arrows indicate the repetition of the previous Port or Modem Type.
6. Written in the Port Type (4) and Modem Type (not applicable) for AEA ports 22-04 through 23-07 (12 ports); the arrows indicate the repetition of the previous Port or Modem Type.
7. Added a bracket around each group of AEA ports that have the same Port Type and Modem Type, and assigned each group a port set name: DIAL for ports 21-00 – 22-03, and PRTR for ports 22-04 – 23-07.
8. Drawn a switched-line, phone network symbol, and added arrows to show that station sets INFOSERV and VT220 are served by the switched ports of port set DIAL.
9. Added an arrow to show that Station Set LOCPRTR is served by the non-switched ports of port set PRTR.

Additional Customizing Requirements

To provide system security on the dial-in ports (VT220s only), a password could be specified on the AEA Configuration Panel, question 701. Additionally, on the AEA Station Set Panel, you could restrict the stations in the VT220 station set from using the Connection Menu; the VT220s would have access only to the IBM host.

To assign the ASCII printers to 3270 terminals, you will have to define the printer authorization matrix (PAM). Refer to the *3174 Customizing Guide* for details on the PAM procedure.

ASCII Attachment Diagram



Station Type Table

ASCII Host	= AH	IBM PC-FTTERM Color	= FC	Lear Siegler ADM 11/12	= L1	TeleVideo 912	= T1
ASCII Printer	= AP	IBM PC-FTTERM Mono	= FM	Lear Siegler ADM 3A/5	= L3	TeleVideo 970	= T7
ADDS Viewpoint A2	= A2	Hewlett-Packard 2621B	= H2	Lear Siegler ADM 1178	= L7	DEC VT100	= V1
ADDS Viewpoint/78	= A7	IBM 3101	= I1	ANSI 3.64 Terminal	= S1	DEC VT241	= V2
Hazeltine 1500	= E1	IBM 3161/3163	= I3			DEC VT52	= V5
Esprit Executive 10/78	= E7	IBM 3164	= I4				

Figure 3-16. 3270/ASCII Terminal Emulation — ASCII Attachment Diagram

Chapter 4. Modem and ASCII Terminal Setup Reference

Modem Specifications and Setup 4-2
IBM 5841 and 5842 Setup 4-2
Hayes SmartModem 1200 Setup 4-3
Micom Data Modems 4-5
ASCII Station Setup 4-5

This chapter describes how to set up modems and ASCII terminals that are connected to an Asynchronous Emulation Adapter (AEA) port.

Modem Specifications and Setup

IBM 5841 and 5842, Hayes SmartModem[1] 300 and 1200, and Micom Data Modems Models 3012 and 3024 are auto-call modems supported for communication to ASCII hosts. The dial strings may be either stored in the 3174 at customizing or entered from a display station keyboard (manual dial).

For automatic calling (auto-call), the AEA's interface to IBM, Hayes, and Micom intelligent modems conforms to the specification in the documentation supplied with each modem. For manual calling, the AEA acts only as a conduit for a user-to-modem conversation; the user represents the interface to the auto-call modem and must have a detailed understanding of the modem's commands and responses.

These modems should conform to the following general specifications:

- Asynchronous, EIA 232D transmission
- Auto-answer or auto-call
- 9- to 11-bit character frame (includes 1 start bit, 7 data bits, 1 parity bit [optional], and 1 or 2 stop bits).

IBM 5841 and 5842 Setup

IBM 5841 and 5842 modems are operated in Attention Command Set (AT) mode; any parameters set by commands that are required for operation with the AEA feature are the same as for Hayes modems. However, the switch settings for IBM 584x modems are not compatible with Hayes, and must be set as specified here.

For the IBM 5842 modem, the six front panel switches must be in the "out" position. In addition, the eight configuration switches must be set as described in Table 4-1 on page 4-3.

[1] Trademark of Hayes Microcomputer Products, Inc.

Table 4-1. IBM 584x Modem Switch Settings

Switch Number	Option Name	Switch Setting	Description
1	Receive Line Signal Detect (RLSD). (Also known as Carrier Detect [CD] or Data Carrier Detect [DCD])	On	Carrier Detect is raised at connection time.
2	Reset to Default Options on Loss of DTR	Off	When this switch is set to OFF, the 3174 can reset the modem to a known state by dropping DTR. If register settings are not required for special installation requirements, this reset can be used to avoid unexpected results that can arise from previous use. Not used on 5841.
3	Transmit Timing Option (Synchronous mode only)	Not relevant	
4	Asynchronous or Synchronous Mode	On	Asynchronous mode is used.
5	Source of Data Terminal Ready (DTR)	On	AEA controls DTR.
6	Transmit Clocking from Remote Modem (Synchronous mode only)	Not relevant	
7	Request to Send (RTS)	Off	AEA controls RTS.
8	Data Set Ready (DSR)	Off (5842) On (5841)	DSR is raised at connection (5842). DSR is always on (5841).

Hayes SmartModem 1200 Setup

A Hayes SmartModem 1200 should be set up as described in Table 4-2 on page 4-4. Once the Hayes modem is turned on, many of the operating parameters or default values may be overridden by keyboard commands entered during Online Test 12 (/12 test). Refer to the *3174 User's Guide* and *3174 Extended Problem Determination* for Test 12 procedures. In Table 4-3 on page 4-4, a register number is the Hayes Register number that can be set by sending commands to the modem from the keyboard.

Note: Modems that operate at 2400 bps and some that operate at 1200 bps do not have configuration switches. These modems must be configured prior to attachment to the 3174 and must be consistent with the options shown in Table 4-1, Table 4-2 on page 4-4, and Table 4-3 on page 4-4.

Table 4-2. Hayes SmartModem 1200 Configuration Switch Settings

Switch Number	Option Name	Switch Setting	Description
1	Data Terminal Ready (DTR)	Up	The station supports DTR.
2	Connection indication state format	Up	The results are sent as messages in English (also see V command).
3	Connection state indication	Down	Results are sent (also see Q command).
4	Command mode echo	Up	All characters sent to the modem while it is in command state are echoed back to the display.
5	Automatic answer	Up	The modem answers incoming calls (after a number of rings specified in register S0 [default=1]).
6	Carrier Detect (CD) lead handling	Up	Carrier Detect reflects carrier (Down during command mode).
7	Telephone jack	Not relevant	Up = Single-line RJ11 jack Down = Multiple-line RJ12 or RJ13 jack. Should match your installation.
8	Command mode recognition	Down	The modem recognizes its commands before connection and its command mode escape during a connection.

Table 4-3. Hayes SmartModem 1200 Register Settings

Register Number	Description
0	Ring to answer on. See switch 5 in Table 4-2. Not relevant to AEA operation.
2	Escape code. Not relevant to AEA operation.
3	Carriage return code. Command and result code terminator can be changed for non-standard equipment. Set to 13 (default).
4	Line feed code. Line feed follows carriage return when English result codes are selected. Set to 10 (default).
5	Backspace code. Not relevant to AEA operation.
6	Wait for dial tone (default=2 seconds). The amount of time the modem waits for dial tone. Not relevant to AEA operation.
7	Wait for carrier (default=30 seconds). The amount of time the modem waits for the remote station to answer before terminating the call. Not relevant to AEA operation.
8	Pause time (caused by comma in dial string; default=2 seconds). Not relevant to AEA operation.
9	Carrier Detect Delay. Not relevant to AEA operation.
10	Delay time between carrier loss and outage notification (default=0.7 second). Not relevant to AEA operation.
11	Tone dialing speed (default=0.07 second). Should be set to match the central telephone switch or private branch exchange (PBX). Not relevant to AEA operation.
12	Escape to command mode guard time (default=1 second). Not relevant to AEA operation.
16	Self Test mode (default=0). This may be set to 1 by using online Test 12 to run modem tests. For auto-call operation, register 16 must be set to 0 (default).

Micom Data Modems

S1 and S2 switch groups on Micom's 3012 and 3024 modems should be set to OFF. Other setup options can be set by using the modem's configuration menu. This menu is accessed by using online Test 12 (see the *3174 User's Guide* for the procedure). The default settings are suitable to AEA operation.

ASCII Station Setup

The setup guidelines listed here apply to all ASCII display stations, printers, and hosts. Refer to the *3174 Terminal User's Reference for Expanded Functions* for more specific setup instructions for display stations.

ASCII terminals and hosts should be set up to operate as follows:

- Asynchronous, EIA 232D transmission
- Duplex, character-mode
- Seven-bit ASCII (ANSI 3.4,1977) data
- Odd, even, mark, space parity, or no parity
- One or 2 stop bits
- Line speeds of 300, 1200, 2400, 4800, 9600, or 19 200 bits per second (bps)
- Flow Control Type:
  - XON/XOFF (used for all port types)
  - DTR (used for nonswitched ports)
  - CTS (used for direct ports).

Chapter 5. EIA 232D Cabling Specification

EIA 232D Cabling to Data Terminal Equipment (DTE) 5-2
EIA 232D Cabling to Data Circuit-Terminating Equipment (DCE) 5-3
Pin Assignments and Signal Description 5-4

This chapter describes the signals and pin assignments for EIA 232D interface cables that connect an Asynchronous Emulation Adapter port either to a data terminal equipment (DTE), such as a terminal or computer, or to data circuit-terminating equipment (DCE), such as a modem.

EIA 232D Cabling to Data Terminal Equipment (DTE)

An asynchronous terminal or computer port requires a 1-to-15-meter (3-to-50-foot) EIA 232D cable with at least nine wires. The EIA 232D-interface cable must have one male connector for the 3174 connection and an appropriate connector (male or female) for the terminal or computer.

The crossing over of signals makes the 3174 appear to be a DCE (modem) to the DTE (terminal or computer). Figure 5-1 shows the signals and pin assignments for the 3174 and the DTE connections. The crossing over of signal leads can be done in the cable connector or in a null modem.

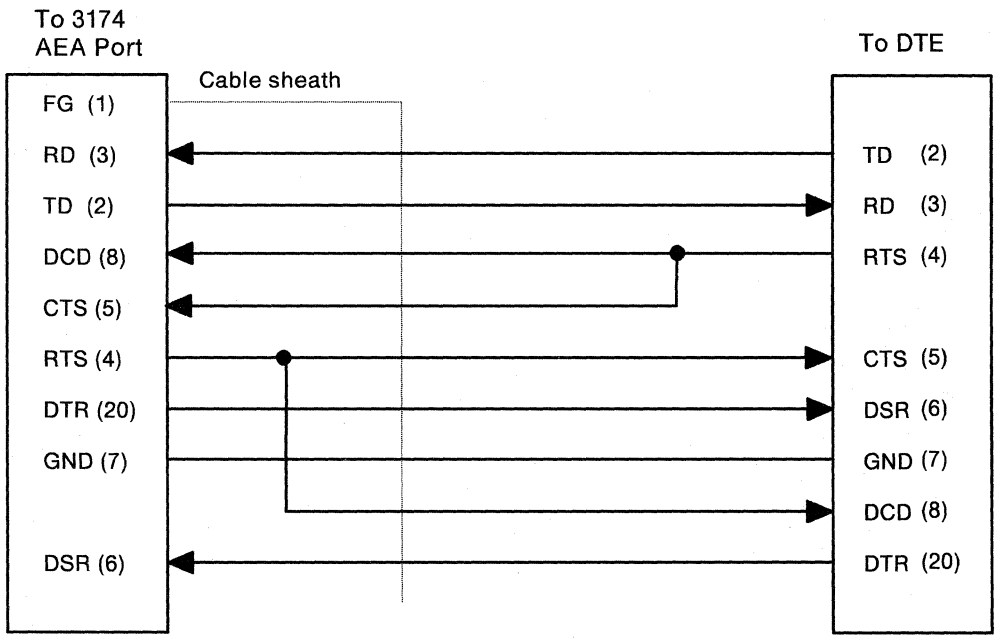


Figure 5-1. EIA 232D-Interface Cabling to a DTE (Terminal or Computer)

EIA 232D Cabling to Data Circuit-Terminating Equipment (DCE)

The EIA 232D—interface cable to a DCE requires a 1-to-15—meter (3-to-50—foot) EIA 232D cable with at least nine wires. The wires for this connection are straight-through (no crossing over of wires). The cable must have a male connector for the interface to the 3174, and a male connector for the modem. Figure 5-2 shows the signals and pin assignments for the 3174 and the DCE connections.

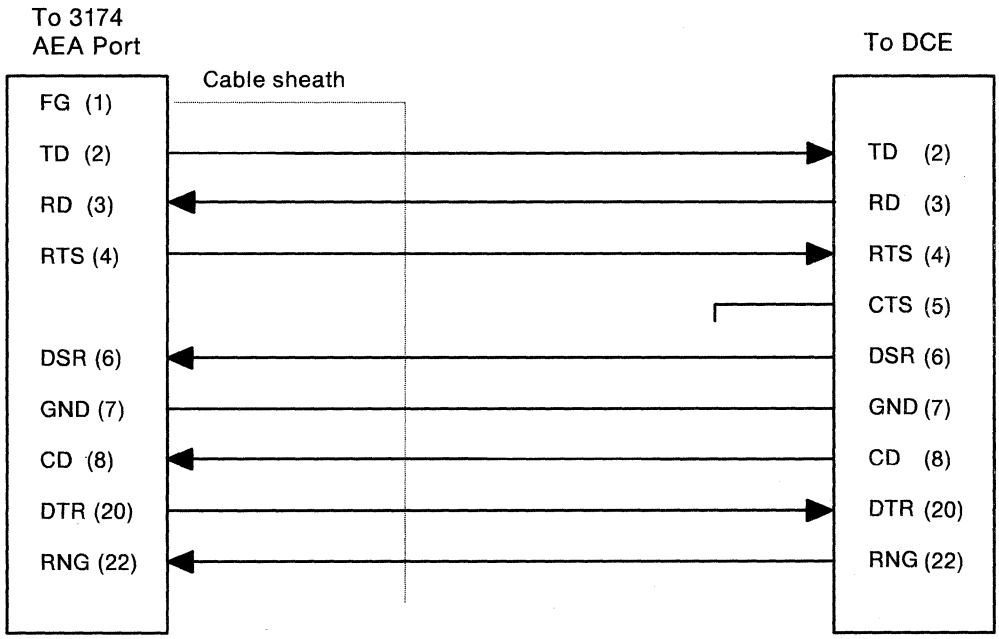


Figure 5-2. EIA 232D—Interface Cabling to a DCE (Modem)

Pin Assignments and Signal Description

Table 5-1. 3174-to-DCE Connector Pin Assignments

Pin	EIA Circuit	Mnemonic	Source	Description
1	AA	FG	NA	Protective ground
2	BA	TD	DTE	Transmitted data
3	BB	RD	Modem	Received data
4	CA	RTS	DTE	Request to send. After DTR and DSR are on, the 3174 raises RTS, which indicates to the modem to prepare to send data.
5	CB	CTS	Modem	Clear to send. Also called ready for sending (RFS). This signal is not connected to the AEA; CTS is assumed to be ON at the modem. This means that the modem is ready to send data when the 3174 raises RTS (request to send).
6	CC	DSR	Modem	Data set ready. In switched-line operation, this signal is raised after RI.
7	AB	SG or GND	NA	Signal ground
8	CF	CD or DCD	Modem	Data carrier detect. Also called received line signal detector (RLSD). This signal indicates to the 3174 that the modem attached to the AEA port has detected a data carrier on the communication line. In switched-line operation, this line is raised after RI.
20	CD	DTR	DTE	Data terminal ready. DTR indicates to the modem that the Asynchronous Emulation Adapter port is operational.
22	CE	RI	Modem	Ring indicator. RI indicates the presence of an incoming call.

Appendix A. 3174 Attachment Diagrams

Refer to Chapter 3 for examples of completed 3270 Attachment Diagrams.

To fill out the 3270 Attachment Diagram (Figure A-1 on page A-3):

1. Write in the station types and default destinations, add brackets around those stations that are in the same station set, and name the station set.
2. Add brackets around those ports that are in a port set, and name the port set.
3. Using arrows, indicate the assignment of station sets to port sets.

3270 Attachment Diagram

Station Set Name	Station Set Number
IBM Host =	= 1
ASCII Host =	=
ASCII Host =	=
ASCII Host =	=
ASCII Host =	=
ASCII Host =	=
ASCII Host =	=
ASCII Host =	=
ASCII Host =	=

Note:
For 3270 Stations
Port Type = Coax = 1

3270
Display = 3D
Printer = 3P

Terminal Adapter HG-26	Port Set Name	Station Set Name	Default Destinations					Station Type
26-00								
26-01								
26-02								
26-03								
26-04								
26-05								
26-06								
26-07								
26-08								
26-09								
26-10								
26-11								
26-12								
26-13								
26-14								
26-15								
26-16								
26-17								
26-18								
26-19								
26-20								
26-21								
26-22								
26-23								
26-24								
26-25								
26-26								
26-27								
26-28								
26-29								
26-30								
26-31								

Figure A-1. 3270 Attachment Diagram

Refer to Chapter 3 for examples of completed ASCII Attachment Diagrams.

To fill out the ASCII Attachment Diagram (Figure A-2 on page A-5):

1. Write in the station types and default destinations, add brackets around those stations that are in the same station set, and name the station set.
2. Write in port types and modem types.
3. Add brackets around those ports that are in a port set, and name the port set.
4. Using arrows, indicate the assignment of station sets to port sets.

ASCII Attachment Diagram

Port Type	Modem Type	Port Set Name	Station Set Name	Default Destination	Station Type
Switched = 2 Direct = 3 Non-switched = 4	Hayes = 1 Micom = 2 IBM = 3 Other = 4		Station Set Name IBM Host = ASCII Host = ASCII Host = ASCII Host = ASCII Host = ASCII Host = ASCII Host = ASCII Host = ASCII Host =	Station Set Number = 1 = = = = = = = =	See Station Type Table below
AEA HG-21					
21-00					
21-01					
21-02					
21-03					
21-04					
21-05					
21-06					
21-07					
AEA HG-22					
22-00					
22-01					
22-02					
22-03					
22-04					
22-05					
22-06					
22-07					
AEA HG-23					
23-00					
23-01					
23-02					
23-03					
23-04					
23-05					
23-06					
23-07					

Station Type Table

ASCII Host	= AH	IBM PC-FTTERM Color	= FC	Lear Siegler ADM 11/12	= L1	TeleVideo 912	= T1
ASCII Printer	= AP	IBM PC-FTTERM Mono	= FM	Lear Siegler ADM 3A/5	= L3	TeleVideo 970	= T7
ADDS Viewpoint A2	= A2	Hewlett-Packard 2621B	= H2	Lear Siegler ADM 1178	= L7	DEC VT100	= V1
ADDS Viewpoint/78	= A7	IBM 3101	= I1	ANSI 3.64 Terminal	= S1	DEC VT241	= V2
Hazeltine 1500	= E1	IBM 3161/3163	= I3			DEC VT52	= V5
Esprit Executive 10/78	= E7	IBM 3164	= I4				

Figure A-2. ASCII Attachment Diagram

Appendix B. ASCII Emulation

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This appendix contains keyboard maps and operational information concerning 3101 and VT100 emulation.

Note: Refer to the *3174 Terminal User's Reference for Expanded Functions* for additional details on keyboard mappings.

VT100 Emulation

The DEC VT100 asynchronous terminal closely follows the ANSI X3.64 standard. VT100 emulation by 3270 display stations allows them to use many applications developed for the VT100. If you are not familiar with VT100 operation, it may be useful to refer to the user's guide for the VT100.

Keyboard Map

The keyboard map defines the translation that takes place during VT100 emulation. Many keys on the 3270 display keyboard have different functions during VT100 emulation, as shown in the following VT100 keyboard map.

VT100 Key Function	Key Used on 3178 Keyboard
A-Z, a-z, 0-9, Space	A-Z, a-z, 0-9, Space
CTRL+Space, (NUL)	ALT+Space
CTRL+ A-Z (SOH - SUB)	ALT+A-Z
CTRL+[(ESC)	ALT+¢
CTRL+\ (FS)	ALT+\
CTRL+] (GS)	ALT+ =
CTRL+~ (RS)	ALT+ <
CTRL+? (US)	ALT+/
|@#$%&*()_-+ =:;"' > <,.?/!	|@#$%&*()_-+ =:;"' > <,.?/!
{, }	{, }
\	\
~, Back quote	~, Back quote
^	¬
[	¢
]	¦
Cursor Left-Right-Up-Down	Cursor L-R-U-D
Back Space, Tab	Back Space, Tab
SHIFT	Shift
CAPS LOCK	Shift Lock
CTRL	ALT
RETURN	Enter or New Line
LINE FEED	ALT New New Line
DELETE	Delete Character
ESC	ATTN
BREAK	FIELD MARK
SHIFT+BREAK (Long BREAK)	SHIFT + FIELD MARK
CTRL+BREAK (Answerback)	ALT + FIELD MARK
NO SCROLL	Back Tab
BELL	ALT G
local screen copy	PRINT

VT100 Numeric Pad keys:

VT100 Key Function	Key Used on 3178 Keyboard
0-9	ALT 0-9
,.-	ALT ,.-
PF1	CURSOR SEL
PF2	erase input key
PF3	ERASE EOF
PF4	unlabeled key below ATTN
ENTER	DUP

This keyboard map applies to the large class of 3270 typewriter keyboards with layouts similar to the 3178. Keyboards in the other main series (Converged and Enhanced keyboards) are the same with the following exceptions:

VT100 Key Function	Key Used on 3180 Converged Keyboard
BREAK	PA2
SHIFT + BREAK (Long BREAK)	Shift + PA2 (Field Mark)
CTRL + BREAK (Answerback)	DUP

VT100 Numeric Pad keys:

VT100 Key Function	Key Used on 3180 Converged Keyboard
0-9	Numeric Pad 0-9
,.-	Numeric Pad ,.-
PF 1 to 4	PF 1 to 4
ENTER	Numeric Pad ENTER

VT100 Key Function	Key Used on 3191 Enhanced Keyboard
CTRL + [	ALT + ¬
CTRL + ~	ALT + ¦
CAPS LOCK	Caps Lock
BREAK	PA2
SHIFT + BREAK (Long BREAK)	Shift + PA2
CTRL + BREAK (Answerback)	Dup

VT100 Numeric Pad keys:

VT100 Key Function	Key Used on 3191 Enhanced Keyboard
0-9	Numeric Pad 0-9
,.-	Numeric Pad ,.-
PF 1 to 4	PF 1 to 4
ENTER	Numeric Pad Enter

Caps Lock Key

The AEA emulates the VT100's use of the CAPS LOCK key. The CAPS LOCK key enables the transmission of uppercase alphabetic characters only. CAPS LOCK affects only the 26 alphabetic keys. All numeric and special symbol keys remain in lowercase.

Typematic Keys

Typematic keys on a 3270 keyboard continue to be typematic during VT100 emulation, and, conversely, typematic keys on the VT100 are typematic on the 3270 keyboard. The keys that are nontypematic on the VT100 are ESC, NO SCROLL, TAB, RETURN, and keys pressed with CTRL. Only ESC and NO SCROLL have nontypematic 3270 equivalents. RETURN is typematic on Converged or Enhanced keyboards.

CTRL Key

VT100 emulation sends any of the standard ANSI 3.4 (ASCII) control characters. These characters are generated by pressing the ALT key (=CTRL) and the character key in question; for example, ALT-A generates the SOH control character.

Break Key

The mapped BREAK key produces a short break of 0.2333 second, while a SHIFT BREAK produces a long break of 3.5 seconds. CNTRL BREAK generates the answerback message VT100.

Function Keys

The mapped versions of VT100 function keys send the same codes to the line as the real keys. See Figure B-1 on page B-5.

A number of VT100 keyboard functions are not supported by the emulation. These keys are used exclusively for VT100 setup mode, which is handled by 3174 customization. The key functions are:

SETUP The SETUP key is used to put the display into setup mode. This mode is not supported. A VT100 is customized through setup.

SET/CLEAR TAB Terminal-defined tab stops are not supported.

CLEAR ALL TABS Terminal-defined tab stops are not supported.

LINE LOCAL LOCAL mode is not supported. LOCAL mode allows the user to type at the display without sending any data to the host. 3270 display stations can be tested with the IBM tests provided.

SETUP A B This key allows the user to shift between setup screens; setup mode is not supported.

Key	Code Sent	
	Cursor Key Mode[1]	
	Set	Reset
Cursor Up	ESC O A	ESC (left bracket) A
Cursor Down	ESC O B	ESC (left bracket) B
Cursor Right	ESC O C	ESC (left bracket) C
Cursor Left	ESC O D	ESC (left bracket) D
	Keypad Mode[1]	
	Numeric	Application
0	0	ESC O p
1	1	ESC O q
2	2	ESC O r
3	3	ESC O s
4	4	ESC O t
5	5	ESC O u
6	6	ESC O v
7	7	ESC O w
8	8	ESC O x
9	9	ESC O y
-	-	ESC O m
,	,	ESC O l
.	.	ESC O n
ENTER	CR	ESC O M
PF1	ESC O P	ESC O P
PF2	ESC O Q	ESC O Q
PF3	ESC O R	ESC O R
PF4	ESC O S	ESC O S

Figure B-1. VT100 Function Key Map

TOGGLE 1 0 TOGGLE 1 0 is used to change setup values; setup mode is not supported.

TRANSMIT SPEED Baud rate is set during 3174 customizing.

RECEIVE SPEED Baud rate is set during 3174 customizing.

80/132 COLUMNS The emulation does not support the 132-column screen size.

RESET RESET is used to change all VT100 configuration options to their permanently stored values.

SHIFT S While in setup mode, entering an uppercase S saves configuration settings. This function is not supported.

[1] Cursor Key Mode and Keypad Mode are set by the application using escape sequences.

Setup

A VT100 has a variety of setup options that can be used to match the terminal to host capabilities or to make the terminal easier to use. Some of these setup features are emulated by the AEA feature. Most of them are specified during 3174 customization. Some can be altered from the host using control sequences handled by the emulation.

The following table summarizes the VT100 setup options and indicates whether the AEA feature supports them.

Setup Feature	AEA Support ?
ANSI/VT52 Mode	No
Answerback Message	No
Auto Repeat	No
Bits per character	No
Characters per line (80/132)	No
Interlace	No
Line/Local	No
Parity Sense	No
Pound sign display	No
Power	No
Screen Bac' ground	No
Smooth Scroll	No
Tabs	No
Auto XON/XOFF	Yes
Cursor	Yes
Keyclick	Yes
Margin Bell	Yes
New Line	Yes
Parity	Yes
Receive Speed	Yes
Screen Brightness	Yes
Transmit Speed	Yes
Wrap around (autowrap)	Yes

ANSI/VT52 Mode (Not mapped): VT100s can emulate their predecessor, the VT52. The AEA does not support setup as a VT52; it does support most VT52 escape sequences and the VT100 escape sequence that enters and exits VT52 emulation mode.

Answerback Message (Not mapped): The answerback feature allows a message to be sent to the host when CTRL-BREAK (ALT-Field Mark) is pressed or when the host requests it by sending ENQ. The AEA sends an answerback message (VT100), but the text of the answerback message is stored in the 3174 and cannot be altered through setup or customization.

Auto Repeat (Not mapped): The VT100 can disable its typematic keyboard action. 3270 typematic keys remain typematic during VT100 emulation.

Bits per character (Not mapped): This option defines whether a VT100 sends 7 or 8 data bits per character. When it sends 8, the high bit is set to 0. The AEA always sends 7 data bits.

Characters per line (80/132) (Not mapped): The VT100 display can switch between 80 columns and 132 columns; 3178s do not support this feature.

Interlace (Not mapped): This option is used for a high-resolution hardware feature on VT100.

Line/Local (Not mapped): Local mode is not supported. (See the LINE/LOCAL key discussion above.)

Pound sign display (Not mapped): The VT100 can display a British pound sign (£) in place of an octothorp (#).

Power (Not mapped): VT100 offers a choice of 50- or 60-cycle power. This is supported differently for 3270 displays.

Screen Background (Not mapped): Reverse video is not supported on 3178 displays.

Smooth Scroll (Not mapped): VT100 can scroll one display line at a time (jump scroll) or one raster line at a time (smooth scroll). 3270 displays do not have a smooth scroll capability.

Tabs (Not mapped): Local setting of tab stops is not supported, but the host may define tab stops with an escape sequence.

Auto XON/XOFF (Mapped): This option is supported by specifying at customization the type of flow control used by the ASCII host.

Cursor (Mapped): 3270 displays support both block and underscore cursors.

Keyclick (Mapped): 3270 displays provide a keyclick control.

Margin Bell (Mapped): An AEA customization option controls whether the audible alarm is sounded when the cursor is 10 spaces from the end of a line.

New Line (Mapped): An AEA customization option controls whether the new line key sends carriage return and line feed or just carriage return.

Parity (Mapped): The ASCII host's use of odd or even parity is specified at customizing.

Parity Sense (Not Mapped): Parity is always checked.

Receive Speed (Mapped): The VT100 allows the receive and transmit speeds to be specified independently, but the AEA supports only a single common speed. The AEA supports the following VT100 speeds: 300, 600, 1200, 2400, 4800, 9600, and 19 200 bps. The speed the host uses is specified at customization. The following VT100 speeds are not supported: 50, 75, 110, 134.5, 150, 200, 1800, 2000, and 3600.

Screen Brightness (Mapped): 3270 displays provide a screen brightness control.

Transmit Speed (Mapped): See Receive Speed.

Wraparound (autowrap) (Mapped): An AEA customization option defines whether the cursor moves to the next line or remains in column 80 after a character is typed there.

Indicator Line

The VT100 uses seven light-emitting diodes (LEDs) as status indicators. ASCII Terminal Emulation maps these indicators on the 3270 display's indicator line as follows:

VT100 LED Label	ASCII Emulation Mapping	Columns from-to	Meaning
LOCAL	(not mapped[2])		
KBDLOCKED	Bold-X followed by:	21 – 29	Inhibit
	Clock		Wait (XOFF received)
ON LINE	VT100	46 – 50	VT100 mode active
	VT52		VT52 mode active
L1,...,L4	> 1234 <	75 – 80	Programmable LEDs

In addition, the following indications that are available in 3270 mode are also available in VT100 mode:

3270 Field	Symbols Used	Column from-to	Meaning
Controller att	S	1 – 1	3174 connected
KBDLOCKED	Bold-X followed by:	9 – 17	Inhibit
	Slashed-box nnn		Machine check
	? +		Input not accepted
	Key		Security key
	Box line slashed-box		Printer down
	Box line box clock		Printer busy
	Box line box 2 clocks		Printer very busy
Shifts and Modes	Up-arrow	36 – 40	SHIFT KEY
	A		CAPS LOCK
	Right-pointer		Extended select
Printer Status	Box line followed by:	60 – 64	
	Box nn		Assigned printer
	Solid-box nn		Printing
	Slashed-solid-box		Printer stopped
	Box ??		Printer ID changed

Host Data Streams

The AEA's VT100 emulation supports all ASCII control codes in the same way as a VT100 does:

Control Character	Action Taken
NUL	Ignored on input.
ENQ	Transmit an answerback message.

[2] VT100's local mode is not mapped for 3270 displays.

BEL	Sounds the terminal's audible alarm.
BS	Back Space one character – if at the left margin, the BS is ignored.
HT	Tab cursor to the next tab stop, or to the right margin.
LF	Causes a line feed or new line.
VT	Interpreted as line feed (LF).
FF	Interpreted as LF.
CR	Move cursor to left margin.
SO	Ignored.
SI	Ignored.
DC1 (XON)	Causes terminal to resume transmission and keyboard to unlock.
DC3 (XOFF)	Causes the terminal to stop transmitting all characters except XOFF and XON. The keyboard locks, and the Wait symbol (clock) appears.
CAN	If received during a control sequence, the sequence is immediately terminated, and a parity symbol is displayed.
SUB	Interpreted as CAN.
ESC	Introduces a control sequence.
DEL	Ignored on input.

All other ASCII control codes are ignored by the VT100 and by the AEA when emulating VT100.

If an XON or XOFF control character is received during an escape sequence, the AEA (unlike the VT100) will interrupt the escape sequence and send any remaining characters to the display station.

Most device control in VT100 is done with escape sequences. The map accepts all the escape sequences handled by the VT100 and performs the same function as VT100 for most of them. Where the requested function is not performed, the sequence is still parsed and any associated parameters are skipped so that the rest of the data stream can be processed correctly.

Figure B-2 on page B-10 lists all the escape sequences supported by a standard VT100 and indicates the support or nonsupport of the AEA's VT100 emulation. Refer to VT100 documentation for a complete description of VT100 device control. Those sequences that the AEA does not support completely are discussed in Table B-1 on page B-11.

Description	Escape sequence		AEA Support	See Note
Change line to 1W 1H	ESC #	5	Yes	
Change line to 2H bot half	ESC #	4	Yes	1
Change line to 2H top half	ESC #	3	Yes	2
Change line to 2W	ESC #	6	Yes	3
Cursor Backward	ESC [Pn	D	Yes	
Cursor Down	ESC [Pn	B	Yes	
Cursor Forward	ESC [Pn	C	Yes	
Cursor Position	ESC [Pn;Pn	H	Yes	
Cursor Position Report	ESC [Pn;Pn	R	Yes	
Cursor Up	ESC [Pn	A	Yes	
Define Scrolling Region	ESC [Pn;Pn	r	Yes	
Device Attr report	ESC [?1;Ps	c	Yes	
Device Attributes (old)	ESC	Z	No	4
Device Attribute query	ESC [Pn	c	Yes	
Device Status Report	ESC [Ps	n	Yes	
DEC Req/Rept Term Parms	ESC [Pn;..;Pn	x	Yes	
DECANM - ANSI/VT52 Mode	ESC [? 2	h	Yes	5
DECARM - Auto Repeat Mode	ESC [? 8	h	No	6
DECAWM - Auto Wrap Mode	ESC [? 7	h	Yes	
DECCKM - Cursor Key Mode	ESC [? 1	h	Yes	
DECCOLM - 80/132 column Mode	ESC [? 3	h	No	7
DECINLM - Interlace Mode	ESC [? 9	h	No	8
DECOM - Origin Mode	ESC [? 6	h	Yes	
DECSCLM - Smooth Scroll Mode	ESC [? 4	h	No	9
DECSCNM - Screen Background	ESC [? 5	h	No	10
Erase in Display	ESC [Ps	J	Yes	
Erase in Line	ESC [Ps	K	Yes	
Fill Screen with E's	ESC #	8	Yes	
Graphic Processor Off	ESC	2	No	11
Graphic Processor On	ESC	1	No	12
Hard Copy	ESC #	7	No	13
Horizontal and Vertical Pos.	ESC [Pn;Pn	f	Yes	
Horizontal Tab Set	ESC	H	Yes	
Index	ESC	D	Yes	
Invoke Tests	ESC [2;Ps	y	No	14
Keypad Mode = Application	ESC	=	Yes	
Keypad Mode = Numeric	ESC	>	Yes	
Load Programmable LEDs	ESC [Ps;..;Ps	q	Yes	
Lock Keyboard	ESC	:	Yes	
New Line Mode	ESC [20	h	Yes	
Next Line	ESC	E	Yes	
Reset to Initial State	ESC	c	Yes	
Reset DEC Mode	ESC [? Ps	l	Yes	
Reset Mode	ESC [Ps	l	Yes	
Restore Cursor and Attrib.s	ESC	8	Yes	
Reverse Index	ESC	M	Yes	
Save Cursor and Attributes	ESC	7	Yes	
Select Graphic Rendition	ESC [Ps;..;Ps	m	Yes	15
Set Char Set 0 = special	ESC (	0	Yes	16
Set Char Set 0 = Alt ROM	ESC (	1	No	
Set Char Set 0 = AROM+sp	ESC (	2	No	
Set Char Set 0 = UK	ESC (	A	No	
Set Char Set 0 = USASCII	ESC (	B	Yes	
Set Char Set 1 = special	ESC)	0	Yes	
Set Char Set 1 = Alt ROM	ESC)	1	No	
Set Char Set 1 = AROM+sp	ESC)	2	No	
Set Char Set 1 = UK	ESC)	A	No	
Set Char Set 1 = USASCII	ESC)	B	Yes	
Tab Clear	ESC [Ps	g	Yes	
Unlock Keyboard	ESC	;	Yes	

Figure B-2. VT100 Emulation Escape Sequences

Table B-1 (Page 1 of 2). Notes on Escape Sequences

Note	Comments
1 2 3	Change line to two-high bottom half (mapped) Change line to two-high top half (mapped) Change line to two-wide (mapped) Characters that are two lines high or two character positions wide cannot be constructed on 3178 displays. Double-width characters are emulated by inserting a space after every character supposed to be double width. Double-height characters are emulated by inserting a blank line as the bottom half of any line supposed to be double height.
4	Device Attributes (old) (not mapped). This sequence is no longer used – the DA sequence is now preferred and is supported by the emulation.
5	DECANM – ANSI/VT52 Mode (mapped) VT100s can emulate their predecessor, the VT52. The AEA supports the VT100 escape sequence that enters VT52 emulation mode and most of the escape sequences provided by VT100's VT52 subset: Description / Escape Sequence / AEA Support Cursor Up — ESC A — Yes Cursor Down — ESC B — Yes Cursor Right — ESC C — Yes Cursor Left — ESC D — Yes Select Special Graphics — ESC F — No Select ASCII Character Set — ESC G — Yes Cursor Home — ESC H — Yes Reverse Line Feed — ESC I — Yes Erase to End Of Screen — ESC J — Yes Erase to End Of Line — ESC K — Yes Cursor Position — ESC Y Pn Pn — Yes Identify — ESC Z — Yes Enter Alt Keypad Mode — ESC = — Yes Exit Alt Keypad Mode — ESC > — Yes Graphics Processor On — ESC 1 — No Graphics Processor Off — ESC 2 — No Enter ANSI Mode — ESC < — Yes Identify Response — ESC / Z — Yes Those not supported have the same restrictions as the corresponding VT100 sequences.
6 7 8 9 10	DECARM – Auto Repeat Mode (not mapped) DECCOLM – 80/132 column Mode (not mapped) DECINLM – Interlace Mode (not mapped) DECSCLM – Smooth Scroll Mode (not mapped) DECSCNM – Screen Background (not mapped) These mode setting escape sequences allow the program to control various setup options. They are not supported by the AEA, because the corresponding setup options are not supported. See the description in the setup section.
11 12	Graphic Processor Off (not mapped) Graphic Processor On (not mapped) These sequences start and stop a hardware feature of VT100 that is not emulated by the AEA.

Table B-1 (Page 2 of 2). Notes on Escape Sequences

Note	Comments
13	Hard Copy (not mapped) The 3270 display cannot attach a printer. Therefore, this command is not supported.
14	Invoke Tests (not mapped) The tests started by this sequence are not needed in a 3270 environment.
15	Select Graphic Rendition (mapped) This sequence is used to intensify, underscore, blink, or reverse screen characters on a VT100 display. The AEA maps these with field intensify on 3270 displays and is not able to highlight on a character-by-character basis but only on minimum units of words surrounded by spaces.
16	Set Character Set 0/1 (mapped) This sequence is used to invoke the ASCII character code set and special graphics sets including one containing figure drawing characters and mathematical symbols. For the VT100s, the ASCII character codes **ESC (0, ESC (B, ESC) 0, and ESC) B,** are used to load the G1 and G0 registers with the ASCII character code set or the Special Graphics code set which contains figure drawing characters and mathematical symbols. 3270 terminals cannot display all these characters or symbols. The AEA will, however, recognize the ESC sequence and draw figures using an emulated graphics subset. The ESC sequences in conjunction with the SI (Shift-In) and SO (Shift-Out) characters will place the AEA in Special Graphics mode or ASCII Character mode. While in Graphics mode the AEA will map some of the graphics characters to 3270 characters and display others as blanks, as indicated in the table below.

Hex Code	US Character	Special Graphics Character	3270 Emulated Character
5F	-	Blank	Blank
60	-	Diamond	Blank
61	a	Checkerboard	Blank
62	b	Horizontal Tab (HT)	Blank
63	c	Form Feed (FF)	Blank
64	d	Carriage Return (CR)	Blank
65	e	Line Feed (LF)	Blank
66	f	Degree Symbol	Blank
67	g	Plus/Minus	Blank
68	h	New Line (NL)	Blank
69	i	Vertical Tab (VT)	Blank
6A	j	Lower-right Corner	+
6B	k	Upper-right Corner	+
6C	l	Upper-left Corner	+
6D	m	Lower-right Corner	+
6E	n	Crossing Lines	+
6F	o	Horizontal Line - Scan 1	-
70	p	Horizontal Line - Scan 3	-
71	q	Horizontal Line - Scan 5	-
72	r	Horizontal Line - Scan 7	-
73	s	Horizontal Line - Scan 5	-
74	t	Left "T"	+
75	u	Right "T"	+
76	v	Left "T"	+
77	w	Top "T"	+
78	x	Vertical Bar	Vertical Bar
79	y	Less than or equal to	Blank
7A	z	Greater than or equal to	Blank
7B		Pi	Blank
7C	|	Not equal to	Blank
7D		UK pound sign	Blank
7E	-	Centered dot	Blank

3101 Emulation

The 3101 can operate in block or character mode. In block mode, the terminal displays and holds keystrokes, performs local editing (insert/delete), and forwards modified fields to the host when the operator presses SEND. Character mode is more like VT100—all keystrokes are processed by the host before being echoed back and displayed. Only **character mode** is supported by the AEA's 3101 emulation. If you are unfamiliar with 3101 operation, refer to the *IBM 3101 Display Terminal Description*, GA18-2033.

Keyboard Map

The keyboard map defines the translation that takes place during 3101 emulation. 3101 and 3178 keyboards are very similar; the main differences are in the ASCII bracket and caret symbols. Below is the keyboard map for the 3101.

3101 Key Function	Key Used on 3178 Keyboard
A-Z, a-z, 0-9, Space	A-Z, a-z, 0-9, Space
ALT+[(NUL)	ALT+Space
ALT+ A-Z (SOH - SUB)	ALT+ A-Z
ALT+\ (ESC)	ALT+¢
ALT+ = (FS)	ALT+\
ALT+{ (GS)	ALT+ =
ALT+- (RS)	ALT+ <
ALT+ ' (US)	ALT+/
|@#$%&*()_-+ =:;"' > <,.?/!	|@#$%&*()_-+ =:;"' > <,.?/!
{, }	{, }
\	\
~, Back quote	~, Back quote
^	¬
[	¢
]	¦
Cursor Left Right Up Down	Cursor L-R-U-D
Back Space, Tab, Home	Back Space, Tab, Home
Shift	Shift
Shift Lock	Shift Lock
Space	Space
ALT	ALT
New Line	New Line
DEL	Delete Char
BREAK	FIELD MARK
ESC	ATTN
CLEAR	CLEAR
ERASE EOL/EOF	ERASE EOF
ERASE INPUT	ERASE INPUT
ERASE EOS	CURSR SEL
RESET	RESET
Clicker Key	Clicker Key
local screen copy	PRINT

3101 Numeric Pad:

3101 Key Function	Key Used on 3178 Keyboard
0-9	0-9
,.	,.
PF1-PF8	PF1-PF8

The table above applies to the large class of 3270 typewriter keyboards with layouts similar to the 3178. Keyboards in the other main series (Converged and Enhanced keyboards) are the same with the following exceptions:

3101 Key Function	Key Used on 3180 Converged Keyboard
BREAK	PA2

3101 Key Function	Key Used on 3191 Enhanced Keyboard
ALT+\ (ESC)	ALT+¬
ALT+- (RS)	ALT+¦
Shift Lock	Caps Lock
BREAK	PA2

Typematic Keys

Keys that are typematic on a 3270 keyboard continue to be typematic during 3101 emulation. The 3101 and 3270 have the same typematic keys except for those keys pressed with CTRL (ALT on 3270); these keys are typematic on the 3270 but not on the 3101.

ALT key

The emulation sends any of the standard ANSI 3.4 (ASCII) control characters. These characters are generated by pressing the ALT key (=CTRL) and a character key; for example, ALT-A generates the SOH control character.

Break Key

The BREAK key (FIELD MARK or PA2 on the keyboard) produces a break signal of 500 milliseconds.

Function keys

The mapped versions of 3101 function keys send the same codes to the line as the real keys:

Key	Code Sent
CURSOR UP	ESC A
CURSOR DOWN	ESC B
CURSOR LEFT	ESC C
CURSOR RIGHT	ESC D
HOME	ESC H
NEW LINE	CR or CR/LF
CLEAR	ESC L
ERASE INPUT	ESC K
ERASE EOL/EOF	ESC I
ERASE EOS	ESC J

Key	Code Sent
PF1	ESC a CR
PF2	ESC b CR
PF3	ESC c CR
PF4	ESC d CR
PF5	ESC e CR
PF6	ESC f CR
PF7	ESC g CR
PF8	ESC h CR

The following 3101 keyboard functions are not supported by the emulation:

- Block Mode keys:

  ATTR
  PRGM MODE
  SEND MSG
  SEND
  SEND LINE
  INS CHAR
  INS LINE
  CANCEL
  DEL CHAR
  DEL LINE

- Auxiliary printer control keys:

  AUX
  PRINT LINE
  PRINT MSG

- The 3101 LOCAL mode key.

Setup

A 3101 has a variety of setup options that can be used to match the terminal-to-host capabilities, or to make the terminal easier to use. Some of these setup features are emulated by the AEA. Most of them are specified during 3174 customization.

The following table summarizes the setup options supported by 3101s and indicates AEA support or nonsupport.

Refer to Table B-2 on page B-16 for details on some of the setup options.

Set-up Feature	AEA Support	Reason
Aux Line Speed	No	Block Mode only
Block/Character Mode	No	Block Mode only
Half or Full Duplex	No	Full Duplex only
Null Suppress	No	Block Mode only
Permanent or Controlled RTS	No	Full Duplex only

Set-up Feature	AEA Support	Reason
Reverse Channel Use	No	Full Duplex only
Reverse Video	No	See Note 1
Send Line Option	No	Block Mode only
Time Fill Characters	No	Block Mode only
Auto Line Feed on CR in	Yes	See Note 2
Auto Line Feed on CR out	Yes	See Note 3
Auto New Line – column 80	Yes	See Note 4
Cursor Blink	Yes	See Note 5
Line Turn Character	Yes	See Note 6
Mono-Case/Dual-Case	Yes	See Note 7
Parity = Odd, Even, Mark, Space	Yes	See Note 8
EIA 232D, 422A, or Current	Yes	See Note 9
Scrolling on/off	Yes	See Note 10
Speed setting	Yes	See Note 11
1 or 2 Stop Bits	Yes	See Note 12

Table B-2. Notes on 3101 Setup Options

Note	Comments
1	Not supported by 3270 displays.
2	Customizing option.
3	Customizing option.
4	Customizing option.
5	3270 keyboard option.
6	Customizing option.
7	Supported via the 3270 display's mono/dual case display switch.
8	Customizing option.
9	The AEA supports only EIA 232D attachment.
10	Scrolling mode can be specified at customizing.
11	The AEA supports the following 3101 speeds: 300, 600, 1200, 2400, 4800, and 9600 bps. Speeds not supported are 110, 150, 200, and 1800 bps.
12	Customizing option.

Indicator Line

The 3101 and 3270 displays have similar indicator lines; however, the 3101 indicator line uses only alphanumerics (no special graphics). The 3101 also has two indicator lights. The 3101's status indications and their mappings follow:

3101 Indicator	ASCII Emulation Mapping	Columns from-to	Meaning
Light 1 (test)	(see Note 1)		
CHAR | BLOCK	(see Note 2)		
(XPARENT)	(see Note 3)		
LOCK-	Bold-X followed by:	9 – 17	Inhibit
RE-KEY	?+		Input not accepted
LOCK-	Bold-X followed by:	21 – 29	Inhibit
SENDING	(see Note 4)		Wait
SYSTEM COMMAND	SYSTEM		System wait
LINE CHECK 2	(see Note 5)		Comm check DSR
LINE CHECK 1	(see Note 5)		Comm check CTS
Keyboard mode	Right-pointer	36 – 44	Extended select
(3101 UPSHIFT)	Up-arrow		Up-shift
(3101 INSERT)	(see Note 6)		Insert mode
(3101 LOCAL)	(see Note 7)		Local mode
FORMAT CHECK	(see Note 4)		Go elsewhere
Light 2 (DSR)	3101 (see Note 8)	46 – 50	3101 mode active

Table B-3. Notes on the 3101 Indicator Line

Note	Comments
1	The 3101's test mode is not mapped for 3270 displays.
2	The 3101's block mode is not mapped; CHAR can be assumed.
3	The 3101's transparent mode is not mapped for 3270 displays because it requires characters that are not implemented in the 3270 character generator.
4	The LOCK-SENDING and LOCK-FORMAT CHECK indications are not relevant in character mode.
5	The two LINE CHECK indications are replaced by a similar message that appears in the Connection Menu when a host connection is broken.
6	The 3101's insert mode works only in block mode (not emulated) so this indicator is not used.
7	The 3101's local mode is not mapped for 3270 displays.
8	The Data Set Ready signal that drives this light is assumed when 3101 mode is entered because the connection is established while the menu occupies the display screen.

In addition, the following indications that are available in 3270 mode are also available in 3101 mode:

3270 Field	Symbols Used	Columns from-to	Meaning
Controller attached	S	1-1	3174 connected
Input Inhibit	Bold-X followed by:	9 – 17	Inhibit
	Slashed-box nnn		Machine check
	Key		Security key
	Box line slashed-box		Printer down
	Box line box clock		Printer busy
	Box line box 2 clocks		Printer very busy
Printer Status	Box line followed by:	60 – 64	
	Box nn		Assigned printer
	Solid-box nn		Printing
	Slashed-solid-box		Printer stopped
	Box ??		Printer ID changed

Host Data Streams

The AEA's 3101 emulation supports most of the ASCII control codes in the same way as the 3101 does:

Control Character	Action Taken
NUL	Receipt of more than seven NULLS in a row causes a logical keyboard lock.
BEL	Sounds the terminal's audible alarm.
BS	Backspace the cursor one position.
HT	Horizontal Tab cursor to next Tab Stop.
VT	Moves the cursor to next lower line.
FF	Causes Erase Input function if SCROLL mode is OFF. Moves the cursor to the next lower line if SCROLL mode is ON.
DLE.EOT	Disconnect
CR	Moves the cursor to the first character position of the current line (or next lower line).
ESC	Introduces a control sequence (see below).

The following ASCII controls are not mapped:

Control Character	Action Taken
DLE.STX	Enter transparent mode (not supported)
DLE.ETX	Exit transparent mode (not supported)

All other ASCII control codes are ignored by the 3101 and are ignored by the AEA when emulating 3101.

Most device control in the 3101 is done with escape sequences. The map accepts all the escape sequences handled by the 3101 and does the same function as the 3101 for most of them. Where the requested function is not done, the sequence is still parsed and any associated parameters are skipped so that the rest of the data stream can be processed correctly.

Figure B-3 lists all the escape sequences supported by a standard 3101, and indicates AEA support or nonsupport. Refer to 3101 documentation for a complete description of 3101 device control. Those sequences that the AEA does not support are used only in block mode.

Description	Escape Sequence	AEA Support
Back Tab (2X only)	ESC 2	No
Cancel (2X only)	ESC S	No
Clear All (incl tabs)	ESC L	Yes
Clear Tab	ESC 1	Yes
Cursor Down	ESC B	Yes
Cursor Home	ESC H	Yes
Cursor Left	ESC D	Yes
Cursor Right	ESC C	Yes
Cursor Up	ESC A	Yes
Delete Character (Blk Mode)	ESC Q	No
Delete Line (Blk Mode)	ESC O	No
Erase to end of Line	ESC I	Yes
Erase to end of Screen	ESC J	Yes
Erase Screen (leave tabs)	ESC K	Yes
Insert Character (Blk Mode)	ESC P	No
Insert Cursor	ESC Z	Yes
Insert Line (Blk Mode)	ESC N	No
Keyboard Lock	ESC :	Yes
Keyboard Unlock	ESC ;	Yes
Print Line (2X only)	ESC U	No
Print Message (2X only)	ESC V	No
Print Page (2X only)	ESC W	No
Read Buffer (Blk Mode only)	ESC 8	No
Read Cursor Address	ESC 5	Yes
Read Setup Switch	ESC 7 x y	Yes
Read Status	ESC 6 x y	Yes
Set Buffer Address	ESC X x y	Yes
Set Control	ESC 9 x	Yes
Set Cursor Address	ESC Y x y	Yes
Set Tab	ESC 0	Yes
Start Field (2X only)	ESC 3	No
Write Send Mark (2X only)	ESC E	No

Figure B-3. 3101 Emulation Escape Sequences

ASCII Printer Emulation

The AEA allows 3262 Models 3 and 13, 3268 Model 2, 3287 Models 1 and 2, and 4224 Models 210 and 202 class printers to emulate ASCII printers. All ASCII characters can be printed by the 3270 printers supported by the AEA if they are set up to print International Alphabet number 1 or 5 (code page 256 or 500) since the ASCII graphic set (code page 38) is a subset of these code sets. In addition, the AEA supports a basic set of ASCII control codes:

Character	Hex Code	Action Taken
BEL	X'07'	Sound audible alarm
CR	X'0D'	Carriage Return
FF	X'0C'	Form Feed
HT	X'09'	Tab – Skip to next multiple of 8
LF	X'0A'	New Line
US	X'1F'	Carriage Return, Line Feed
VT	X'0B'	New Line
XON (DC1)	X'11'	Request that the host stop sending
XOFF(DC3)	X'13'	Tell the host to resume transmission

ASCII printer capabilities, such as underscoring, programmable fonts, and color are not supported.

Some ASCII printers send status indications to the host on detection of such conditions as out of paper, buffer full, broken parts; the AEA indicates that its buffer is full or that it is not ready to print by means of flow control indications (XOFF or DTR drop), but will not otherwise send status to the host.

List of Abbreviations

A

A. (1) Ampere. (2) Angstrom. (3) Attention.

AC. Alternating current.

AEA. Asynchronous Emulation Adapter.

Alt. Alternate.

ANSI. American National Standards Institute.

APL. A programming language.

ASCII. American National Standard Code for Information Interchange.

ATTN. Attention.

B

B. Busy.

BB. Begin bracket.

bps. Bits per second.

BSC. Binary synchronous communication.

C

C. Celsius.

C&D. Cause and diagnostic (codes).

CC. Control check, Chain Command (flag).

CCITT. International Telegraph and Telephone Consultative Committee.

CD. (1) Compact disk. (2) Change direction.

CE. (1) IBM Customer Engineer.

char. Character.

coax. Coaxial (cable).

comm. Communication.

CR. Command Reject.

ctl. Control.

CTS. Clear to Send.

CUT. Control unit terminal.

D

D. Display.

DCE. Data-circuit-terminating equipment.

DEC. Digital Equipment Company.

DEL. The delete character.

DLE. Data link escape.

DP. (1) Data processing. (2) Distribution panel.

DSL. (1) Downstream load. (2) Data set label.

DSR. Data set ready.

DTE. Data terminal equipment.

DTR. Data terminal ready.

E

EBCDIC. Extended binary-coded decimal interchange code.

EIA. Electronic Industries Association.

ENQ. Enquiry.

EOF. End of file.

EOT. End-of-transmission character.

ESC. Escape.

ETX. End of Text.

EX. Exception (response).

F

F. Fahrenheit.

FF. Forms feed.

FTTERM. File Transfer and Terminal Emulator Program

G

H

h. Coaxial cable type for indoor installation.

H. Height.

hex. Hexadecimal.

I

I. Information (format).

ID. Identification, identifier.

IML. Initial microcode load.

in. inch (or inches).

INS. Insert.

I/O. Input/output.

K

k. 1000.

K. 1024.

L

l. Coaxial cable type for indoor or outdoor installations.

L. Left.

LED. Light-emitting diode.

LF. Line feed.

LT. Logical terminal.

LU. Logical unit.

M

m. Meter (or meters).

MAP. Maintenance analysis procedure.

MB. Megabyte; 1 048 576 bytes.

MB. Optical fiber mounting bracket.

MLT. Multiple logical terminals.

modem. Modulator-demodulator.

MVS. Multiple virtual storage.

N

NL. New Line.

No. Number.

NUL. Null.

NUM. Numeric.

O

OEM. Original equipment manufacturer.

P

P. Printer, protected.

PA. (1) Program access. (2) Program attention.

PAM. Printer authorization matrix.

PBX. Private branch exchange.

PC. Personal Computer.

pF. Picofarad.

PF. Program function.

PI. Pacing indicator.

PS. Programmed symbols.

PT. Program Tab.

R

R. Rear, row.

Req. Request.

RI. Ring In.

ROM. Read-only memory.

RPQ. Request for price quotation.

RTS. Request to send.

RU. Request/response unit.

S

S. Sequenced (format), side.

SCS. SNA character string.

SI. Suppress Index.

SNA. Systems Network Architecture.

SOH. Start-of-heading character.

SP. (1) Space. (2) Specific Poll.

SSCP. System services control point.

STX. Start of text.

SUB. Substitute.

T

TA. Terminal adapter.

U

U. Unprotected.

U.S. United States.

US. The unit separator character.

V

V. Volt.

VM/PROFS. VM/PROFS Virtual Machines Professional Office Systems.

VTAM. Virtual Telecommunications Access Method.

W

WE. Western Electric.

X

XOFF. Transmitter off.

XON. Transmitter on.

Glossary

This glossary includes terms and definitions from the *IBM Dictionary of Computing: Information Processing, Personal Computing, Telecommunications, Office Systems, IBM-specific Terms*, SC20-1699.

The terms in this glossary are defined here as they apply to the 3270 Information Display System.

A

active. Able to communicate on the network. An adapter is active if it is able to pass tokens on the network.

active logical terminal (LT). In MLT, the active LT is the currently displayed logical terminal. Synonymous with *foreground logical terminal.* Contrast with *background logical terminal.*

adapter. (1) A general term for a device that provides some transitional function between two or more devices. (2) See *channel-to-channel adapter, communication adapter, ring interface adapter, staging adapter.* (3) See also *attachment feature.*

address. (1) A value that identifies a register, a particular part of storage, a data source, or a data sink. The value is represented by one or more characters. (2) To refer to a device or an item of data by its address. (3) In word processing, the location, identified by an address code, of a specific section of the recording medium or storage. (4) The location in the storage of a computer where data is stored. (5) In data communication, the unique code assigned to each device or work station connected to a network.

AEA port. A communication connector on the Asynchronous Emulation Adapter (AEA).

AEA port set. (1) One or more 3174 ports that support individual AEA station sets; they must have the same port (connection) type and modem type, but different station types. (2) One or more 3174 station sets that have different station types, but the same port type, modem type, and amount of default destinations.

AEA station. A 3270 or ASCII display station, printer, or host that communicates through the Asynchronous Emulation Adapter.

AEA station set. (1) One or more AEA stations that have the same attributes, for example, line speed and parity. (2) One or more AEA stations that share the same characteristics of station type, port type, modem type, and default destination.

alternate 1 initial microcode load (Alt 1 IML). The action of loading the utility microcode.

American National Standard Code for Information Interchange (ASCII). A standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity check), used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphic characters.

application. The use to which an information processing system is put, for example, a payroll application, an airline reservation application, a network application.

application program. (1) A program written for or by a user that applies to the user's work, such as a program that does inventory control or payroll. (2) A program used to connect and communicate with stations in a network, enabling users to perform application-oriented activities.

ASCII emulation. The ability of a 3270 display station or printer to communicate with an ASCII host using the DEC VT100 or IBM 3101 data stream.

ASCII pass-through. The transmission of unmodified data between ASCII display stations or printers and an ASCII host or public data network.

asynchronous. (1) Without regular time relationship; unexpected or unpredictable with respect to the execution of program instructions. (2) In asynchronous data transmissions, data characters may be sent or received at any time; no modem clocking is used to establish bit timing.

Asynchronous Emulation Adapter (AEA). In the 3174 Subsystem Control Unit, an adapter that enables an ASCII terminal to communicate with a 3270 host using the 3270 data stream, an ASCII terminal to communicate with an ASCII host through the 3174, and a 3270 terminal to communicate with an ASCII host using the DEC VT100 data stream or the IBM 3101 data stream.

attach. To connect a device logically to a 3174 adapter, so that it can communicate over the network.

attachment feature. The circuitry by which a cable from a local terminal or a modem for a remote terminal is attached to a 3792 Auxiliary Control Unit or a 3791 Controller.

attention (ATTN). An occurrence external to an operation that could cause an interruption of the operation.

attribute. (1) A characteristic. (2) A terminal display language or transformation definition language (TDL) keyword that specifies a particular quality for the TDL object with which it is associated.

attribute value. In the 3270 data stream, a code immediately following the attribute type that specifies a particular property from the set defined by the attribute type.

audible alarm. (1) An alarm that is sounded when designated events occur that require operator attention or intervention before system operation can continue. (2) A special feature that sounds a short, audible tone automatically when a character is entered from the keyboard into the next-to-last character position on the screen. The tone can also be sounded under program control.

autobaud. In the 3174 AEA feature, the process of determining the line speed and parity settings of a connecting display station from a specific sequence of characters (CR . CR) entered from the keyboard. ASCII hosts may also support automatic speed and parity detection, but the character sequence they require may differ.

auto-answer. See *automatic answering.*

auto-call. See *automatic calling.*

automatic answering. (1) Answering in which the called data terminal equipment (DTE) automatically responds to the calling signal.

Note: The call may be established whether or not the called DTE is attended.

(2) A machine feature that permits a station to respond without operator action to a call it receives over a switched line. See also *manual answering.* Contrast with *automatic calling.*

automatic calling. (1) Calling in which the elements of the selection signal are entered into the data network contiguously at the full data signaling rate.

Note: The selection signal is generated by the data terminal equipment. A limit may be imposed by the design criteria of the network to prevent more than a permitted number of unsuccessful call attempts to the same address within a specified period.

(2) A machine feature that permits a station to initiate a connection with another station over a switched line without operator action. (3) Synonymous with auto-call. See also *manual calling.* Contrast with *automatic answering.*

B

backbone. In a local area network multiple-bridge ring configuration, a high-speed link to which the rings are connected by means of bridges. A backbone may be configured as a bus or as a ring.

background logical terminal (LT). In MLT, the background LT is any LT that is not currently displayed. Contrast with *active logical terminal (LT).*

binary synchronous communications (BSC). Data transmission in which character synchronism is controlled by timing signals generated at the sending and receiving stations.

blink. An extended highlighting attribute value (for emphasis) of a field or character.

bracket. In SNA, one or more chains of request units (RUs) and their responses, which are exchanged between two LU-LU half-sessions and represent a transaction between them. A bracket must be completed before another bracket can be started. Examples of brackets are data base inquiries/replies, update transactions, and remote job entry output sequences to work stations.

bridge. (1) A functional unit that connects two local area networks (LANs) that use the same logical link control (LLC) procedure but may use different medium access control (MAC) procedures. (2) See also *backbone* and *gateway.*

Note: A bridge connects networks or systems of the same or similar architectures, whereas a gateway connects networks or systems of different architectures.

buffer. (1) A routine or storage used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another. (2) An isolating circuit used to prevent a driven circuit from influencing the driving circuit. (3) To allocate and schedule the use of buffers. (4) A portion of storage used to hold input or output temporarily.

buffer address. The address of a location in the buffer.

burst. (1) In data communication, a sequence of signals counted as one unit in accordance with some specific criterion or measure. (2) To separate continuous-form paper into discrete sheets.

C

card. In the 3174 Subsystem Control Unit, a unit of electronic circuitry contained in a plastic casing (or cassette) and providing the control unit with a specialized function, for example, a Terminal Adapter or an Encrypt/Decrypt Adapter.

central site customizing. The process of tailoring control unit microcode for each control unit in a network, at the central site.

change-screen key. In MLT, a key or sequence of keys on a display station keyboard used to change sessions, one at a time, with up to five different hosts.

channel-attached. Pertaining to attachment of devices directly by data channels (I/O channels) to a computer. Synonym for *local* Contrast with *telecommunication-attached.*

channel-to-channel adapter. A hardware device that can be used to connect two channels on the same computing system or on different systems.

character mode. A mode in which input is treated as alphanumeric data, rather than graphic data.

character position. A location on the screen at which 1 character can be displayed; also, an addressed location in the buffer at which 1 character can be stored.

character set. (1) A defined collection of characters. (2) A group of characters used for a specific reason, for example, the set of characters a printer can print.

closed path (or network). A network in which all the cable paths and wiring closets are directly or indirectly connected.

coaxial cable. A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.

command. An instruction that directs a control unit or device to perform an operation or a set of operations.

communication adapter. (1) A circuit card with associated software that enables a processor, controller, or other device to be connected to a network. (2) See *EIA communication adapter*, *V.35 communication adapter*, and *X.21 communication adapter*.

communication management host. In ACF/TCAM, the host in a communication management configuration that performs all network-control functions in the network except control of locally attached stations of data hosts.

component. (1) Hardware or software that is part of a functional unit. (2) A functional part of an operating system, for example, the scheduler or supervisor. (3) In systems with VSAM, a named, cataloged collection of stored records, such as the data component or index component of a key-sequenced file or alternate index. (4) In System/38 graphics, the representation of a data group on a chart. (5) See *terminal component* and *solid state component.*

configuration. (1) The arrangement of a computer system or network as defined by the nature, number, and chief characteristics of its functional units. More specifically, the term *configuration* may refer to a hardware configuration or a software configuration. (2) See also *system configuration.*.

Connection Menu. A menu on the screen of a display station attached to the 3174 Subsystem Control Unit, from which a user can select an available host.

connector. A means of establishing electrical flow.

control character. (1) A character whose occurrence in a particular context specifies a control function. (2) A character used to specify that a control unit is to perform a particular operation.

control codes. (1) Code points and their assigned control function meanings. (2) The hexadecimal values hex 00 through hex 3F, and hex FF in the 3270 data stream. ASCII control codes are the hexadecimal values hex 00 through hex 1F and 7F.

Control disk. A customized diskette or fixed disk containing the microcode that describes a particular control unit's attached terminals, and its method of attachment to the host.

Control (CTL) diskette. A customized diskette containing the microcode that describes a particular control unit's attached terminals, and its method of attachment to the host. The customized diskette is mailed to the control unit for which it was generated.

control unit. (1) A device that controls input or output operations at one or more devices. (2) A general term for any device that provides common functions for other devices or mechanisms. The 3174 is an example of a control unit.

control unit terminal (CUT). A terminal that relies on the 3174 to interpret the data stream. Examples are the 3178, 3179, 3278, and 3279.

control unit terminal (CUT) mode. A host-interactive mode that enables an IBM 3270 Personal Computer customized in this mode to run only one session emulating a 3178, 3179, 3278 Model 2, or 3279 Model S2A.

controller. A unit that controls input/output operations for one or more devices.

control unit. A general term for any device that provides common functions for other devices or mechanisms. The 3174 is an example of a control unit.

control unit terminal (CUT). A terminal that relies on the 3174 to interpret the data stream. Examples are the 3178, 3179, 3278 Model 2, and 3279 Model S2A.

conversion. (1) In programming languages, the transformation between values that represent the same data item but belong to different data types. Information may be lost as a result of conversion because accuracy of data representation varies among different data types. (2) The process of changing from one method of data processing to another or from one data processing system to another. (3) The process of changing from one form of representation to another, for example, to change from decimal representation to binary representation.

create. In 3174 central site customizing, to create a library member for a network control unit, and store the customizing data for that library member on a Library diskette.

CTS flow control. A procedure for a communicating device to signal its readiness to receive data by raising the CTS lead on an EIA 232D interface.

cursor. (1) A movable, visible mark used to indicate the position at which the next operation will occur on a display surface. (2) A unique symbol that identifies a character position in a screen display, usually the character position at which the next character to be entered from the keyboard will be displayed.

customization. Procedures that tailor the control unit microcode to fit the various types of display stations and printers and the method of host attachment that a particular control unit will handle.

D

data circuit-terminating equipment (DCE). In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line.

Notes:

1. The DCE may be separate equipment or an integral part of the DTE or of the intermediate equipment.
2. A DCE may perform other functions that are usually performed at the network end of the line.

data host. In an ACF/TCAM communication management configuration, a host that is dedicated to processing applications and does not control network resources, except for its locally attached devices. See also *communication management host.*

data processing (DP). The systematic performance of operations upon data; for example, handling, merging, sorting, computing.

data station. See *station.*

data stream. (1) All data transmitted through a data channel in a single read or write operation. (2) A continuous stream of data elements being transmitted, or intended for transmission, in character or binary-digit form, using a defined format. See also *data stream format.*

data stream format. In SNA, the format of the data elements (end-user data) in the request unit (RU). See also *3270 data stream* and *SNA character string (SCS).*

data terminal equipment (DTE). That part of a data station that serves as a data source, data sink, or both.

default destination. A destination for display stations and printers that is defined in customization.

device. A mechanical, electrical, or electronic contrivance with a specific purpose.

display field. (1) An area in the display buffer that contains a set of characters that can be manipulated or operated upon as a unit. (2) A group of consecutive characters (in the buffer) that starts with an attribute character (defining the characteristics of the field) and contains one or more alphanumeric characters. The field continues to, but does not include, the next attribute character.

display frame. (1) In computer graphics, an area in storage in which a display image can be recorded. (2) In computer micrographics, an area on a microform in which a display image can be recorded.

distributed function terminal (DFT). A programmable terminal that can perform operations previously performed by the control unit. These terminals can interpret the 3270 data stream themselves. Examples are the IBM 3270 Personal Computer and the 3290 Information Panel.

dot. One point in a printer or display block matrix.

downstream. (1) In the direction of data flow or toward the destination of transmission. (2) From the processor toward an attached unit or end user. (3) Contrast with *upstream.*

downstream load (DSL). The capability of a distributed function terminal to receive its control program from the control unit to which it is attached. A diskette containing the terminal's control program is loaded into the control unit.

drop. In the IBM Cabling System, a cable that runs from a faceplate to the distribution panel in a wiring closet.

Note: When the IBM Cabling System is used with the IBM Token-Ring Network, a drop may form part of a lobe. Cables between wiring closets are not classified as drops.

DTR flow control. A procedure for a communicating device to signal its readiness to receive data by raising the DTR lead on an EIA 232D interface.

duplex. Pertaining to communication in which data can be sent and received at the same time. Synonymous with full duplex.

E

EIA communication adapter. A communication adapter conforming to EIA standards that can combine and send information on two lines at speeds up to 19.2 kbps.

EIA 232D. An electrical interface defined by the Electronics Industries Association for establishing connections and controlling data flow between data terminal equipment (terminals, computers, or control units) and data circuit-terminating equipment (modems). The interface has been adapted to allow communation between DTEs.

emulate. (1) To imitate one system with another, primarily by hardware, so that the imitating system accepts the same data, executes the same computer programs, and achieves the same results as the imitated computer system. (2) Contrast with *simulate*.

emulation. (1) The imitation of all or part of one system by another, primarily by hardware, so that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated computer system. (2) The use of programming techniques and special machine features to permit a computing system to execute programs written for another system. (3) Imitation, for example, imitation of a computer or device. (4) See *terminal emulation*. (5) Contrast with *simulation*.

equipment rack. A metal stand for mounting components.

event. (1) An occurrence or happening. (2) An occurrence of significance to a task; for example the completion of an asynchronous operation, such as an input/output operation.

extended binary-coded decimal interchange code (EBCDIC). A coded character set of 256 eight-bit characters.

extended highlighting. (1) A function that provides blink, reverse video, and underscore for emphasizing fields or characters on devices supporting extended field attributes and character attributes. (2) An attribute type in the extended field attribute and character attribute. (3) An attribute passed between session partners in the Start Field Extended, Modify Field, and Set Attribute orders.

F

field. See *display field*.

flow control. (1) In data communication, control of the data transfer rate. (2) In SNA, the process of managing the rate at which data traffic passes between components of the network. The purpose of flow control is to optimize the rate of flow of message units with minimum congestion in the network, that is, neither to overflow the buffers at the receiver or at intermediate routing nodes nor to leave the receiver waiting for more message units. (3) The methods used to control the flow of information across a network. (4) See *CTS Flow Control*. (5) See *DTR Flow Control*. (6) See *XON/XOFF Flow Control*.

foreground logical terminal (LT). Synonym for *active logical terminal (LT)*.

frame. (1) The portion of a tape, on a line perpendicular to the reference edge, on which binary characters can be written or read simultaneously. Synonymous with *tape row*. (2) A housing for machine elements. (3) The hardware support structure, covers, and all electrical parts mounted therein that are packaged as one entity for shipping. (4) A formatted display. See *display frame*.

full-duplex. Synonym for *duplex*.

G

gateway. (1) A functional unit that connects two computer networks of different network architectures. (2) See also *bridge*.

Note: A gateway connects networks or systems of different architectures. A bridge interconnects networks or systems with the same or similar architectures.

generate. In 3174 central site customizing, to write a Control diskette containing the customizing data for a particular control unit. Also, to print a mailing address label and a diskette label for a particular control unit.

H

half-duplex. In data communication, pertaining to transmission in only one direction at a time. Contrast with full-duplex.

hexadecimal. (1) Pertaining to a selection, choice, or condition that has 16 possible values or states. (2) Pertaining to a fixed-radix numeration system, with radix of 16. (3) Pertaining to a numbering system with base of 16; valid numbers use the digits 0 through 9 and characters A through F, where A represents 10 and F represents 15.

host access method. The access method that controls communication with a domain.

host application program. An application program processed in the host computer.

host attachment. A mode of SNA communication in which the processor acts as a secondary SNA device.

host computer. (1) In a computer network, a computer that provides end users with services such as computation and data bases and that usually performs network control functions. (2) The primary or controlling computer in a multiple-computer installation. (3) A computer used to prepare programs for use on another computer or on another data processing system; for example, a computer used to compile link edit, or test programs to be used on another system. (4) Synonym for *host processor*.

host interface. Interface between a network and the host computer.

host logical unit (LU). An SNA logical unit (LU) located in a host processor, for example, an ACF/VTAM application program.

host mode. The operating mode of an HASP main processor communicating with an HASP work station.

host node. (1) A node at which a host processor is located. (2) In SNA, a subarea node that contains a system services control point (SSCP); for example, a System/370 computer with OS/VS2 and ACF/TCAM.

host processor. (1) A processor that controls all or part of a user application network. (2) In a network, the processing unit in which resides the access method for the network. (3) In an SNA network, the processing unit that contains a system services control point (SSCP). (4) A processing unit that executes the access method for attached communication controllers. (5) The processing unit required to create and maintain PSS. (6) Synonymous with *host computer*.

host system. (1) A data processing system used to prepare programs and operating environments for use on another computer or controller. (2) The data processing system to which a network is connected and with which the system can communicate. (3) The controlling or highest-level system in a data communication configuration; for example, a System/38 is the host system for the work stations connected to it.

I

initial microcode load (IML). The action of loading the operational microcode.

input/output (I/O). (1) Pertaining to a device whose parts can perform an input process and an output process at the same time. (2) Pertaining to a functional unit or channel involved in an input process, output process, or both, concurrently or not, and to the data involved in such a process.

Note: The phrase *input/output* may be used in place of *input/output data*, *input/output signals*, and *input/output process* when such a usage is clear in context.

(3) Pertaining to input, output, or both.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, common physical interconnection characteristics, signal characteristics, and other characteristics as appropriate. (2) A shared boundary. An interface may be a hardware component to link two devices or a portion of storage or registers accessed by two or more computer programs. (3) Hardware, software, or both, that links systems, programs, or devices.

J

jack. A connecting device to which a wire or wires of a circuit may be attached and that is arranged for insertion of a plug.

K

keyboard definition. A customizing procedure for defining a maximum of four modified keyboard layouts for modifiable keyboards only. Most characters, symbols, and functions can be relocated, duplicated, or deleted from almost any keyboard position.

L

leased line. Synonym for *nonswitched line*.

Library (CSL) diskette. A diskette that contains customizing data for some or all of the control units in a network.

library member. A file located on a Library diskette that contains customizing information for a control unit in a network.

line speed. (1) The rate at which data is transmitted from one point to another over a telecommunication line. (2) The number of binary digits that can be sent over a telecommunication line in 1 second, expressed in bits per second (bps).

link. The logical connection between nodes including the end-to-end link control procedures.

link station. (1) A specific place in a service access point that enables an adapter to communicate with another adapter. (2) A protocol machine in a node that manages the elements of procedure required for the exchange of data traffic with another communicating link station.

local. Pertaining to a device accessed directly without use of a telecommunication line. Synonym for *channel-attached*. Contrast with *remote*.

local area network (LAN). A data network located on the user's premises in which serial transmission is used for direct data communication among data stations.

Notes:

1. Communication within a local area network is not subject to external regulation; however, communication across the LAN boundary may be subject to some form of regulation.
2. A LAN does not use store and forward techniques.

location. With reference to a 3174, a place within the 3174 chassis where a particular card or adapter is inserted.

logical terminal (LT). In MLT, one of five sessions available to share one display station.

logical unit (LU). In SNA, a port through which an end user accesses the SNA network in order to communicate with another end user and through which the end user accesses the functions provided by system services control points (SSCPs). An LU can support at least two sessions, one with an SSCP and one with another LU, and may be capable of supporting many sessions with other logical units. See also *network addressable unit*, *physical unit*, *primary logical unit*, *secondary logical unit*, and *system services control point*.

M

maintenance analysis procedure (MAP). A maintenance document that gives an IBM service representative a step-by-step procedure for tracing a symptom to the cause of a failure.

manual answering. (1) Answering in which a call is established only if the called user signals a readiness to receive the call by means of a manual operation. (2) Operator actions to prepare a station to receive a call on a switched line. Contrast with *automatic answering*.

manual calling. (1) Calling that permits the entry of selection signals from a calling data station at an undefined character rate. (2) Operator actions to place a call over a switched line. Contrast with *automatic calling*.

Note: The characters may be generated at the data terminal equipment or at the data circuit-terminating equipment.

mark. A symbol or symbols that indicate the beginning or the end of a field, a word, an item of data or a set of data such as a file, record, or block.

medium. A physical carrier of electrical energy.

microcode. (1) One or more microinstructions. (2) A code, representing the instructions of an instruction set, that is implemented in a part of storage that is not program-addressable. (3) To design, write, and also to test one or more microinstructions.

Note: The term *microcode* represents microinstructions used in a product as an alternative to hard-wired circuitry to implement functions of a processor or other system component. The term *microprogram* means a dynamic arrangement of one or more groups of microinstructions for execution to perform a certain function.

modem (modulator/demodulator). A device that converts digital data from a computer to an analog signal that can be transmitted on a telecommunication line, and converts the analog signal received to data for the computer.

multiple logical terminals (MLT). In the 3174, a function that provides a CUT-attached fixed-function display station with the ability to interact with as many as five host sessions. Each session is processed as though it were a separate display station.

N

network. (1) An arrangement of nodes and connecting branches. Connections are made between data stations. (2) A configuration of data processing devices and software connected for information interchange.

network addressable unit (NAU). In SNA, a logical unit, a physical unit, or a system services control point. The NAU is the origin or the destination of information transmitted by the path control network. See also *logical unit*, *physical unit*, and *system services control point (SSCP)*.

node. An end point of a link or a junction common to two or more links in a network.

nonswitched line. (1) A connection between systems or devices that does not have to be made by dialing. Contrast with *switched line*. (2) A telecommunication line on which connections do not have to be established by dialing. Synonymous with *leased line.*

null modem. A device with two 25-pin D-shell connectors that attaches to the station end of a standard, straight-through, pin-for-pin EIA 232C cable. The null modem does the crossing-over of the appropriate EIA 232C leads required for the direct connection of a terminal or computer to an AEA port.

O

office. See *work area*.

online test. A diagnostic test or data collection program that is run without interrupting the normal operation of the 3174 and its associated terminals.

original equipment manufacturer (OEM). A manufacturer of equipment that may be marketed by another manufacturer.

P

pacing. (1) A technique by which a receiving station controls the rate of transmission of a sending station to prevent overrun. (2) In SNA, a technique by which a receiving component controls the rate of transmission of a sending component to prevent overrun or congestion.

parallel. (1) Pertaining to a process in which all events occur within the same interval of time, each handled by a separate but similar functional unit; for example, the parallel transmission of the bits of a computer word along the lines of an internal bus. (2) Pertaining to concurrent or simultaneous operation of two or more devices or to concurrent performance of two or more activities in a single device. (3) Pertaining to concurrent or simultaneous occurrence of two or more related activities in multiple devices or channels. (4) Pertaining to the simultaneity of two or more processes. (5) Pertaining to the simultaneous processing of the individual parts of a whole, such as the bits of a character and the characters of a word, using separate facilities for the various parts. (6) Contrast with *serial*.

parity. A transmission error-checking scheme in which an extra bit is added to some unit of data, usually a byte, in order to make the total number of one bits even or odd. For the AEA feature, odd, even, mark, space, or no-parity coding is supported. No-parity means that no parity bit is sent or expected. Mark and space mean that the parity position is always set to one or zero, respectively, and that received parity is not checked.

parity bit. (1) A binary digit appended to a group of binary digits to make the sum of all the digits, including the appended binary digit, either odd or even as preestablished. (2) A check bit appended to an array of binary digits to make the sum of all the binary digits, including the check bit, always odd or always even.

parity check. (1) A redundancy check by which a recalculated parity bit is compared with the pregiven parity bit. (2) A check that tests whether the number of ones (or zeros) in an array of binary digits is odd or even.

path. In a network, a route between any two nodes.

physical unit (PU). In SNA, the component that manages and monitors the resources (such as attached links and adjacent link stations) of a node, as requested by an SSCP through an SSCP-SSCP session.

port. (1) An access point for data entry or exit. (2) A connector on a device to which cables for other devices such as display stations and printers are attached.

primary logical unit (PLU). In SNA, the logical unit (LU) that contains the primary half-session for a particular LU-LU session. Contrast with *secondary logical unit*.

printer authorization matrix. A matrix stored in the control unit that establishes printer assignment and classification.

private branch exchange (PBX). An automatic or manual private telephone exchange for transmission of calls to and from the public telephone network.

program access (PA) key. On a display device keyboard, a key that produces a call to a program that performs display operations. See also *program function (PF) key*.

program function (PF) key. On a display device keyboard, a key that passes a signal to a program to call

for a particular display operation. See also *program access (PA) key*.

programmable symbols (PS). Customer-defined symbols. There are a maximum of 190 symbols in a programmed symbol set.

Program Tab (PT) order. An order that advances the current buffer address to the address of the first character location of the next unprotected field and resets the character attributes of all characters in the field that are replaced by nulls.

programmed symbol set (PSS). A set of fonts that can be system-defined or defined by the user and to which a code can be assigned.

programmed symbols (PS). In the 3270 Information Display System, an optional feature that stores up to six user-definable, program-loadable character sets of 190 characters each in terminal read/write storage for display or printing by the terminal.

protected field. (1) In word processing, preset data or an area that cannot be changed or overridden by an operator without altering the program. (2) On a display device, a display field in which a user can't enter, modify, or erase data. Contrast with *unprotected field*.

protocol. (1) A set of semantic and syntactic rules that determine the behavior of functional units in achieving communication. (2) In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components.

protocol conversion. For the AEA feature, emulation of one device protocol by a device designed for a different protocol.

put. In 3174 central site customizing, to store data from the working copy into a library member.

R

read-only memory (ROM). A computer's storage area whose contents cannot be modified.

register. A storage device having a specified storage capacity such as a bit, byte, or computer word, and usually intended for a special purpose.

remote. Pertaining to a system, program, or device that is accessed through a telecommunication line. Contrast with *local*.

request for price quotation (RPQ). An alteration or addition to the functional capabilities that the control unit provides.

return code. (1) A code used to influence the execution of succeeding instructions. (2) A value returned to a program to indicate the results of an operation requested by that program.

ring (network). A network configuration where a series of attaching devices are connected by unidirectional transmission links to form a closed path.

ring interface adapter. A device that assumes the basic data transmission functions of node, such as frame recognition, address decoding, error checking, buffering of frames, fault detection, and, in Token-Ring Networks, token generation.

ring topology. A logically circular, unidirectional transmission path without defined ends. Control can be distributed or centralized.

S

secondary logical unit (SLU). In SNA, the logical unit (LU) that contains the secondary half-session for a particular LU-LU session. Contrast with *primary logical unit*.

serial. (1) Pertaining to a process in which all events occur one after the other; for example, serial transmission of the bits of a character according to V24 CCITT protocol. (2) Pertaining to the sequential or consecutive occurrence of two or more related activities in a single device or channel. (3) Pertaining to the sequential processing of the individual parts of a whole, such as the bits of a character or the characters of a word, using the same facilities for successive parts. (4) Contrast with *parallel*.

session. (1) In network architecture, an association of facilities necessary for establishing, maintaining, and releasing connections for communication between stations. (2) In MLT, synonymous with logical terminal (LT). (3) In SNA, a logical connection between two network addressable units that can be activated, tailored to provide various protocols, and deactivated as requested.

session limit. In 3174, the total number of logical terminals or defined AEA default destinations for an AEA port set.

simulate. (1) To represent certain features of the behavior of a physical or abstract system by the behavior of another system; for example, to represent a physical phenomenon by means of operations performed by a computer or to represent the operations of a computer by those of another computer. (2) To imitate one system with another, primarily by software, so that the imitating system accepts the same data, executes the same computer programs, and achieves the same results as the imitated system. (3) Contrast with *emulate*.

simulation. (1) The representation of selected characteristics of the behavior of one physical or abstract system by another system. In a digital computer system, simulation is done by software; for example, (a) the representation of physical phenomena by means of operations performed by a computer system, and (b) the representation of operations of a computer system by those of another computer system. (2) Contrast with *emulation*.

SNA character string (SCS). A character string composed of EBCDIC controls, optionally intermixed with end-user data, that is carried within a request/response unit.

solid-state component. A component whose operation depends on control of electric or magnetic phenomena in solids, for example, a transistor, crystal diode, ferrite core.

staging adapter. (1) An addition to a System/370 Model 158 or 168 Integrated Storage Control (ISC) feature that enables the integrated storage control to operate in a 3850 Mass Storage System. (2) An IBM 3850 Model 3 Storage Control, which is a 3830 Model 2 Storage Control that has been modified to operate in a 3850 Mass Storage System.

station. (1) An input or output point of a system that uses telecommunication facilities; for example, one or more systems, computers, terminals, devices, and associated programs at a particular location that can send or receive data over a telecommunication line. (2) A location in a device at which an operation is performed, for example, a read station. (3) In SNA, a link station.

storage. (1) A unit into which recorded text can be entered, in which it can be retained and processed, and from which it can be retrieved. (2) See also memory.

subsystem. A secondary or subordinate system, or programming support, usually capable of operating independently of or asynchronously with a controlling system. The 3174 and its attached terminals are an example of a subsystem.

switched line. A telecommunication line in which the connection is established by dialing. Contrast with *nonswitched* line.

synchronous. (1) Pertaining to two or more processes that depend on the occurrences of a specific event, such as common timing signal. (2) Occurring with a regular or predictable time relationship.

system configuration. A process that specifies the devices and programs that form a particular data processing system.

system services control point (SSCP). In SNA, the focal point within an SNA network for managing the configuration, coordinating network operator and problem determination requests, and providing directory support and other session services for end users of the network. Multiple SSCPs, cooperating as peers, can divide the network into domains of control, with each SSCP having a hierarchical control relationship to the physical units and logical units within its domain.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

Note: The layered structure of SNA allows the ultimate origins and destinations of information, that is, the end users, to be independent of and unaffected by the specific SNA network services and facilities used for information exchange.

T

terminal. In data communication, a display station or printer capable of sending or receiving information.

terminal adapter (TA). An adapter that provides control for a maximum of 32 terminals; each BNC connector (four in all) on the terminal adapter can control either one terminal that is directly attached or as many as eight terminals that are attached through a terminal multiplexer adapter (located in the 3174) or a 3299 Terminal Multiplexer (located outside the 3174).

terminal component. A separately addressable part of a terminal that performs an input or output function, such as the display component of a keyboard-display device or a printer component of a keyboard-printer device.

terminal emulation. The capability of a microcomputer, personal computer, 3270 CUT mode display station, 3270 printer, ASCII display station, or ASCII printer to operate as if it were a particular type of terminal linked to a processing unit and to access data.

terminal multiplexer. A device, such as the 3299 Terminal Multiplexer, for interleaving the signals for many devices onto a single coaxial cable.

terminal multiplexer adapter (TMA). This adapter is connected to the terminal adapter in the 3174 and provides control for a maximum of eight terminals.

time-out. (1) An event that occurs at the end of a predetermined period of time that began at the occurrence of another specified event. (2) A time interval allotted for certain operations to occur; for example, response to polling or addressing before system operation is interrupted and must be restarted. (3) A terminal feature that logs off a user if an entry is not made within a specified period of time.

Note: Time-out can be prevented by an appropriate signal.

token. In a local area network, the symbol of authority passed among data stations to indicate the station temporarily in control of the transmission medium.

Note: A token is a particular message or bit pattern that signifies permission to transmit.

Token-Ring Network. (1) A ring network that allows unidirectional data transmission between data stations by a token-passing procedure over one transmission medium so that the transmitted data returns to the transmitting station. (2) A network that uses a ring topology, in which tokens are passed in a circuit from node to node. A node that is ready to send can capture the token and insert data for transmission.

transmission medium. A physical carrier of electrical energy or electromagnetic radiation.

transmitter. See *universal receiver-transmitter.*

Type. In the 3174 Subsystem Control Unit, the identifying number of a card. For example, 9150 is the type number of the terminal adapter in the 3174.

U

universal receiver-transmitter. A circuit used in asynchronous, synchronous, or synchronous/asynchronous data communication applications to provide all the necessary logic to recover data in a serial-in parallel-out fashion and to transmit data in a parallel-in serial-out fashion. It is usually duplex; that is, it can transmit and receive simultaneously with the option to handle various data word lengths.

unprotected field. A displayed field in which a user can enter, modify, or delete data. Contrast with *protected field.*

upstream. (1) In the direction opposite to data flow or toward the source of transmission. (2) Toward the processor from an attached unit or end user. (3) Contrast with *downstream.*

V

V.35 communication adapter. A communication adapter that can combine and send information on one line at speeds up to 64 kbps, and conforms to the CCITT V.35 standard.

W

work area. An area in which terminals (such as display stations, keyboards, and printers) are located. Access units may also be located in work areas.

wrap test. A test that checks attachment or control unit circuitry without checking the mechanism itself by returning the output of the mechanism as input. For example, when unrecoverable communication adapter or machine errors occur, a wrap test can transmit a specific character pattern to or through the modem in a loop and then compare the character pattern received with the pattern transmitted.

wraparound. The continuation of an operation (for example, a read operation or a cursor movement operation) from the last character position in a buffer to the first character position in the buffer.

write. To make a permanent or transient recording of data in a storage device or on a data medium.

X

X.21 communication adapter. A communication adapter that can combine and send information on one line at speeds up to 64 kbps, and that conforms to CCITT X.21 standards.

XON/XOFF flow control. A procedure for indicating readiness to receive data by sending the ASCII control characters DC1 (XON) or DC3 (XOFF) to a transmitter of data.

3

3270 data stream. (1) The commands, control codes, orders, attributes, and data or structured fields for 3270 devices, that are transmitted inbound to an application program or outbound to a terminal. (2) Data being transferred from or to an allocated primary or tertiary device, or to the host system, as a continuous stream of data and 3270 Information Display System control elements in character form.

3270 emulation. The use of a program that allows a device or system such as a personal computer or a System/38 to operate in conjunction with a host system as if it were a 3270-series display station or control unit.

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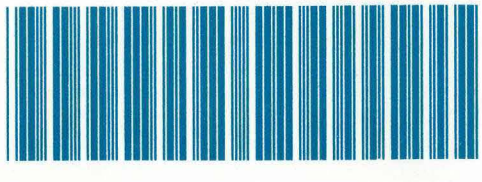

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